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EDEXCEL INTERNATIONAL GCSE GEOGRAPHY: QUESTIONS BY TOPIC

River Environments (Topic 1)

International GCSE Geography Topic 1

32 questions · 688 marks · Mark schemes included

Pearson Edexcel International GCSE (9–1) Geography 4GE1, Papers 1, 1R, 2 & 2R, June 2019 - June 2025

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HOW TO USE THIS BOOKLET

Questions are grouped by sub-topic (exam questions, then fieldwork), oldest paper first.
Click any heading or question row below to jump straight to it.
On every question page, click ANSWER in the top-right corner to jump to its mark scheme.
Diagrams, graphs, tables and data are printed exactly as they appeared in the original papers.

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RIVER ENVIRONMENTS: EXAM QUESTIONS		16 questions · 400 marks		3
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QUESTIONS

32 questions · 688 marks · grouped by sub-topic

SUB-TOPIC

RIVER ENVIRONMENTS: EXAM QUESTIONS

16 questions in this booklet

If you answer Question 1 put a cross in the box ☒

1 River Environments.

(a) Identify the statement below that best describes the channel in the lower course of a river.

(1)

☒	**A** small and fast river channel
☒	**B** wide and deep river channel
☒	**C** narrow and fast river channel
☒	**D** small and narrow river channel

(b) (i) Identify **one** process of river erosion.

(1)

☒	**A** levees
☒	**B** abrasion
☒	**C** overland flow
☒	**D** discharge

(ii) State **one** process of river transportation.

(1)

.....

(iii) Explain **one** way water is stored in the hydrological cycle.

(2)

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(c) Study Figure 1a in the Resource Booklet.

Suggest **two** ways people manage water supply.

(4)

1 .....

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2 .....

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(d) Explain **one** way vegetation can affect river discharge.

(3)

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(e) Study Figure 1b in the Resource Booklet.

Identify the river landform.

(1)

(f) Explain the formation of a river meander.

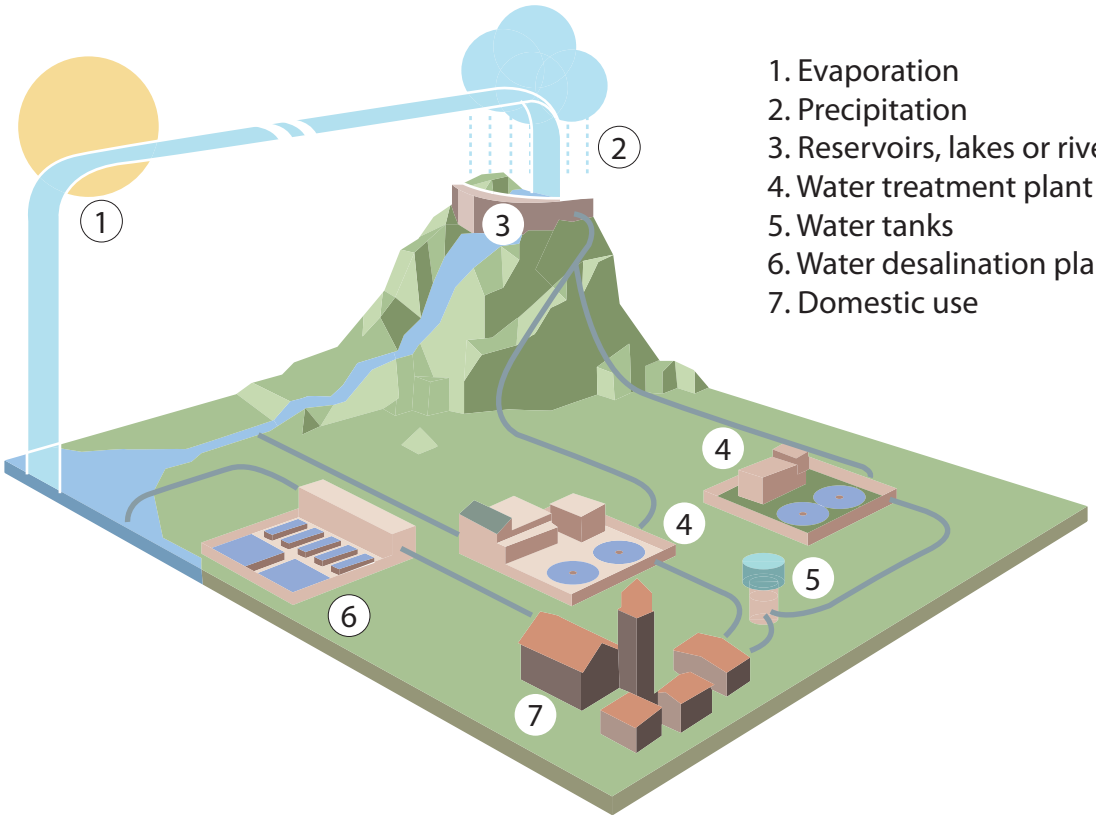
(4)

(g) Study Figure 1c and Figure 1d in the Resource Booklet.

Analyse the reasons for variations in water quality.

(8)

Water cycle management

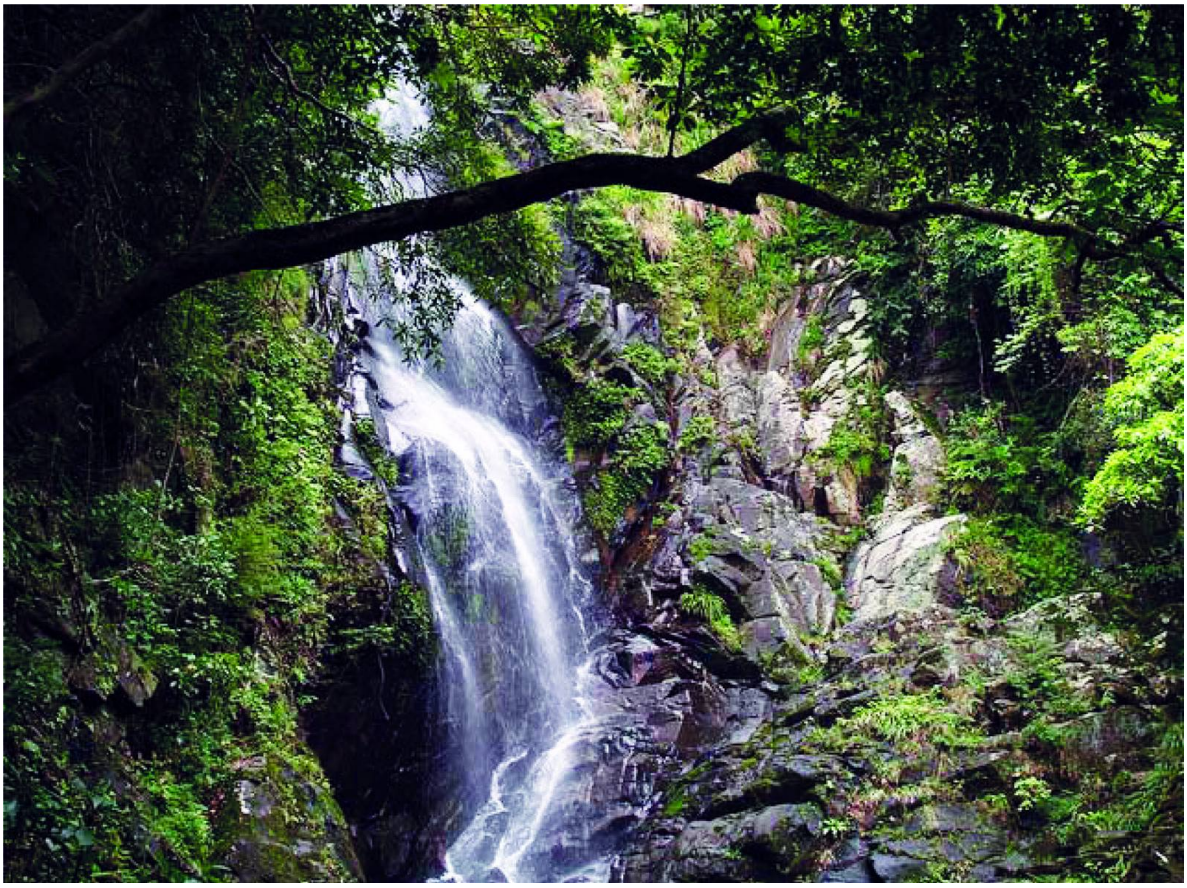


1. Evaporation
2. Precipitation
3. Reservoirs, lakes or rivers
4. Water treatment plant
5. Water tanks
6. Water desalination plant
7. Domestic use

(Source: http://www.sociocosmo.com/2015/05/india-water-management-Indian-agriculture-IMD-Skymet-ICAR.html)

Figure 1a

Water management in India



(Source: © David Holmes)

Figure 1b

A river landform in Hong Kong

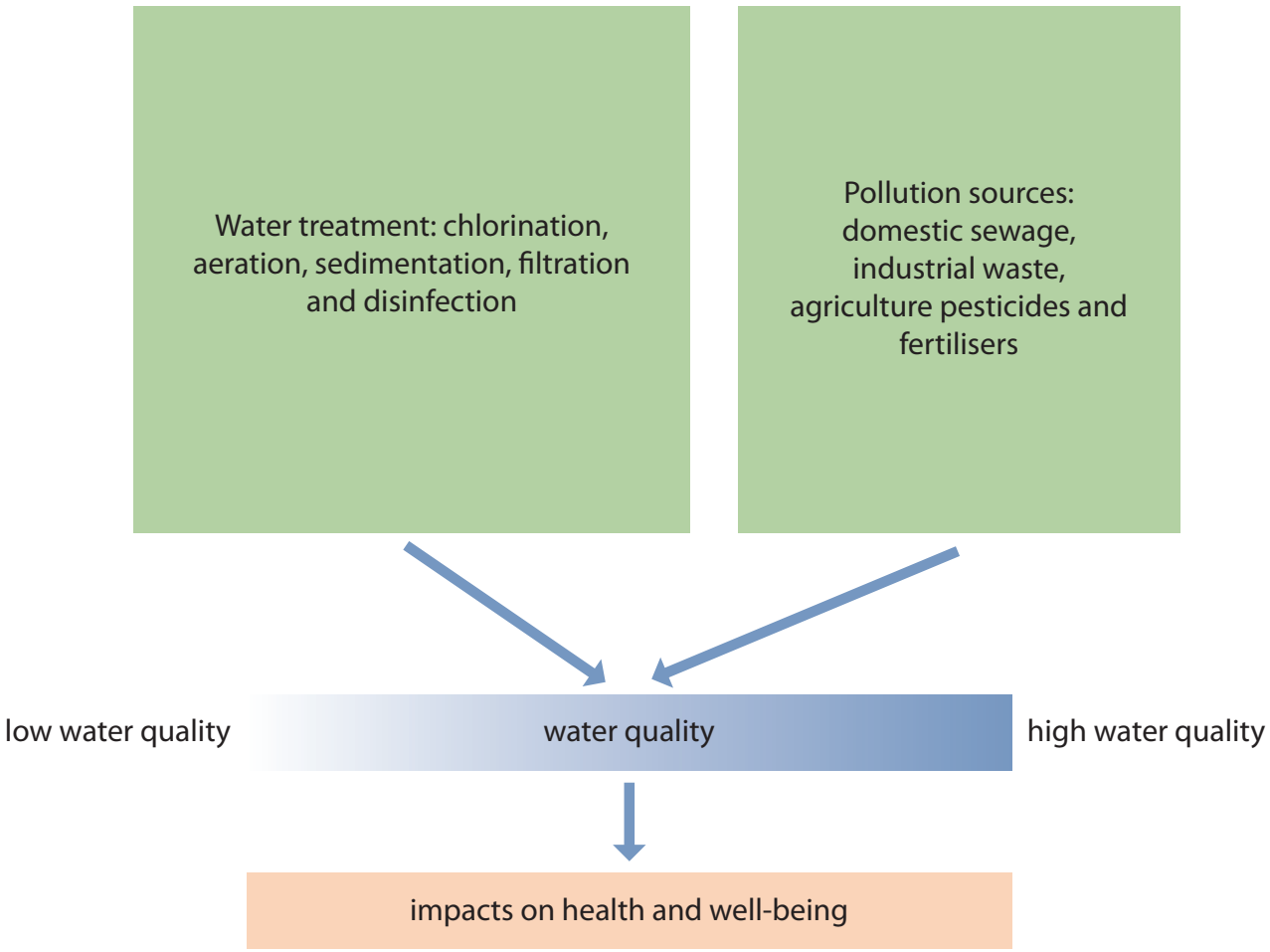
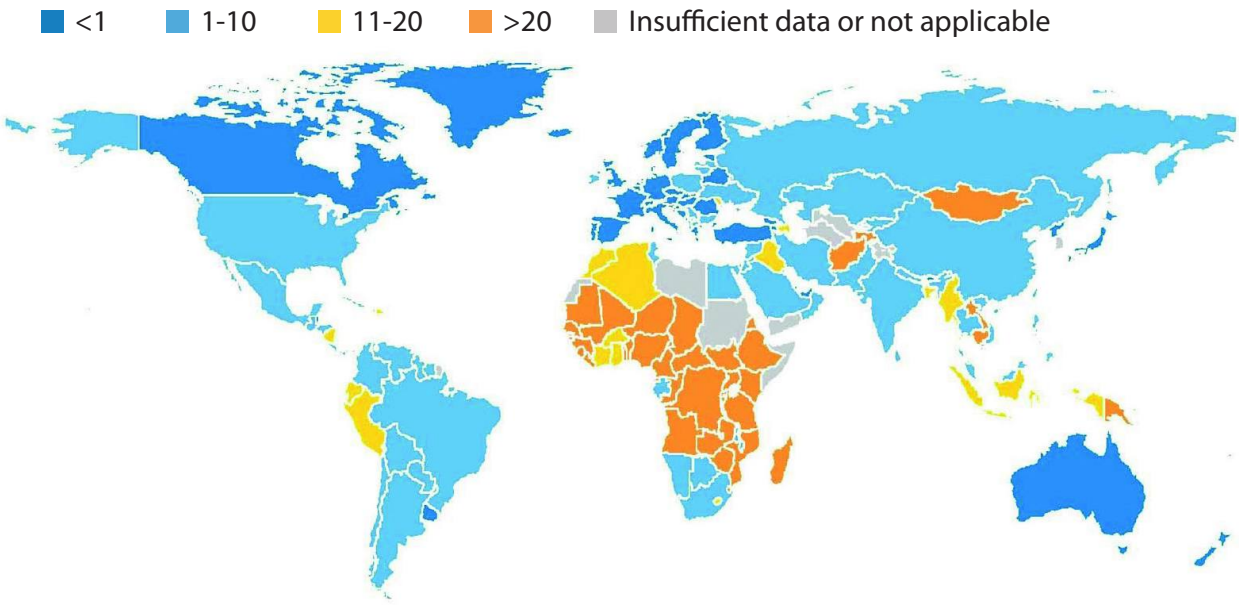


Figure 1c

Factors affecting water quality



(Source: https://www.theguardian.com/global-development-professionals-network/2017/mar/17/access-to-drinking-water-world-six-infographics#img-2)

Figure 1d

Percentage of people using untreated drinking water

If you answer Question 1 put a cross in the box ☒.

1 River Environments.

(a) Identify the statement below that best describes the channel shape in the upper course of a river.

(1)

☒	**A** narrow river channel with shallow sides
☒	**B** narrow river channel with steep sides
☒	**C** wider river channel with shallow sides
☒	**D** widest river channel with very shallow sides

(b) (i) Identify **one** process of river transportation.

(1)

☒	**A** suspension
☒	**B** abrasion
☒	**C** attrition
☒	**D** deposition

(ii) State **one** store in the hydrological cycle.

(1)

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(iii) Explain **one** method of water transfer in the hydrological cycle.

(2)

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(c) Study Figure 1a in the Resource Booklet.

Suggest **two** ways in which water quality can be affected by people.

(4)

1 .....

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2 .....

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(d) Explain **one** way precipitation can affect a river regime.

(3)

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(e) Study Figure 1b in the Resource Booklet.

Identify the river landform at X.

(1)

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(f) Explain the formation of an oxbow lake.

(4)

(g) Study Figure 1c and Figure 1d in the Resource Booklet.

Analyse the reasons why areas differ in their risk of river flooding.

(8)

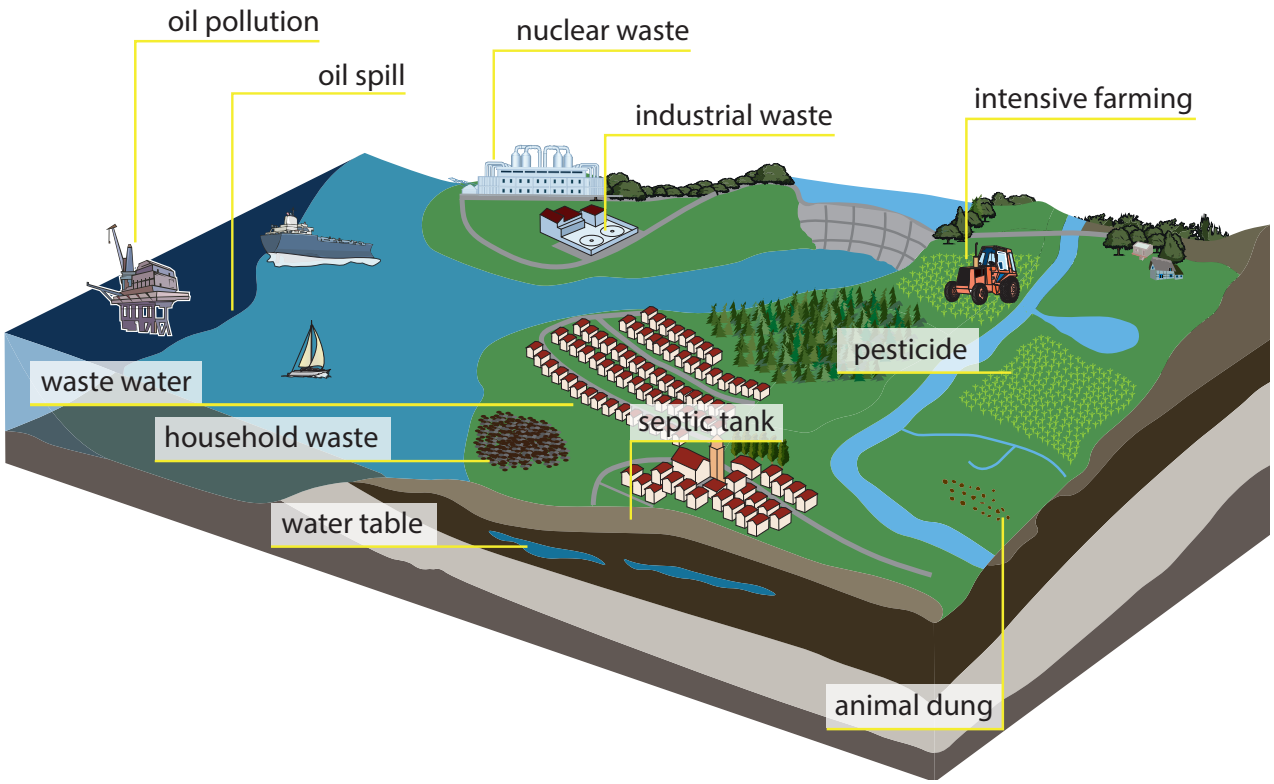


Figure 1a

Factors influencing water quality

(Source: Reproduced with the permission of QA International, www.ikonet.com from the book "The Visual Dictionary". © QA International, 2003. All rights reserved.")



Figure 1b

A fluvial landscape in southwest Iceland

(Source: © David Holmes)

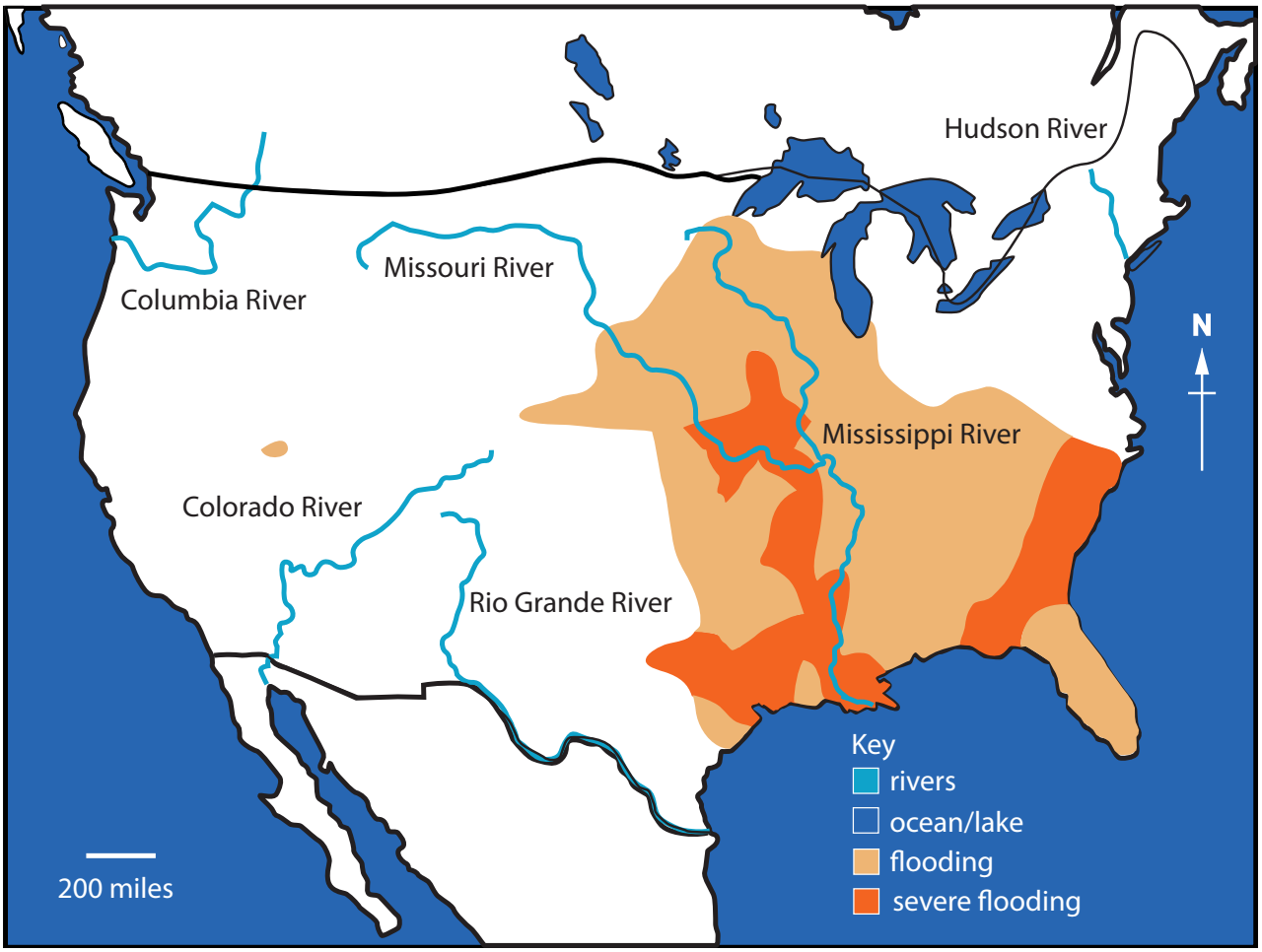


Figure 1c

Levels of river flood risk across the USA in 2016

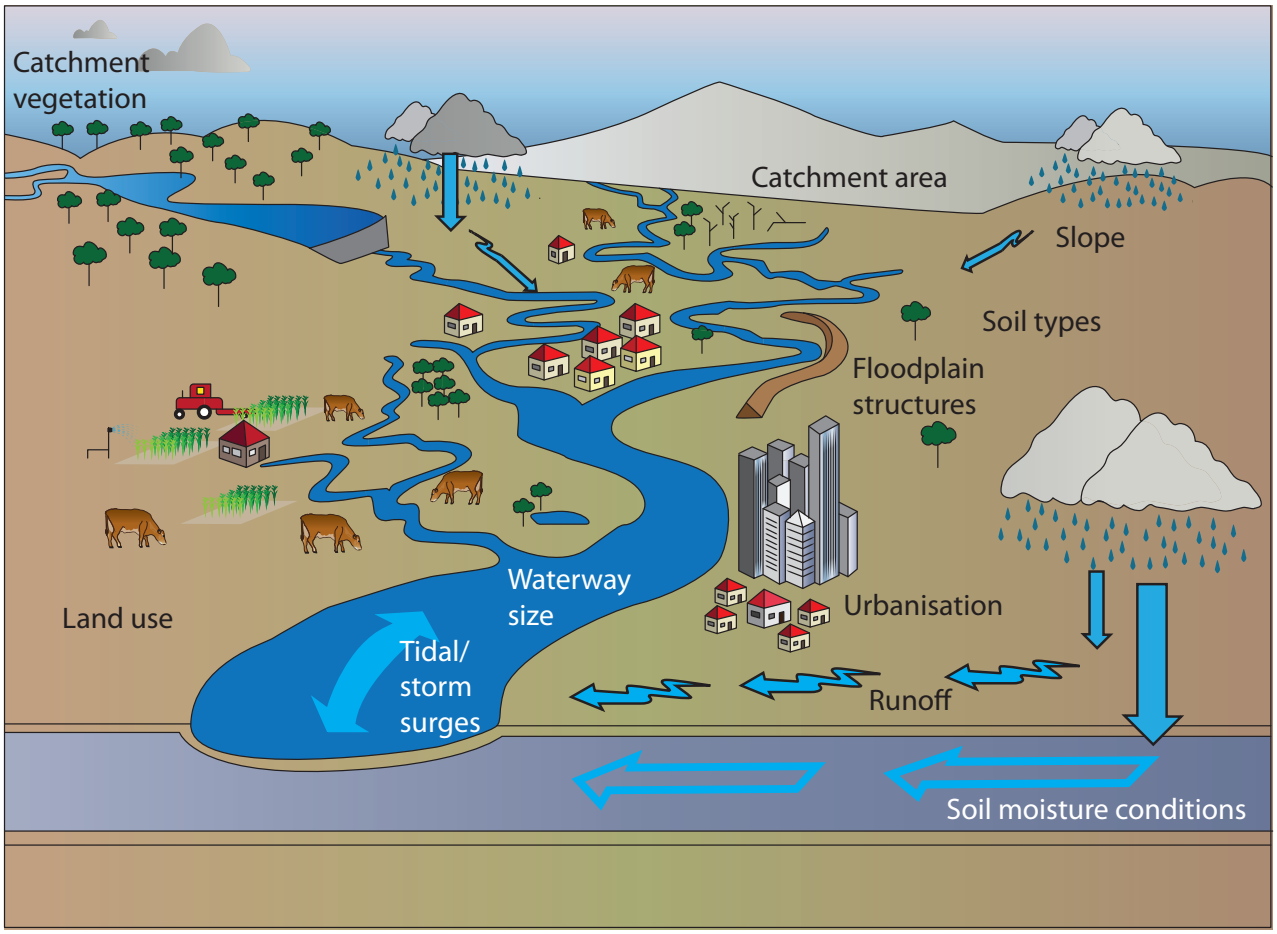


Figure 1d

Factors affecting river flooding

(Source from: © The State of Queensland 2018)

If you answer Question 1 put a cross in the box ☒.

1 River environments

(a) Identify the meaning of the term **river discharge**.

(1)

☒	**A** the average speed of water in a river at one place at any one time
☒	**B** the volume of water in a river at one place at any one time
☒	**C** the average depth of a river at one place
☒	**D** the average width of a river at one place

(b) (i) Identify the meaning of the term **drainage basin**.

(1)

☒	**A** an area of land where water is stored
☒	**B** an area of land where water levels vary
☒	**C** an area of land where flooding occurs
☒	**D** an area of land drained by a river

(ii) State **one** physical factor that affects river discharge.

(1)

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(iii) Explain the term **lag time**.

(2)

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(c) Study Figure 1a in the Resource Booklet.

Suggest how **two** human factors can affect water transfers in the hydrological cycle.

(4)

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(d) Explain **one** way pollution can affect water quality.

(3)

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(e) Study Figure 1b in the Resource Booklet.

Identify the river valley landform at X.

(1)

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(f) Explain the formation of a flood plain.

(4)

(g) Study Figure 1c in the Resource Booklet.

Analyse the impacts of this flood prevention scheme.

(8)





Figure 1a

Factors impacting the hydrological cycle

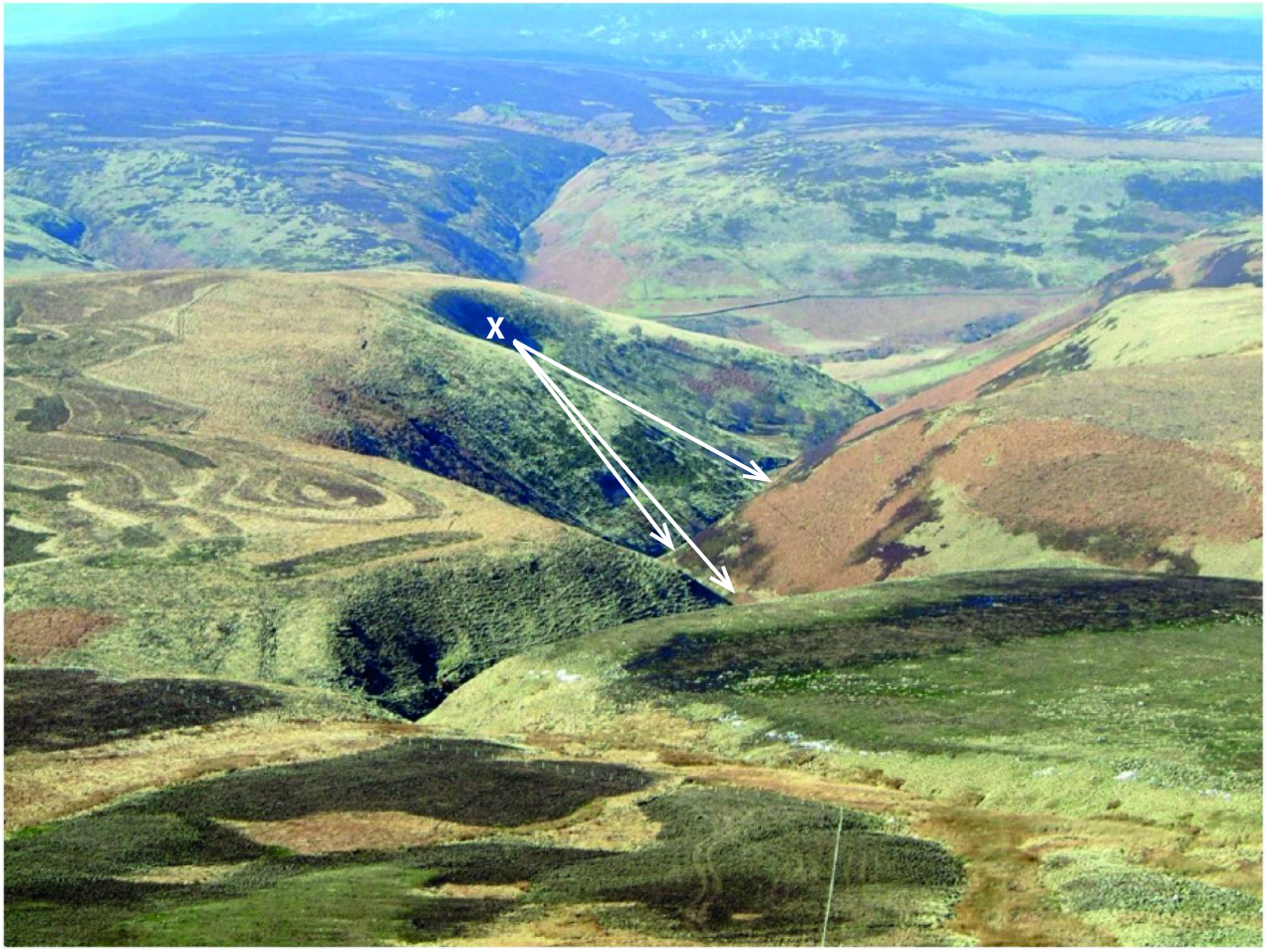


Figure 1b

River landforms in the south west of the UK

1 River environments

(a) Identify the meaning of the term **river regime**.

(1)

☒	**A** variation in river discharge throughout the year
☒	**B** variation in river discharge over a day
☒	**C** variation in river discharge over a month
☒	**D** variation in river discharge throughout the week

(b) (i) Identify the definition of the **hydrological cycle**.

(1)

☒	**A** an open system made up of stores and transfers
☒	**B** a closed system made up of only stores
☒	**C** a closed system made up of stores and transfers
☒	**D** an open system made up of only transfers

(ii) State **one** feature of a drainage basin.

(1)

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(iii) Explain **one** way urbanisation can affect river discharge.

(2)

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(c) Study Figure 1a in the Resource Booklet.

Suggest how **two** physical factors can affect the hydrological cycle.

(4)

1 .....

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2 .....

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(d) Explain **one** way that river channel shape changes along the course of a river.

(3)

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(e) Study Figure 1b in the Resource Booklet.

Identify the river landform at X.

(1)

(f) Explain the formation of a waterfall.

(4)

(g) Study Figures 1c and 1d in the Resource Booklet.

Analyse the positive and negative aspects of the river management scheme.

(8)

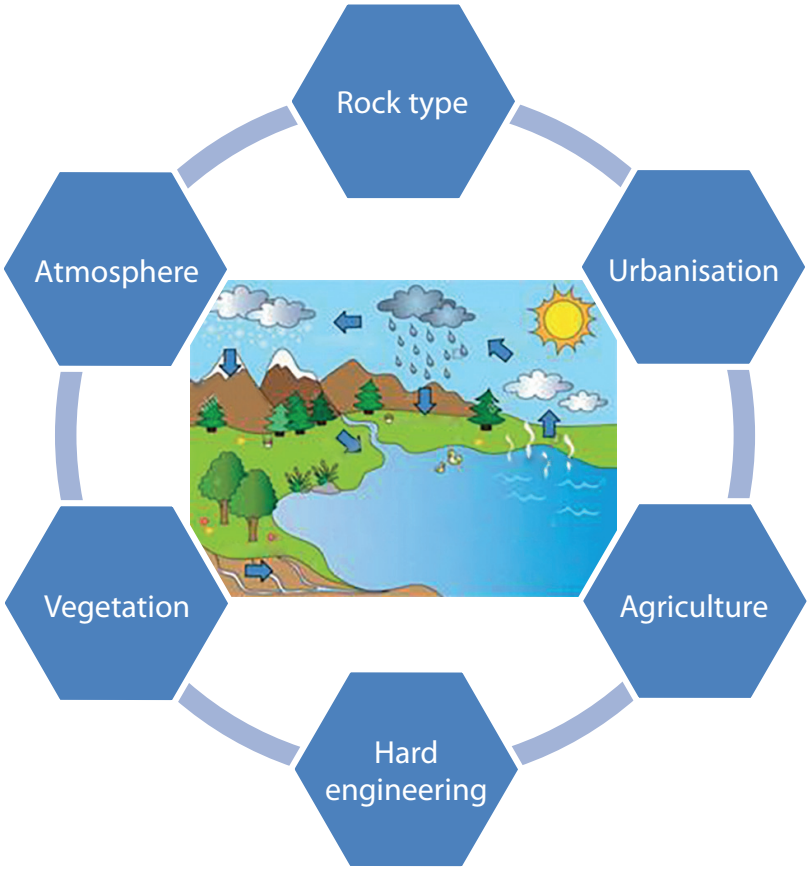


Figure 1a

Factors affecting the hydrological cycle



Figure 1b

Aerial view of river, Denali National Park, Alaska, USA



'Narmada Valley Project'

- Will build six very large dams and thousands of smaller ones, displacing 1.5 million people
- Work started in 1987
- Known as the 'Lifeline of the Gujarat region' because it could irrigate many areas
- High level of HEP provision for Gujarat, Maharashtra and Madhya Pradesh.

Figure 1c

The Narmada Valley Project location and background

Government – 'This scheme will supply water to 30 million people and provide irrigation to crops to feed 20 million. The project will also bring power to 9000 villages.'

Environmental activist – 'This project will have a devastating effect on the environment. We will lose important species such as the tiger. Building these dams could trigger earthquakes.'

Villager 1 – 'The scheme will be good for us because we suffer from drought and flooding. It will allow us to produce more food.'

Villager 2 – 'I don't want this, I will have to move as my fields will be submerged underwater. I will have nowhere to go and no money.'

Figure 1d

Different viewpoints on the Narmada Valley Project

If you answer Question 1 put a cross in the box ☒

1 River environments

(a) (i) Identify **one** store in the hydrological cycle.

(1)

☒	**A** Evaporation
☒	**B** Infiltration
☒	**C** Lake
☒	**D** Throughflow

(ii) Identify the statement that best defines transpiration in the hydrological cycle.

(1)

☒	**A** Transfer of water from the atmosphere to land.
☒	**B** Plants take up water from the soil and release it into the atmosphere as water vapour.
☒	**C** Water moving through the soil as a result of gravity.
☒	**D** Water vapour cooling in the atmosphere to become liquid.

(b) (i) State **one** physical factor that influences deposition in a river.

(1)

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(ii) Explain how abrasion erodes the river channel.

(2)

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(c) Study Figure 1a in the Resource Booklet.

Suggest **two** reasons for the different storm hydrograph shapes.

(4)

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(d) Explain **one** way agriculture can affect water quality.

(3)

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(e) Study Figure 1b in the Resource Booklet.

Identify the feature labelled **X**.

(1)

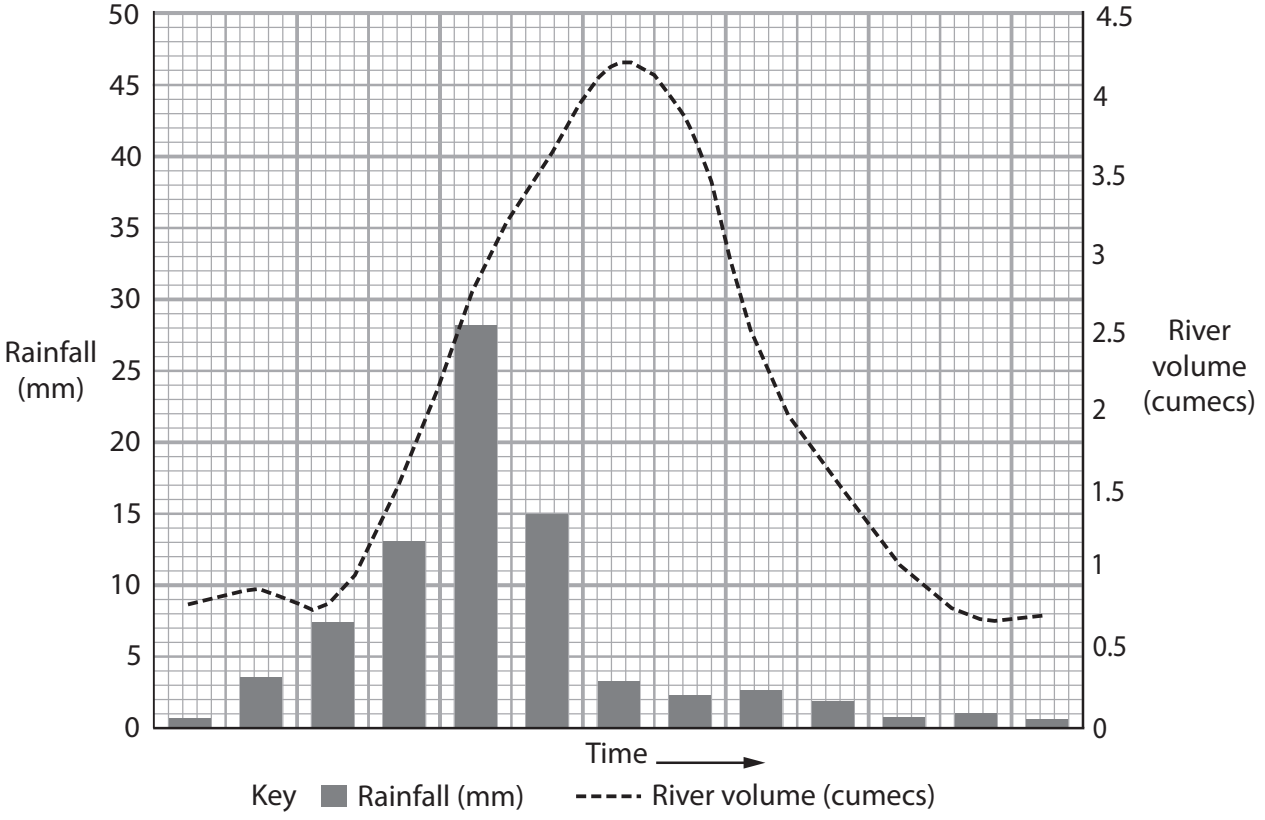
(f) Explain the formation of a waterfall.

(4)

(g) Study Figure 1c in the Resource Booklet.

Analyse the factors that can affect river flood risk.

(8)



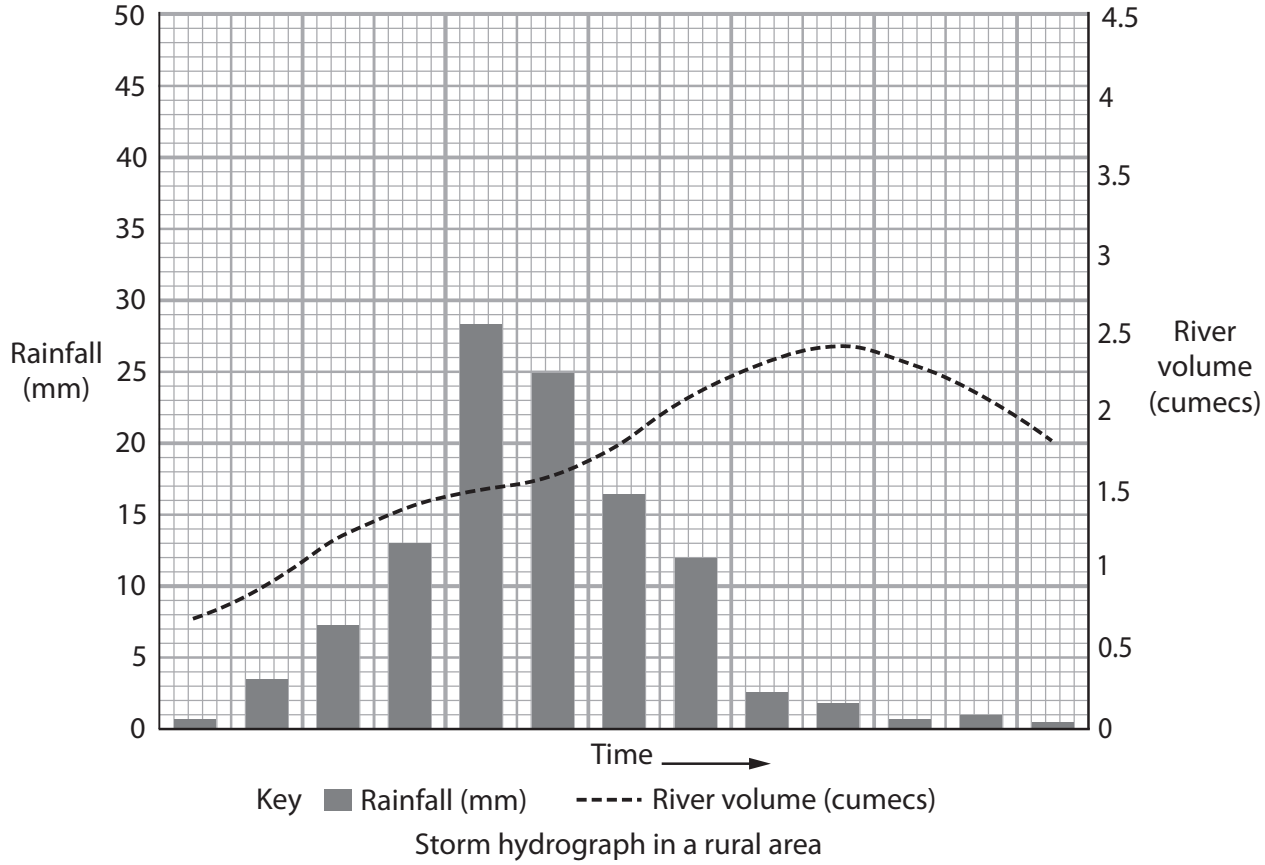


Figure 1a

Two storm hydrographs

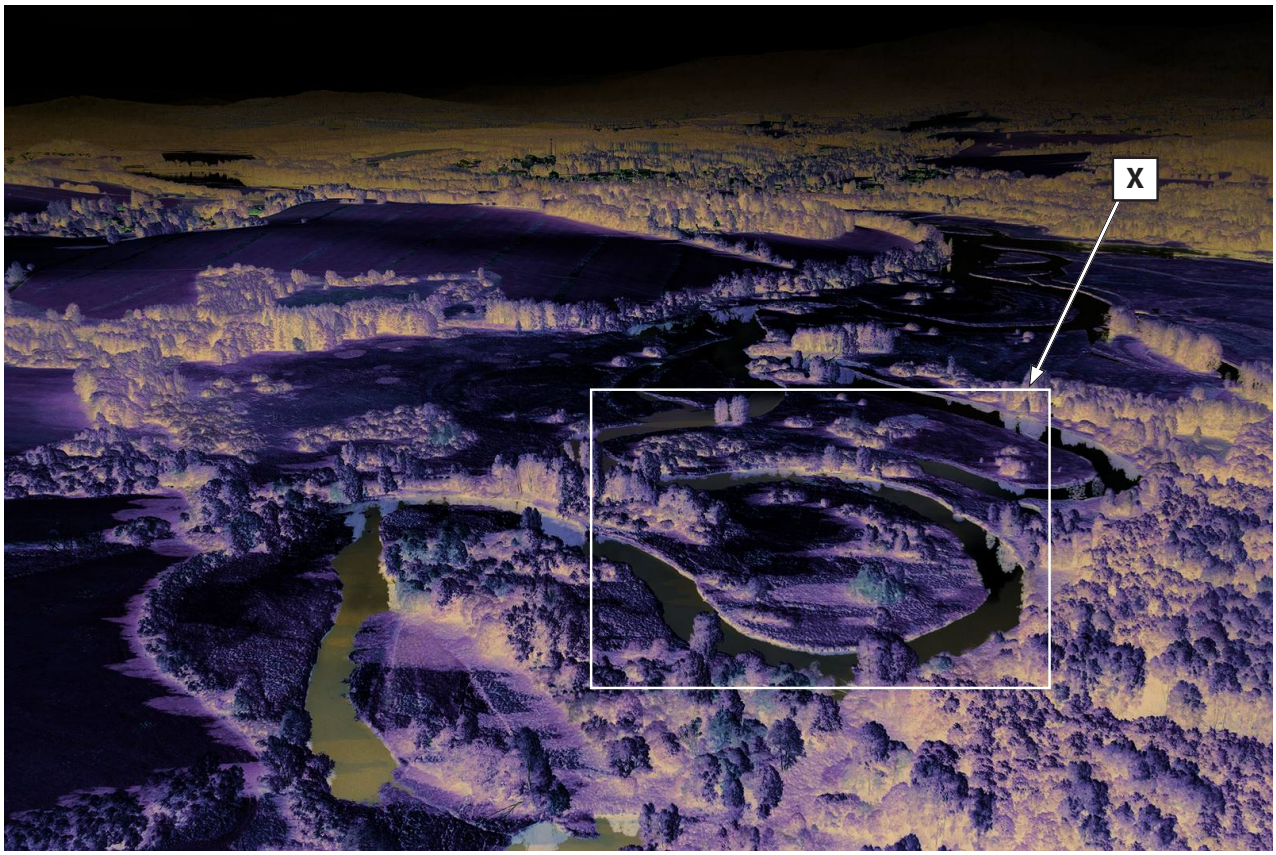
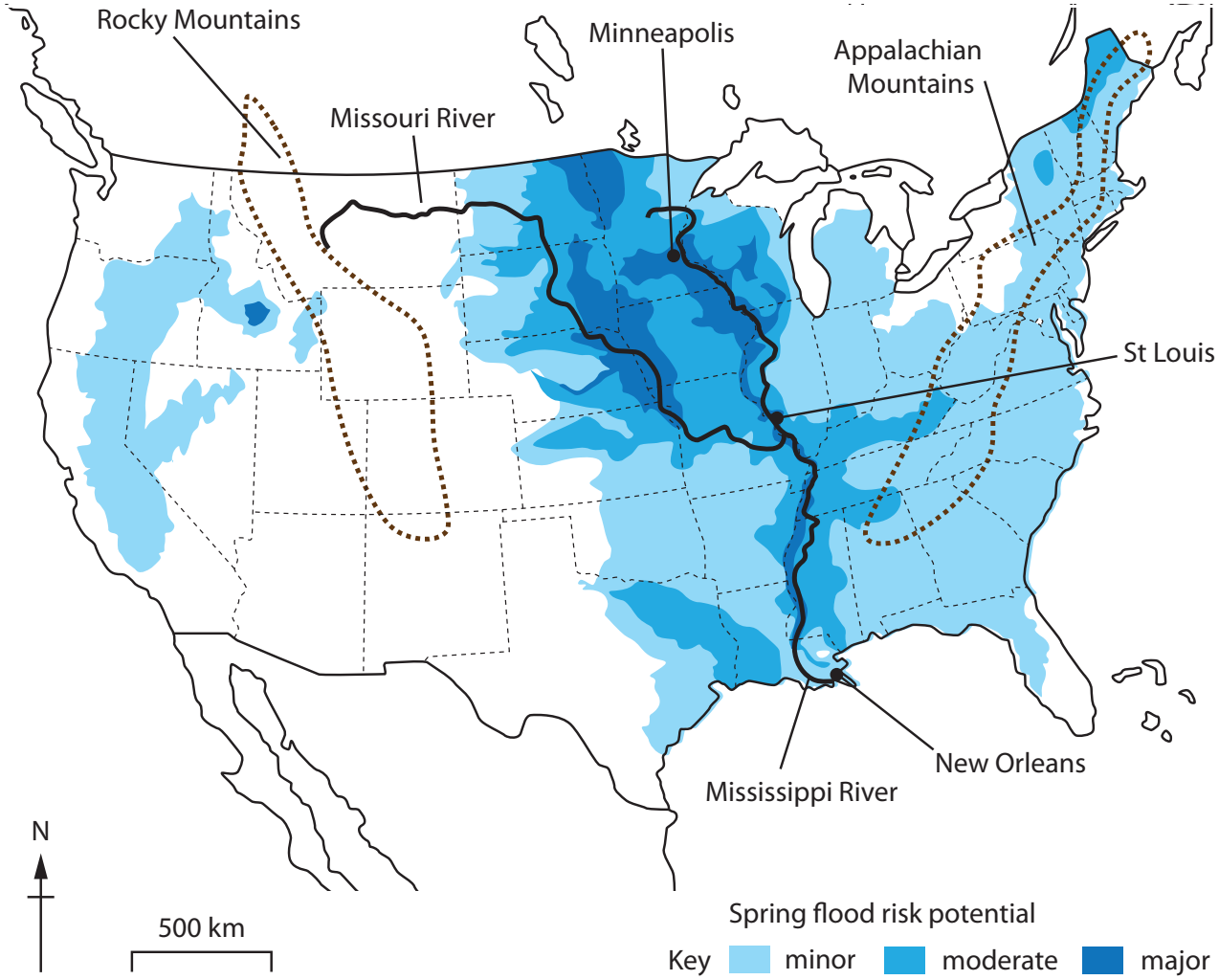


Figure 1b

Vltava River in the Czech Republic



- Glacier and snowmelt from mountains occur in spring.
- 2019 January to May experienced more rainfall that any other year on record.
- 2019 Midwestern flood involving the Mississippi and Missouri rivers in the USA caused US$2.9 billion property damage.
- Flooding worst along the Missouri River.
- At least 1 million acres of farmland was flooded.

Figure 1c

Risk of flood in the USA, spring 2019

If you answer Question 1 put a cross in the box ☒

1 River environments

(a) (i) Identify **one** transfer in the hydrological cycle.

(1)

☒	**A** Groundwater
☒	**B** Infiltration
☒	**C** Interception
☒	**D** Lake

(ii) Identify the statement that best defines **evapotranspiration**.

(1)

☒	**A** Loss of water from the ground from water stores and plants.
☒	**B** Movement of water from stores underground.
☒	**C** Loss of water from the atmosphere into other stores.
☒	**D** Movement of water over the ground into other stores.

(b) (i) State **one** physical factor that influences rates of erosion in a river.

(1)

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(ii) Explain how the process of hydraulic action erodes the river channel.

(2)

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(c) Study Figure 1a in the Resource Booklet.

Suggest **two** physical factors that affect these differences in lag time.

(4)

1 .....

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(d) Explain **one** way industry can affect water quality.

(3)

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(e) Study Figure 1b in the Resource Booklet.

Identify the landform labelled **X**.

(1)

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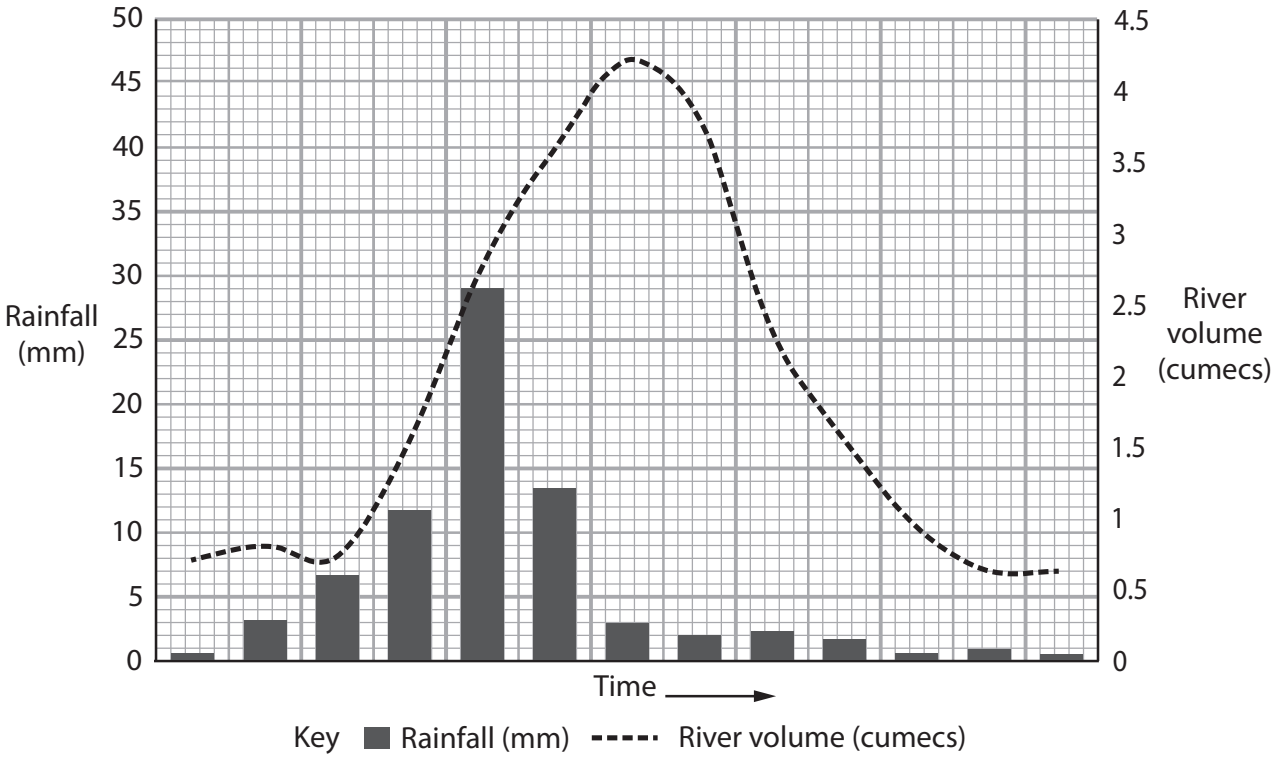
(f) Explain the formation of a levee.

(4)

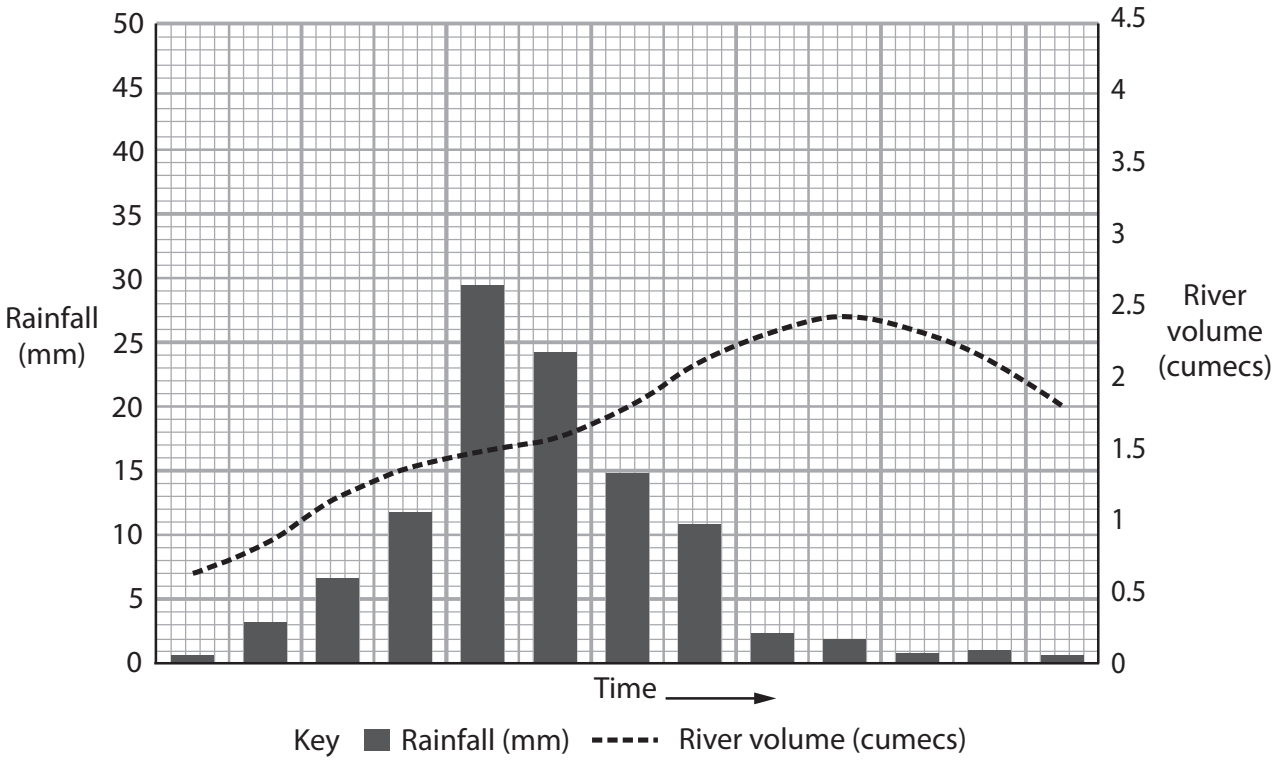
(g) Study Figure 1c in the Resource Booklet.

Analyse the factors that affect flood risk.

(8)



Storm hydrograph in an urban area



Storm hydrograph in a rural area

Figure 1a

Two storm hydrographs in a river basin

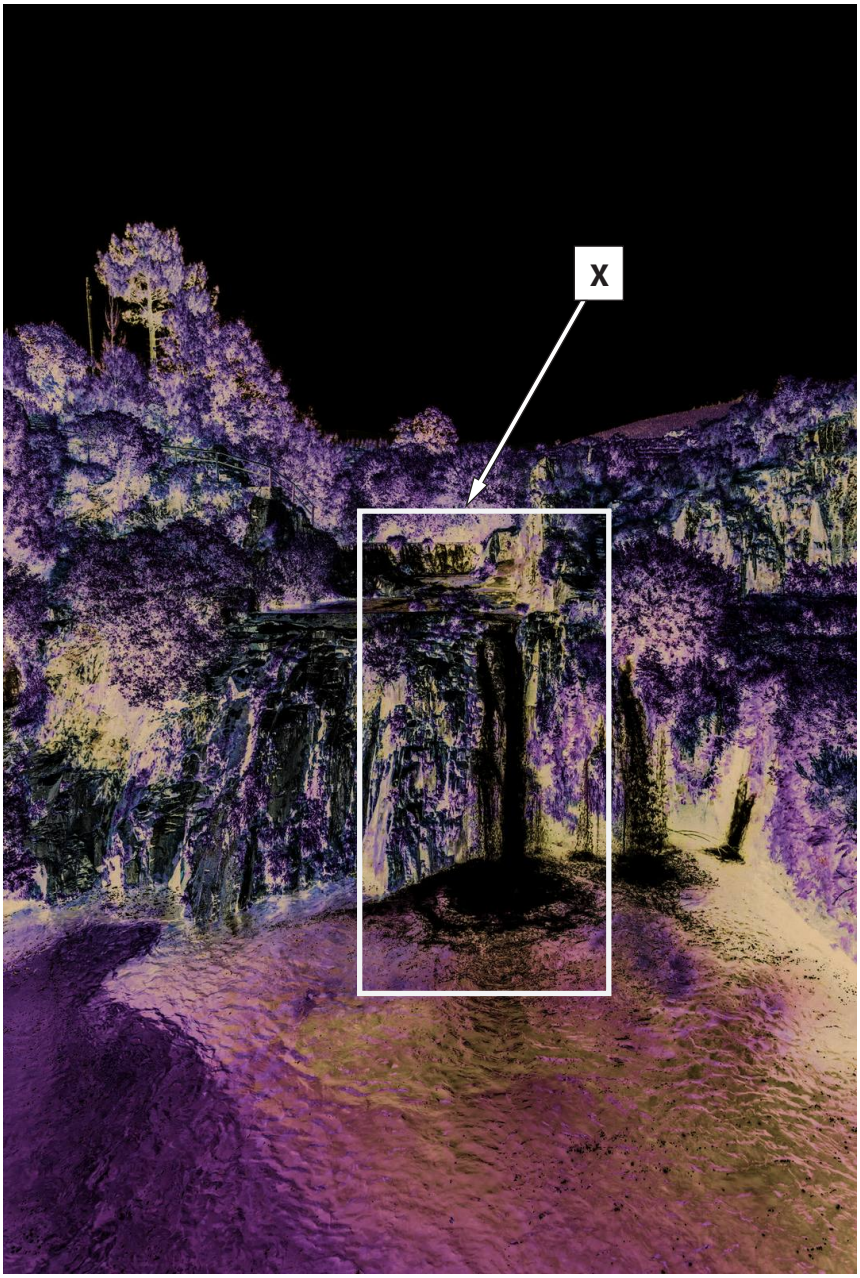
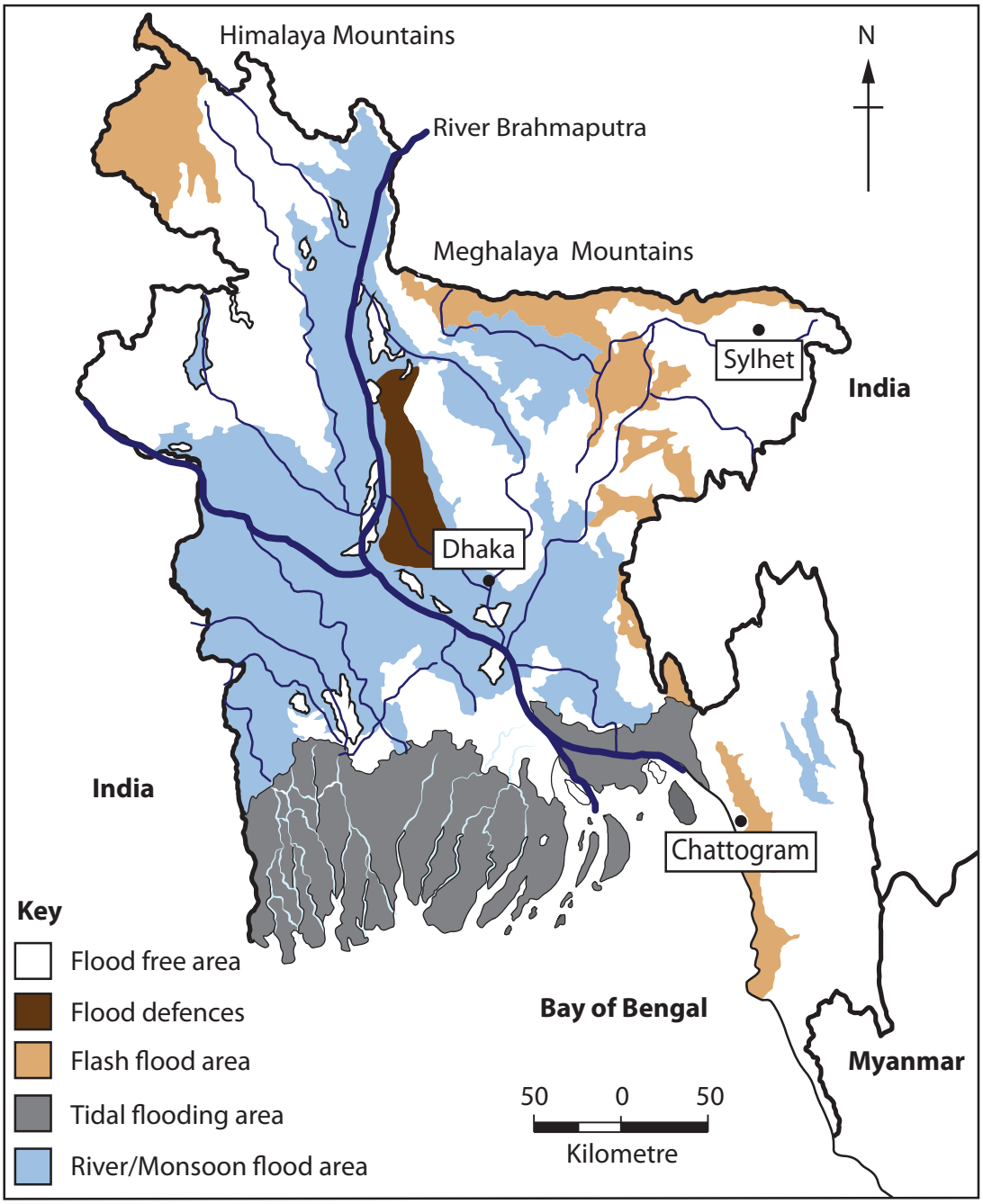


Figure 1b

River landform in Barriosa, Serra da Estrela, Portugal



2019 floods in Bangladesh

- 119 people drowned and over 4 million people affected.
- Over 580,000 houses damaged.
- 30% of Bangladesh's land mass is in danger of flooding during monsoon season.
- More than two thirds of Bangladesh is less than 5 metres above sea level.
- Snowmelt took place from mountain areas.

Figure 1c

A map of flood risk in Bangladesh

If you answer Question 1 put a cross in the box ☒

1 River environments

(a) Identify **one** landform usually found in the upper course of a river.

(1)

- ☒ **A** delta
- ☒ **B** estuary
- ☒ **C** oxbow lake
- ☒ **D** interlocking spurs

(b) (i) Identify the best definition of a watershed.

(1)

- ☒ **A** boundary of a drainage basin
- ☒ **B** bend in a river
- ☒ **C** where a river meets the sea
- ☒ **D** where two rivers meet

(ii) State **one** transfer in the hydrological cycle.

(1)

.....

(c) Explain how a river channel is eroded by solution (corrosion).

(2)

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(d) Study Figure 1a in the Resource Booklet.

Explain **one** advantage and **one** disadvantage of the flood prevention measures shown.

(4)

Advantage

Disadvantage

(e) Explain how urban land use can affect river regimes.

(3)

(f) Study Figure 1b in the Resource Booklet

Identify the feature of the storm hydrograph labelled X.

(1)

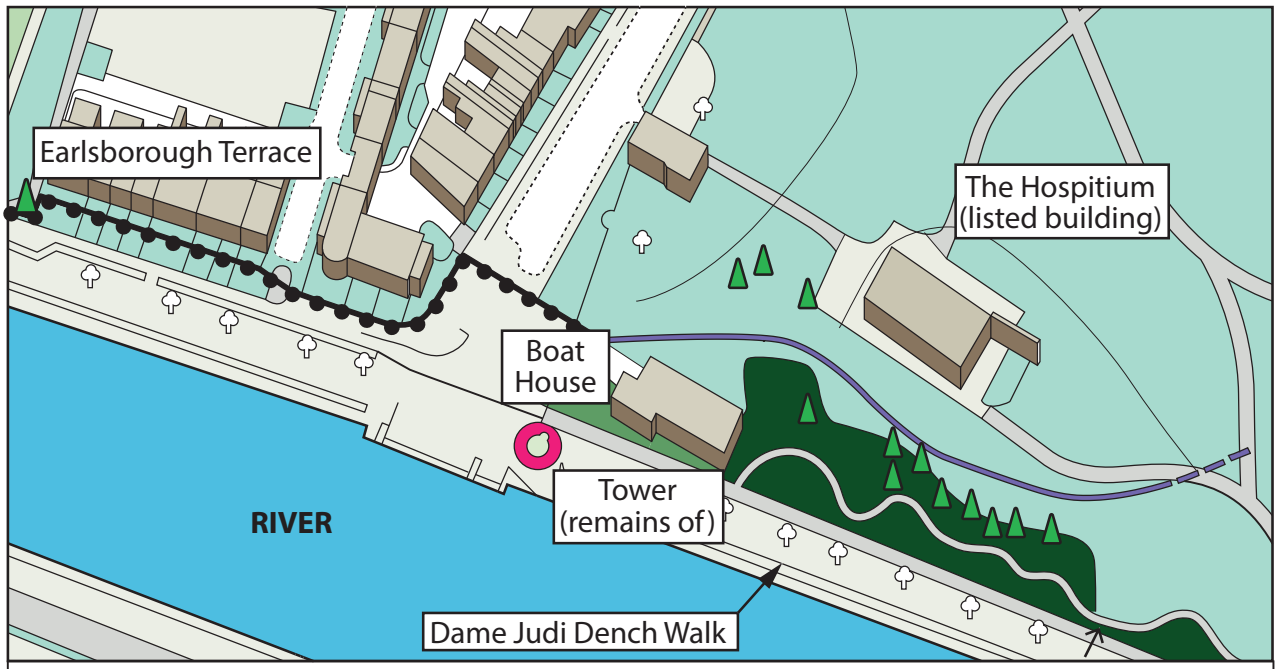
(g) Explain how erosion can form waterfalls.

(4)

(h) Study Figure 1c in the Resource Booklet.

Analyse the importance of this dam for managing the demand and supply of water.

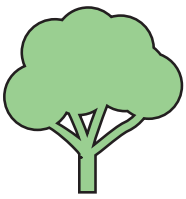
(8)



The height of flood defences (hard engineering) in the area are being increased to protect 56 homes and businesses from flooding.



To build the new flood defences 14 trees must be removed.



Key

- Trees to be removed
- Raising of the flood embankment
- Extension of the flood embankment
- Raising of the flood walls and gates

Figure 1a

Details about flood prevention measures in York, UK

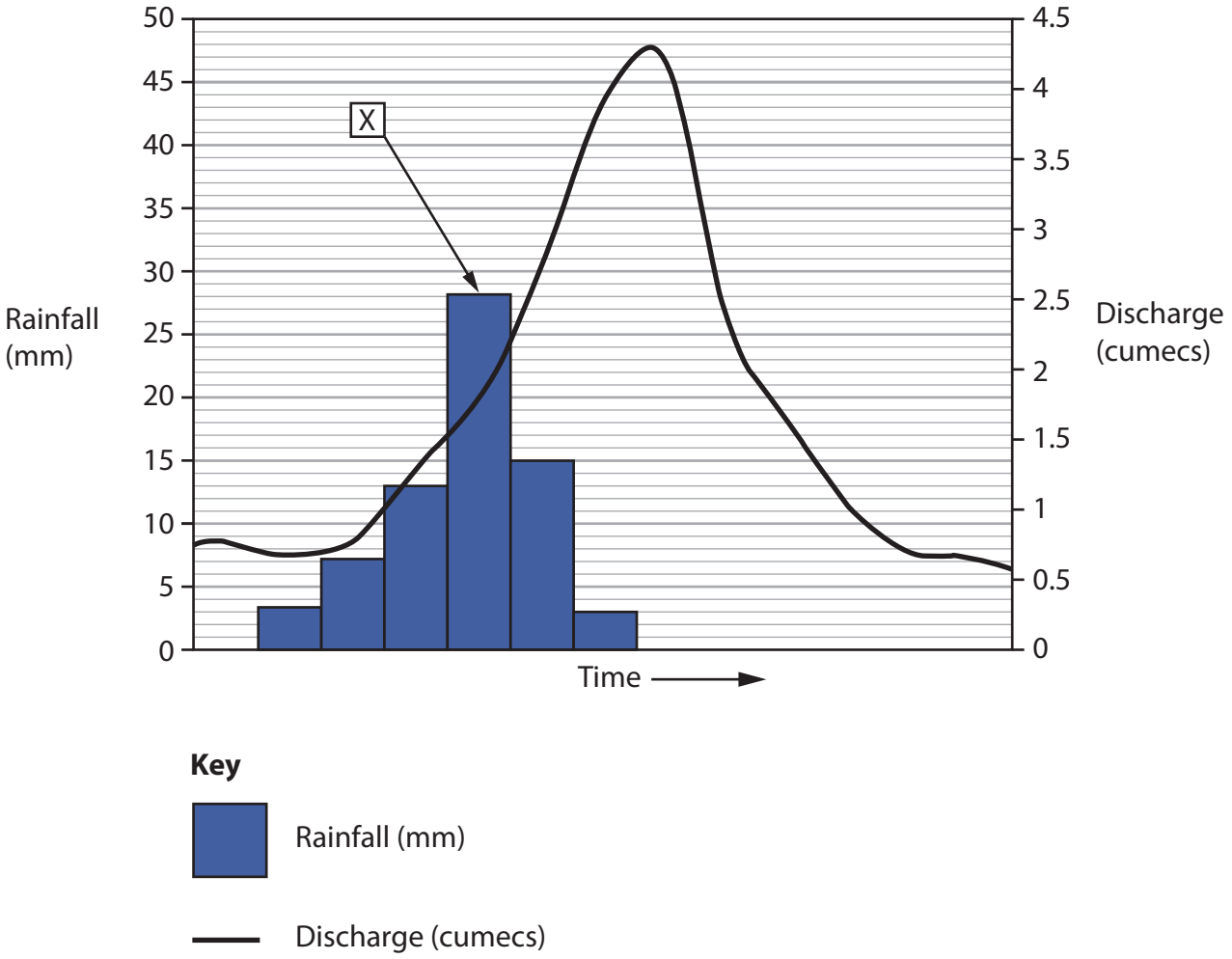


Figure 1b

Storm hydrograph

Grand Renaissance Dam, Ethiopia

- Estimated cost US$5 billion.
- Africa's largest hydroelectric power project.
- Creates reservoirs with 74 billion cubic metres of water.
- Concerns from Egypt that it will limit water supplies to the country.
- 95% of water consumed in Egypt is from the Nile.
- Egypt wants an agreement with Ethiopia to add water to the Nile from reservoirs linked to the dam, especially if there is a drought.

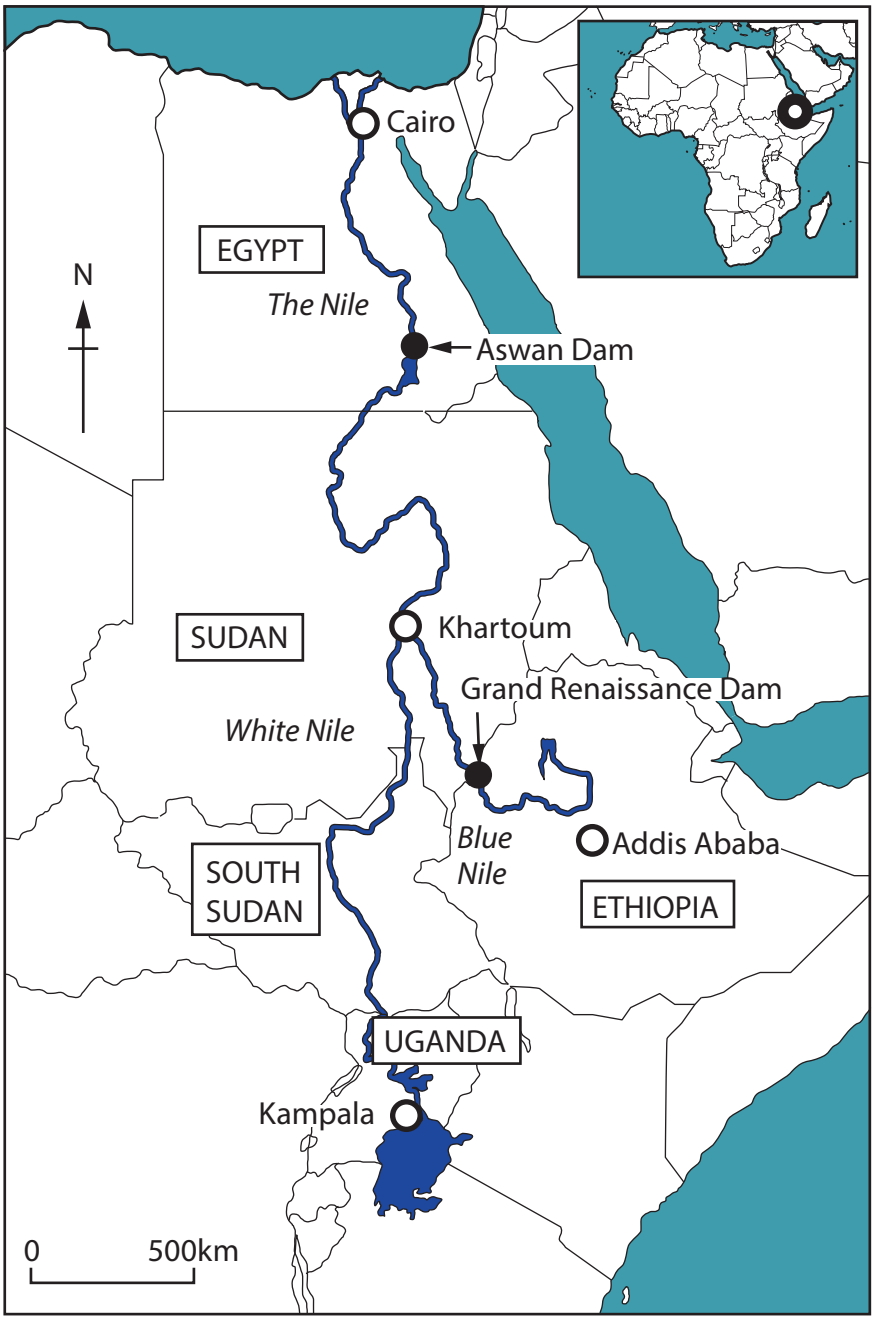


Figure 1c

Information about the Grand Renaissance Dam, Ethiopia

If you answer Question 1 put a cross in the box ☒

1 River environments

(a) Identify the characteristic usually found in the upper course of a river.

(1)

- ☒ **A** frequent meanders
- ☒ **B** ox bow lakes
- ☒ **C** steep valley sides
- ☒ **D** slow river velocity

(b) (i) Identify the best definition of a river mouth.

(1)

- ☒ **A** bend in a river
- ☒ **B** starting point of a river
- ☒ **C** where two rivers meet
- ☒ **D** where a river meets the sea

(ii) State **one** store in the hydrological cycle.

(1)

.....

(c) Explain **one** weathering process in a river valley.

(2)

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(d) Study Figure 1a in the Resource Booklet.

Explain **two** ways human activity can affect water quality.

(4)

1 .....

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(e) Explain **one** river flood prevention method.

(3)

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(f) Study Figure 1b in the Resource Booklet.

Identify the type of mass movement.

(1)

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(g) Explain the formation of interlocking spurs.

(4)

(h) Study Figure 1c in the Resource Booklet.

Analyse the factors that affect the river regime shown in Figure 1c.

(8)

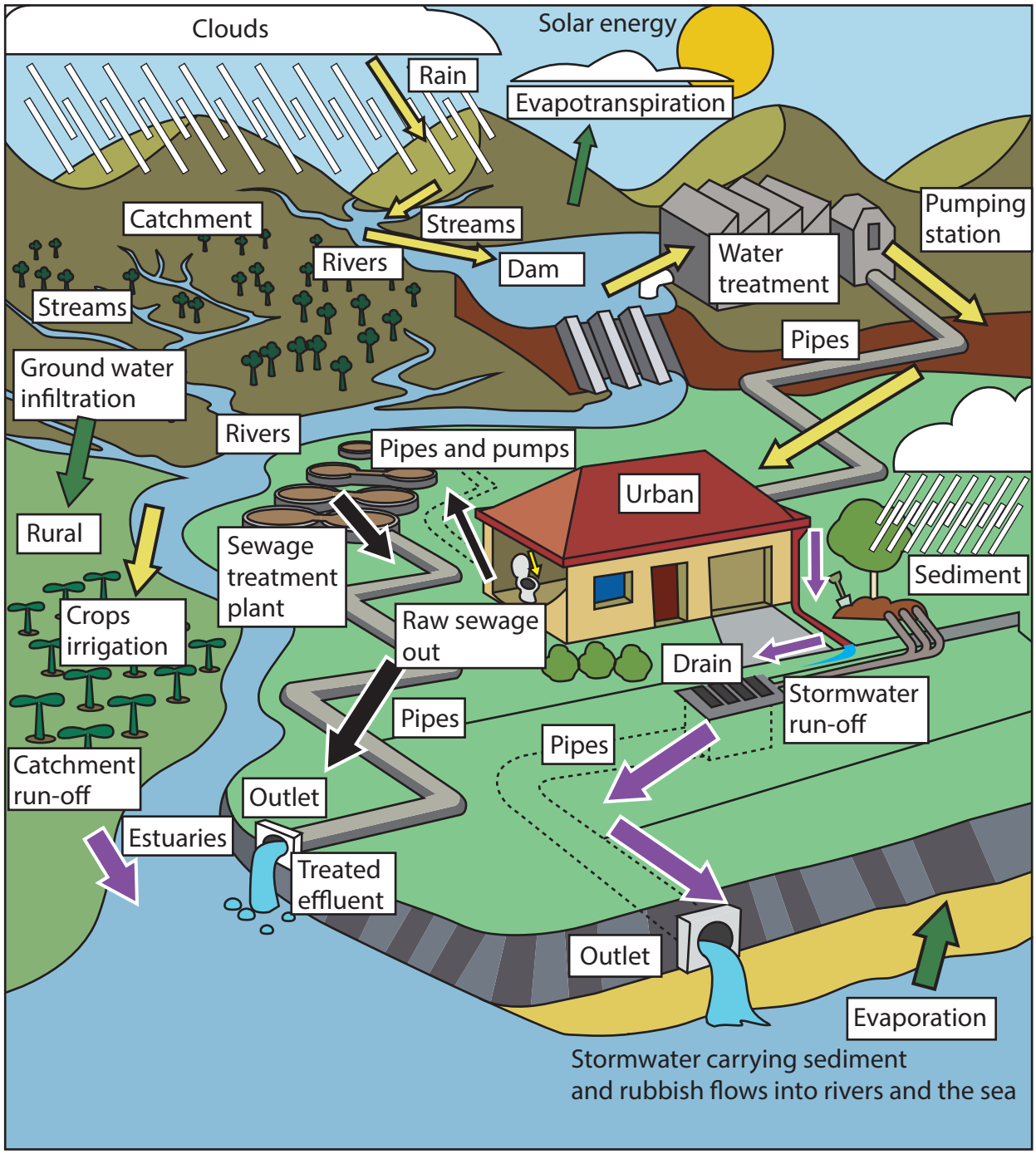


Figure 1a

Human activity in a drainage basin

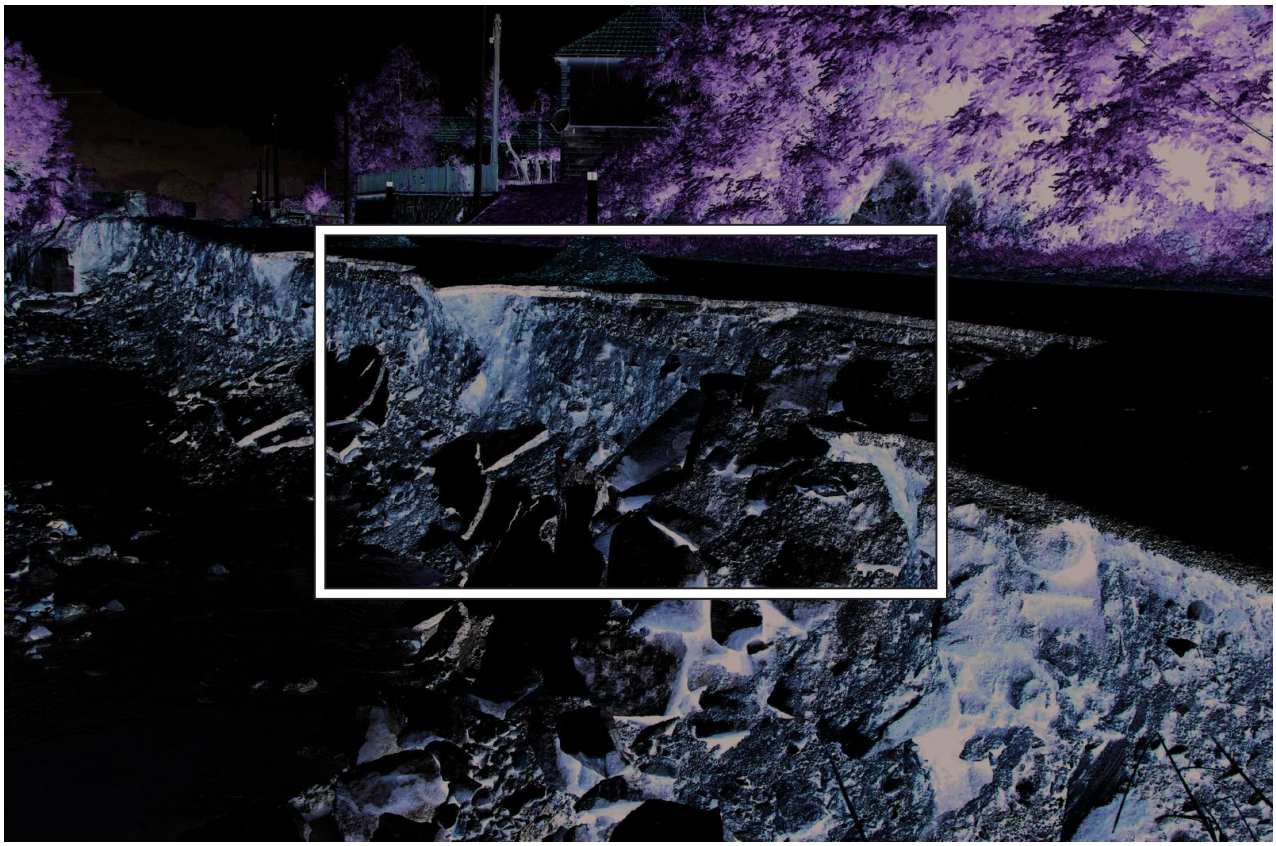
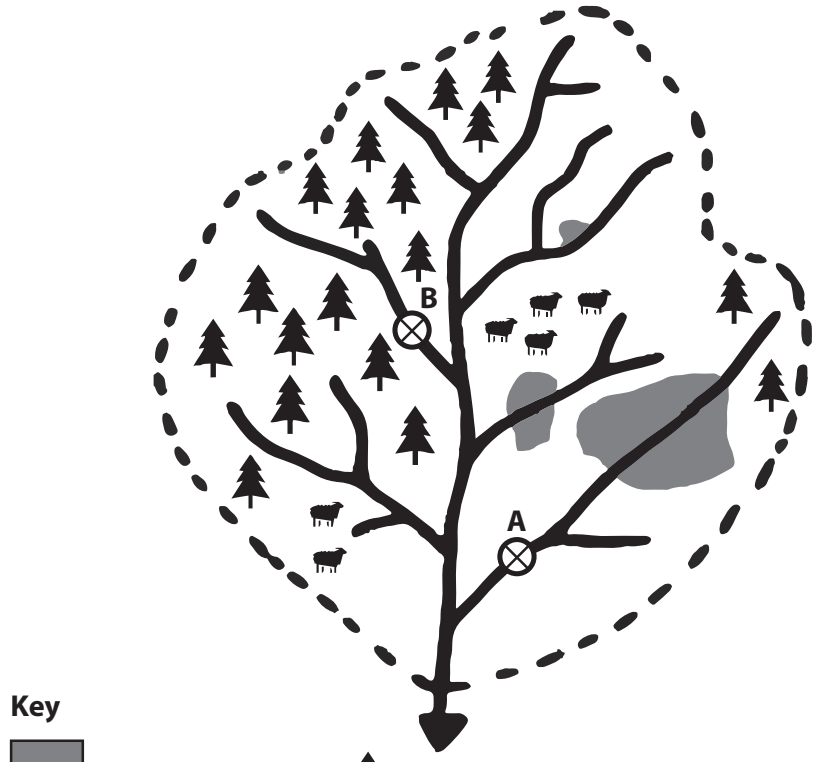
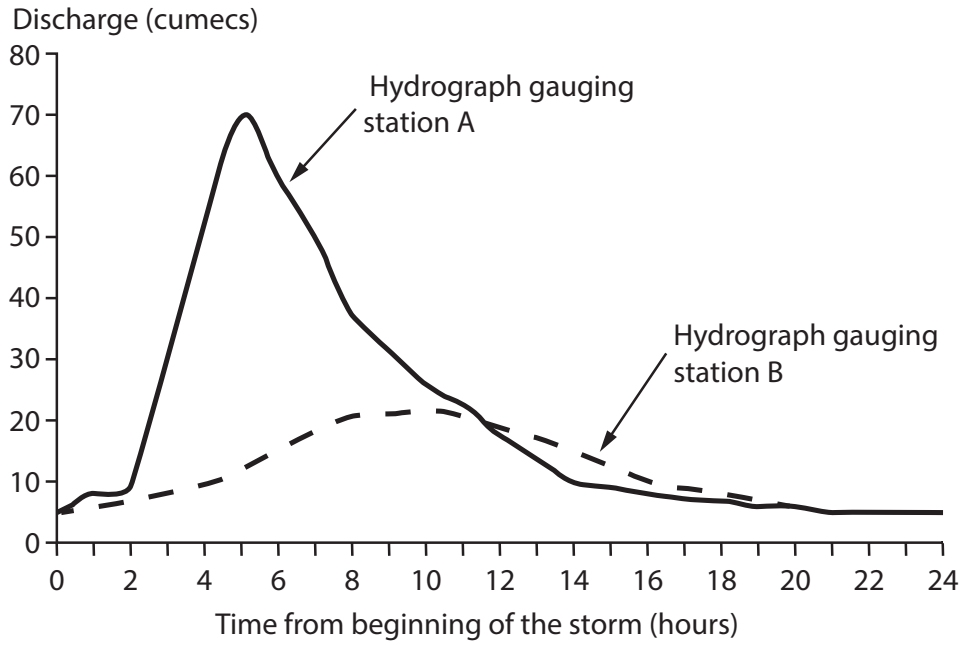


Figure 1b

Mass movement along Naches river valley in the USA





Note: A hydrograph gauging station is where river discharge is measured.

Figure 1c

Information about a drainage basin

Question: How confident do you feel about knowing how to respond in the event of a tropical cyclone?	
Response	**Percentage (%)**
Very confident	5
Confident	10
Unsure	35
Very unsure	25
Didn't feel action was necessary	15
Don't know	10

Figure 6c

Results from a questionnaire of local residents on preparation for a tropical cyclone event

Acknowledgements
Pearson Education Ltd. gratefully acknowledges all following sources used in preparation of this paper:
Figure 1a https://thewatercycle7.weebly.com/ or https://slideplayer.com/slide/9104886/
Figure 1b © Zoonar GmbH/Alamy Stock Photo
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Figure 2c image 2 © Ludmila Smite/Alamy Stock Photo
Figure 3a © National Oceanic and Atmospheric Administration - U.S. Department of Commerce
Figure 3b: © Tommy E Trenchard/Alamy Stock Photo
Figure 3c: image 1 © The Smithsonian Institution's Global Volcanism Program
Figure 3c: image 2 © NASA

If you answer Question 1, put a cross in the box ☒

1 River environments

(a) Identify **one** physical factor that affects river regimes.

(1)

- ☒ **A** amount of rainfall
- ☒ **B** building a reservoir
- ☒ **C** building a football stadium
- ☒ **D** size of river mouth

(b) (i) Identify the best definition of a meander.

(1)

- ☒ **A** where two rivers meet
- ☒ **B** a bend in a river
- ☒ **C** the starting point of a river
- ☒ **D** where a river meets the sea

(ii) State **one** type of erosion that takes place in a river.

(1)

.....

(c) Explain **one** way human activity affects water quality.

(2)

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(d) Study Figure 1a in the Resource Booklet.

Explain **two** ways in which a river changes along its course.

(4)

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(e) Explain how deposition leads to the formation of levees.

(3)

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(f) Study Figure 1b in the Resource Booklet.

Identify the river feature at **X**.

(1)

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(g) Explain **two** causes of river flooding.

(4)

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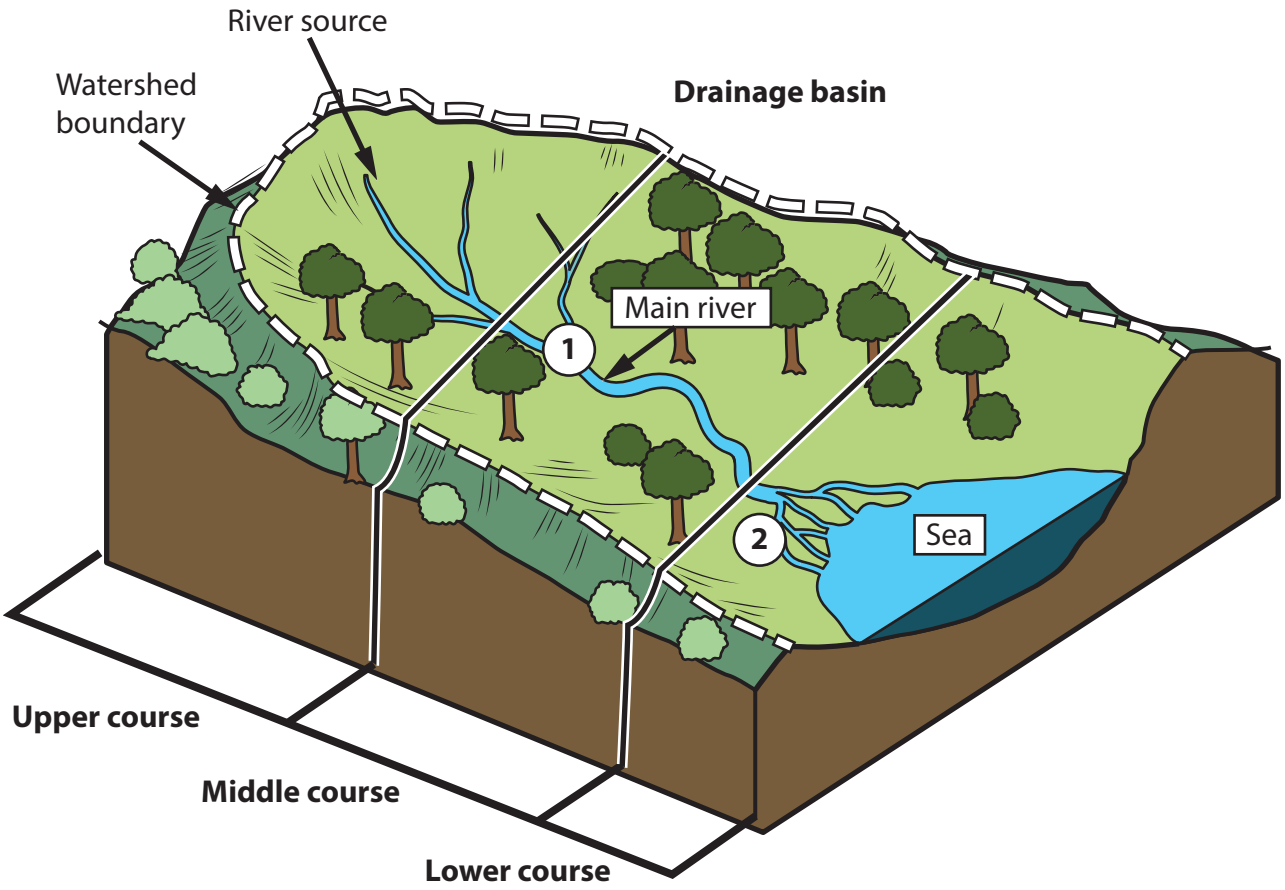
2 .....

(h) Study Figure 1c and Figure 1d in the Resource Booklet.

Analyse reasons why water management in the 21st century can be challenging.

Refer to the resources in your answer.

(8)



Key

1 Confluence

2 Delta

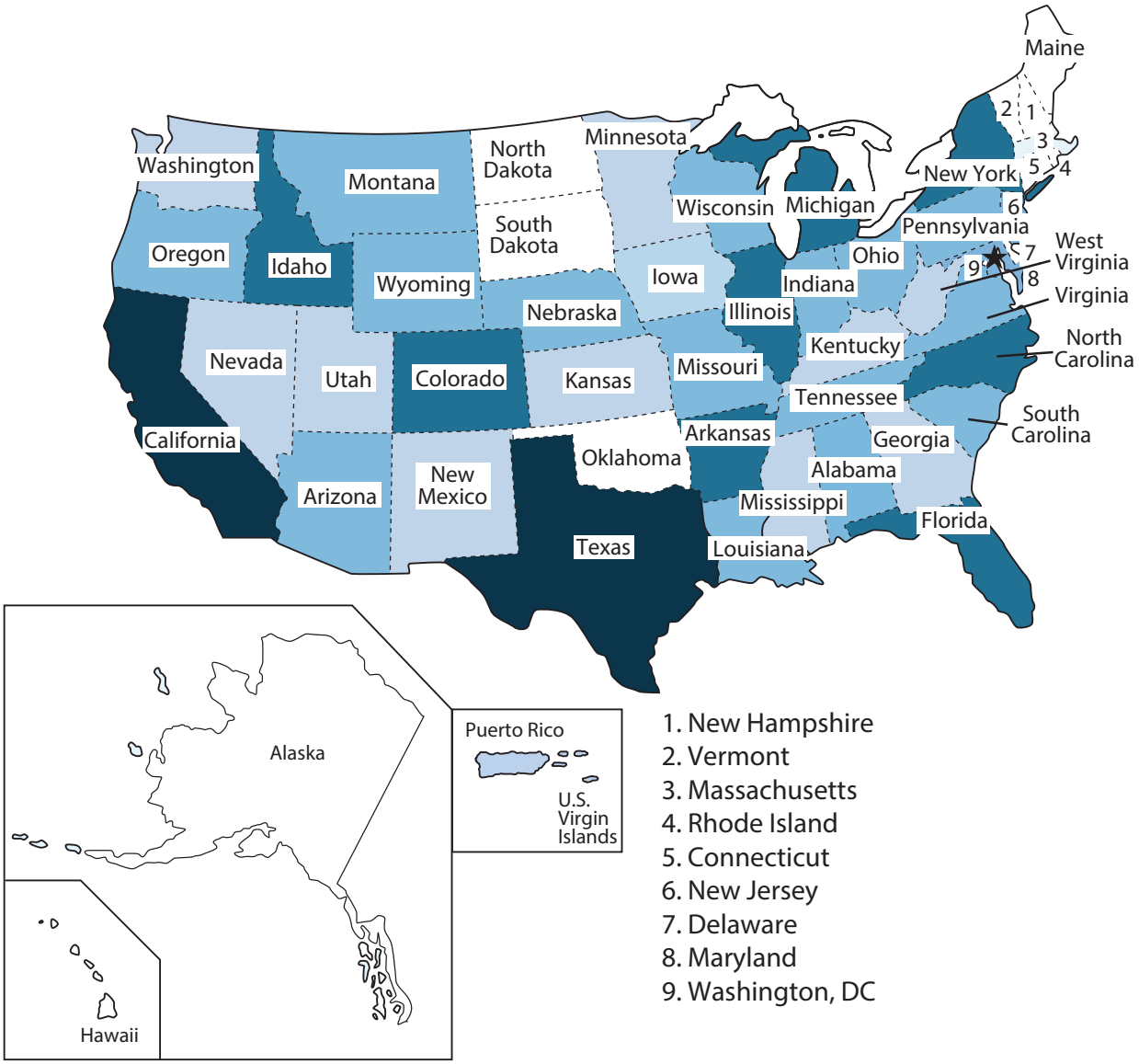
Figure 1a

Diagram of a drainage basin



Figure 1b

Umgeni river, South Africa



1. New Hampshire
2. Vermont
3. Massachusetts
4. Rhode Island
5. Connecticut
6. New Jersey
7. Delaware
8. Maryland
9. Washington, DC

Key

Water withdrawals, in million gallons per day

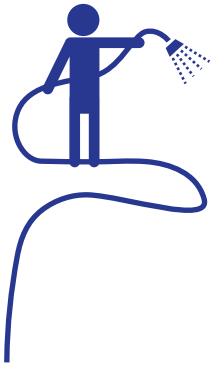
- 0 to 2,000
- 2,001 to 5,000
- 5,001 to 10,000
- 10,001 to 20,000
- 20,001 to 28,800

Note: 1 gallon of water is 4.5 litres

Figure 1c

Map of water use in the USA

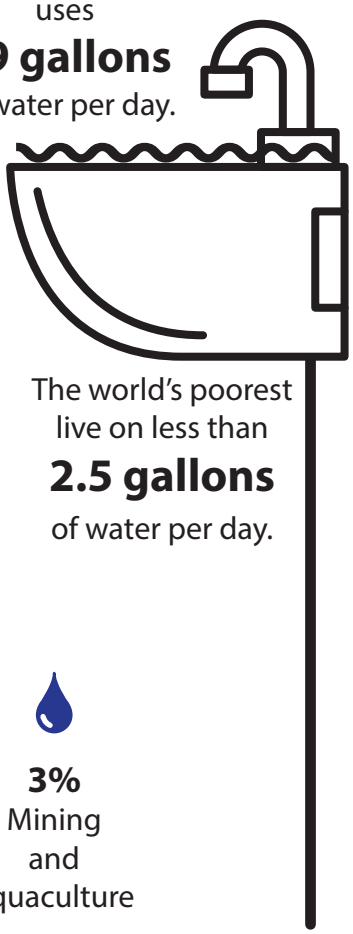
America has a huge demand for water.



The average household in the USA goes through **350 gallons** of water per day.



The average American uses **99 gallons** of water per day.



The world's poorest live on less than **2.5 gallons** of water per day.

Power, farming and the public are top consumers.

American water use



49% Power

32% Irrigation and livestock

12% Public and domestic supply

4% Industrial

3% Mining and aquaculture

1 gallon of water is 4.5 litres

Figure 1d

Information on water use in a developed country, USA

1 River environments

(a) Name the landform created by erosion in a river.

(1)

- ☒ **A** salt marsh
- ☒ **B** meander
- ☒ **C** spring
- ☒ **D** delta

(b) (i) Identify when deposition in a river is most likely to take place.

(1)

- ☒ **A** when a river flows through a V-shaped valley
- ☒ **B** when a river begins at its source
- ☒ **C** when a river flows over a waterfall
- ☒ **D** when a river has a slow velocity

(ii) State what is meant by the term **drainage basin**.

(1)

.....

.....

(iii) Explain **one** reason for poor water quality in a river.

(2)

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(c) Study Figure 1a in the Resource Booklet.

Explain **two** transfers in the hydrological cycle shown.

(4)

1 .....

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2 .....

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(d) Explain how **one** physical factor can affect river regimes.

(3)

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(e) Study Figure 1b in the Resource Booklet.

Identify the feature of a river valley labelled **X**.

(1)

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(f) Explain why water shortages can occur.

(4)

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(g) Study Figure 1c and Figure 1d in the Resource Booklet.

Analyse the causes of the river flood.

Refer to the resources in your answer.

(8)

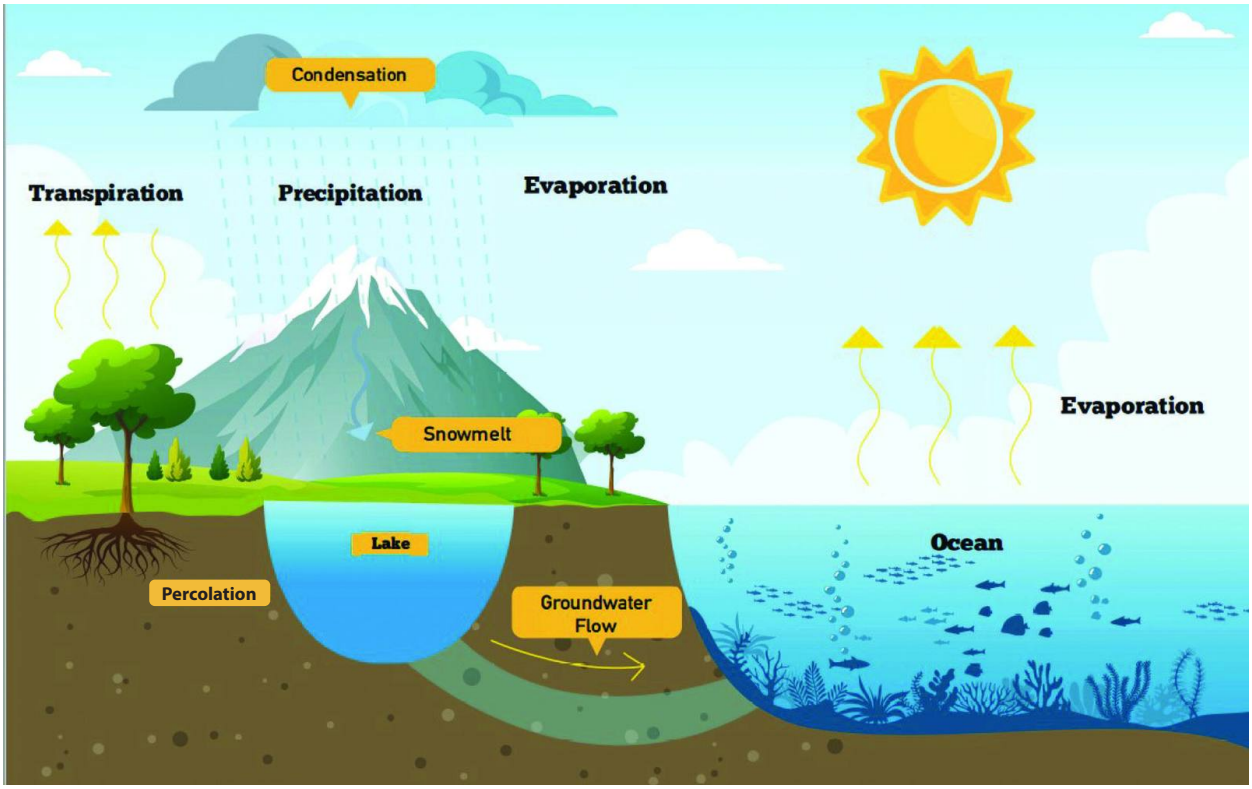


Figure 1a

The hydrological cycle

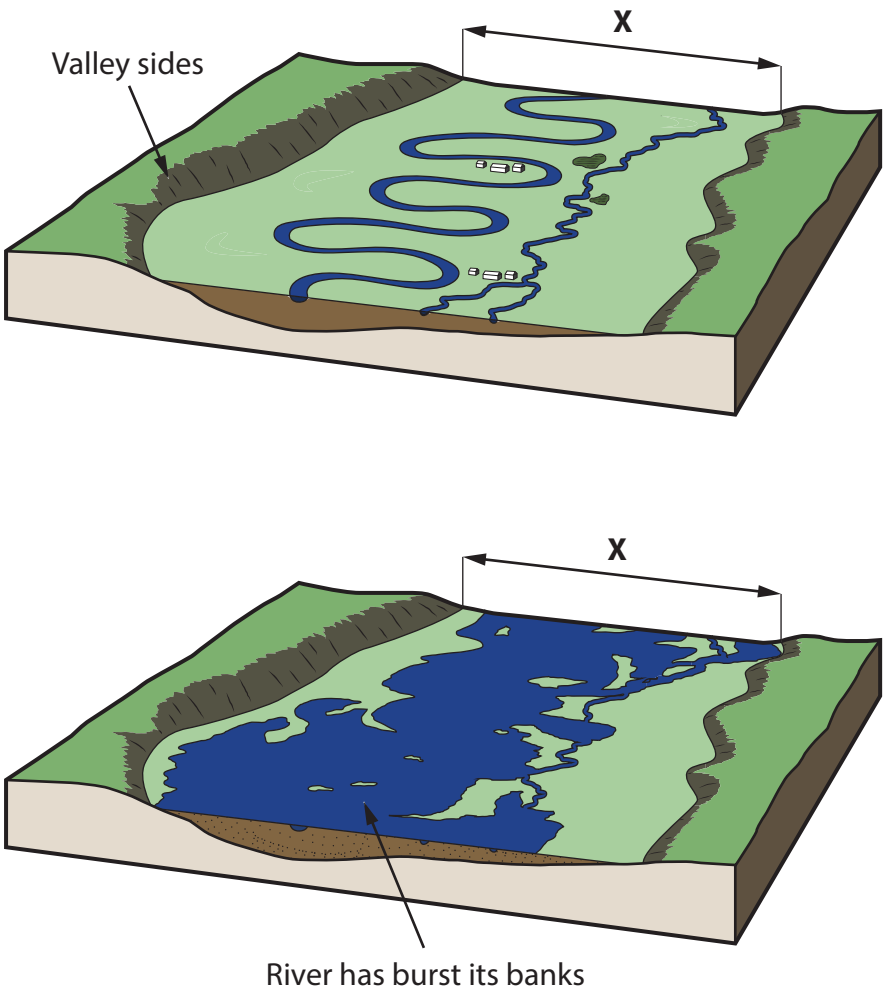


Figure 1b

River features

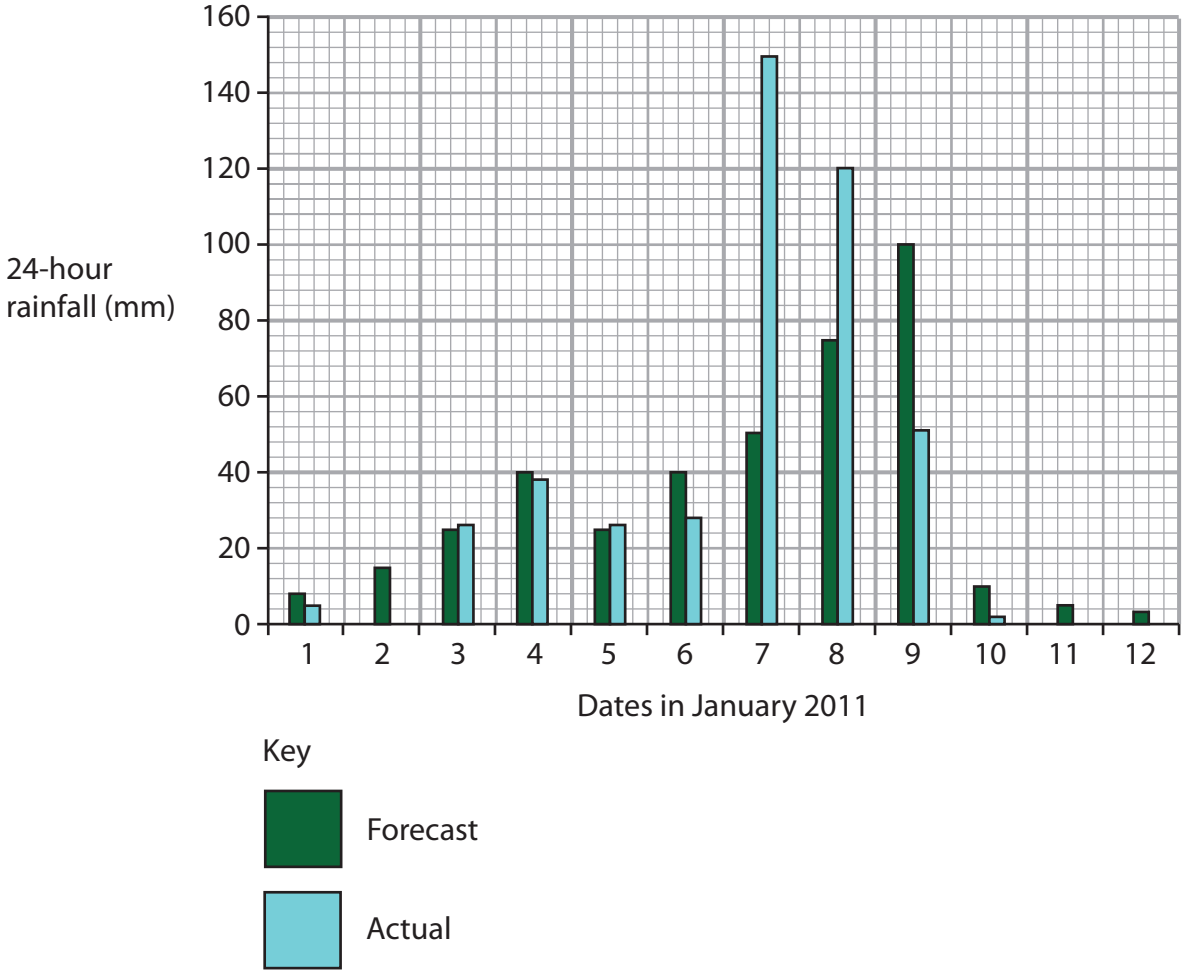
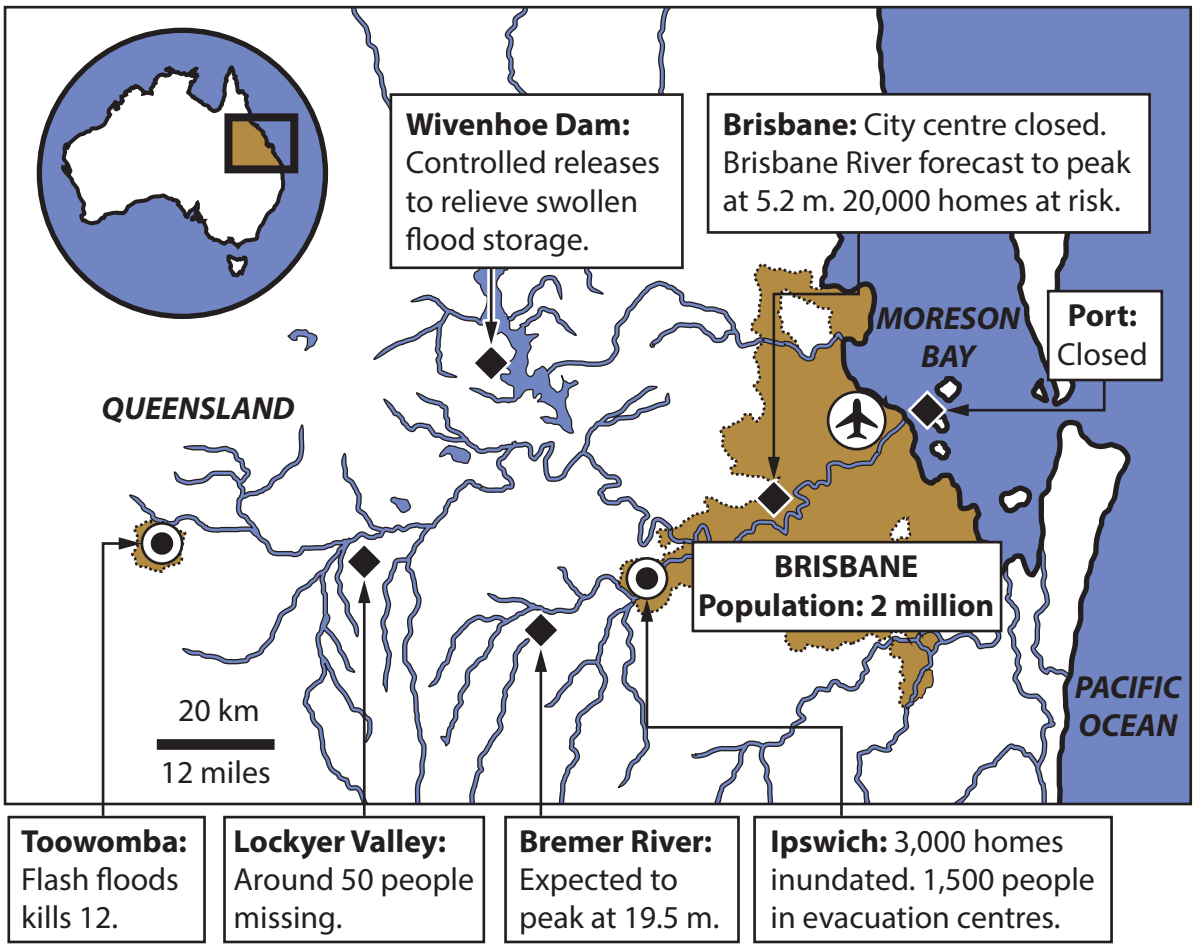


Figure 1c

Actual and predicted rainfall for 12 days in January 2011 for River Brisbane catchment



Key

- Airport
- Cities
- Point of interest
- Flooded area

Figure 1d

Map showing an area around Brisbane where flooding occurred in 2011

If you answer Question 1, put a cross in the box ☒.

1 River environments

(a) Identify **one** type of data shown on a flood hydrograph.

(1)

- ☒ **A** cloud cover
- ☒ **B** discharge
- ☒ **C** temperature
- ☒ **D** wind strength

(b) (i) Identify the best definition of water abstraction.

(1)

- ☒ **A** Holding back water behind a wall
- ☒ **B** Improving water quality to make it acceptable for use
- ☒ **C** The storage of rainwater for reuse
- ☒ **D** The removal of water from surface or underground stores

(ii) State **one** reason why the hydrological cycle is a closed system.

(1)

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(iii) Explain **one** reason river depth changes along the long profile.

(2)

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(c) Study Figure 1a in the Resource Booklet.

Suggest **two** reasons for differences in water usage between developed and developing/emerging countries.

(4)

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(d) Study Figure 1b in the Resource Booklet.

Identify the drainage basin feature labelled **X** on Figure 1b.

(1)

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(e) Explain **two** physical factors that affect river discharge.

(4)

1 .....

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2 .....

(f) Explain **one** way to predict river flooding.

(3)

(g) Study Figure 1c in the Resource Booklet.

Analyse the different impacts of managing water supply.

Refer to the resource in your answer.

(8)

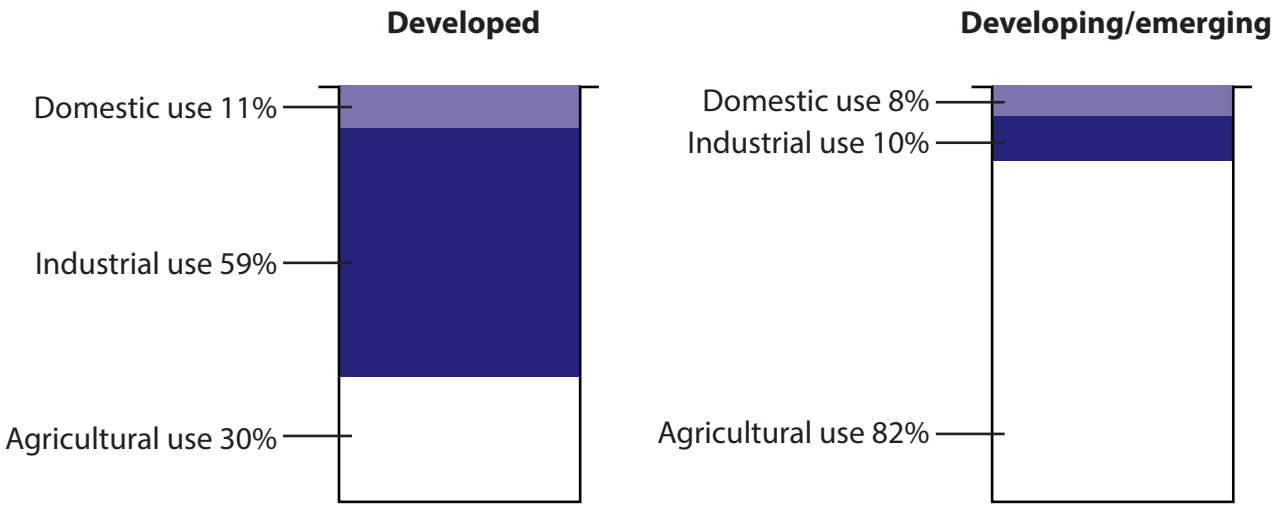


Figure 1a

Information about water usage in developed and developing/emerging countries

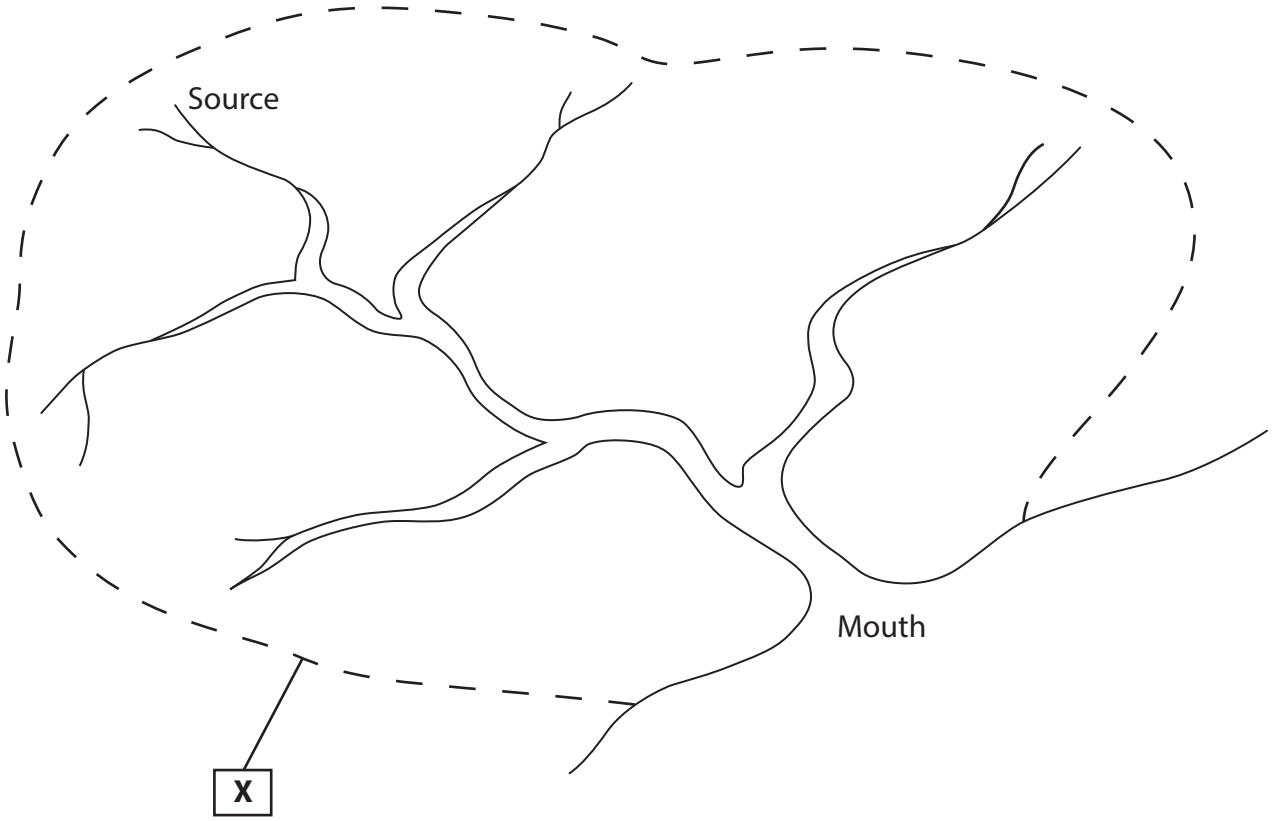
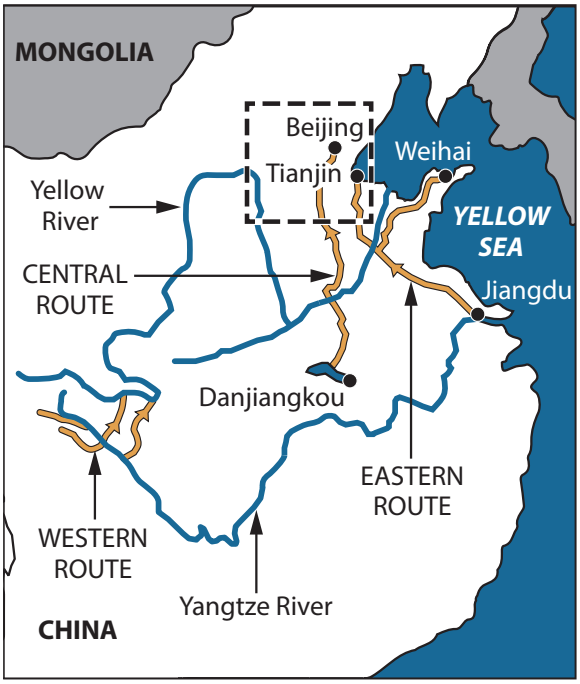


Figure 1b

Diagram of a drainage basin

Impacts on northern regions: over 200 million population

- Will bring 4 billion cubic metres of water to the north
- Less groundwater abstraction reducing subsidence
- Maintains farming in China's breadbasket
- Reduces impact from droughts



Key

Pipelines and canals

Area of large wheat crop production (breadbasket)

Impacts on southern regions:

- Displaced hundreds of thousands of people
- Droughts experienced in south
- Increased pollution from factories
- Loss of wildlife

Figure 1c

Diagram of China's south-north water transfer (pipeline and canal) and selected impacts

If you answer Question 1, put a cross in the box ☒.

1 River environments

(a) Identify the best definition of the term evaporation.

(1)

- ☒ **A** any form of water that falls from the sky
- ☒ **B** the emission of water vapour from leaves
- ☒ **C** water changing from a gas to a liquid
- ☒ **D** water changing from a liquid to a gas

(b) (i) Identify the best definition of a river source.

(1)

- ☒ **A** a smaller river that joins a larger river
- ☒ **B** where the river meets the sea
- ☒ **C** where the river starts
- ☒ **D** where two rivers meet

(ii) State **one** human cause of river flooding.

(1)

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.....

(iii) Explain the process of saltation.

(2)

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(c) Study Figure 1a in the Resource Booklet.

Suggest **two** pieces of evidence from the map that this is an upland area.

(4)

1 .....

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2 .....

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(d) Study Figure 1b in the Resource Booklet.

Identify the feature of the storm hydrograph labelled **X**.

(1)

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(e) Explain **two** different causes of river water pollution.

(4)

1 .....

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(f) Explain **one** way dams can affect river regimes.

(3)

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(g) Study Figure 1c in the Resource Booklet.

Analyse the possible reasons for water shortages.

You **must** refer to the resource in your answer.

(8)

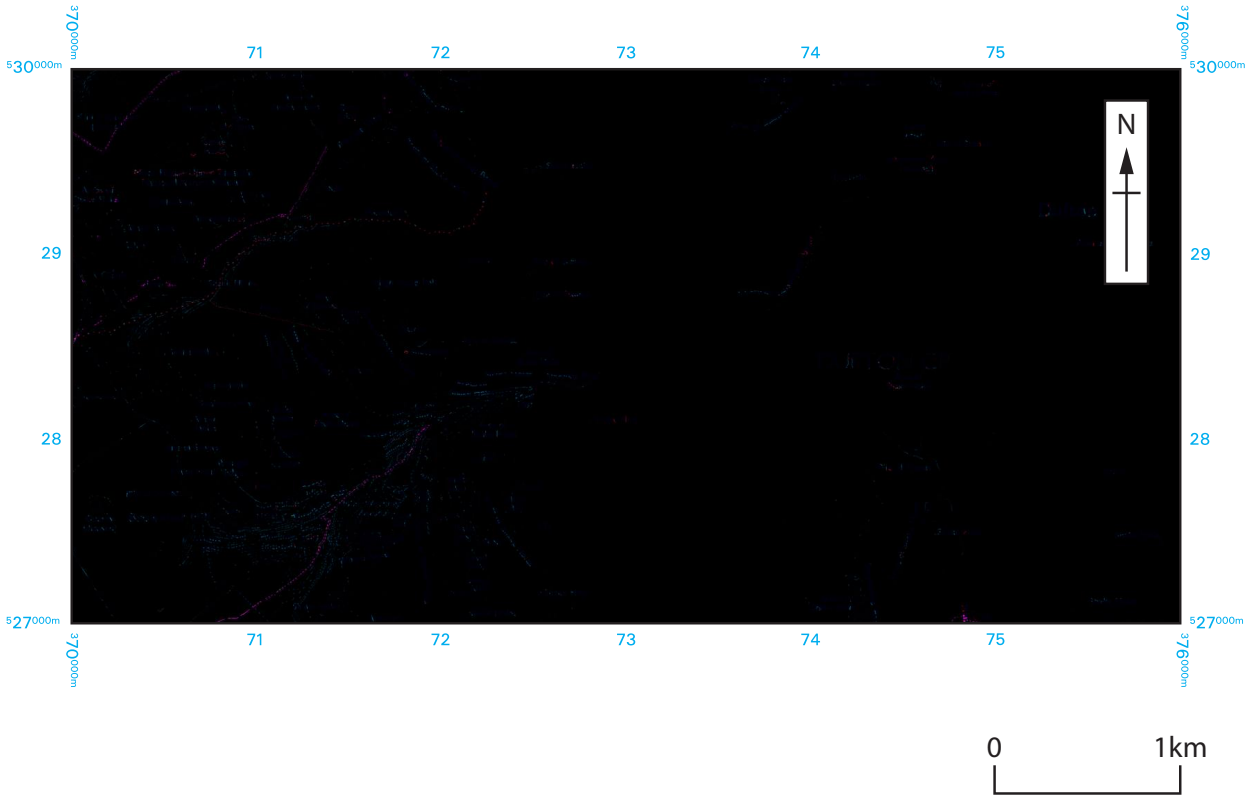
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Key

Contour lines shown at 10m intervals

Contours Vertical face/cliff Outcrop

5m 10m Scree Loose rock Boulders

Footpath

52 · Ground survey height

National Trail

Recreational route

Water; mud

Marsh, reeds or saltings

Bracken, heath or rough grassland

Figure 1a

OS map of an upland river landscape

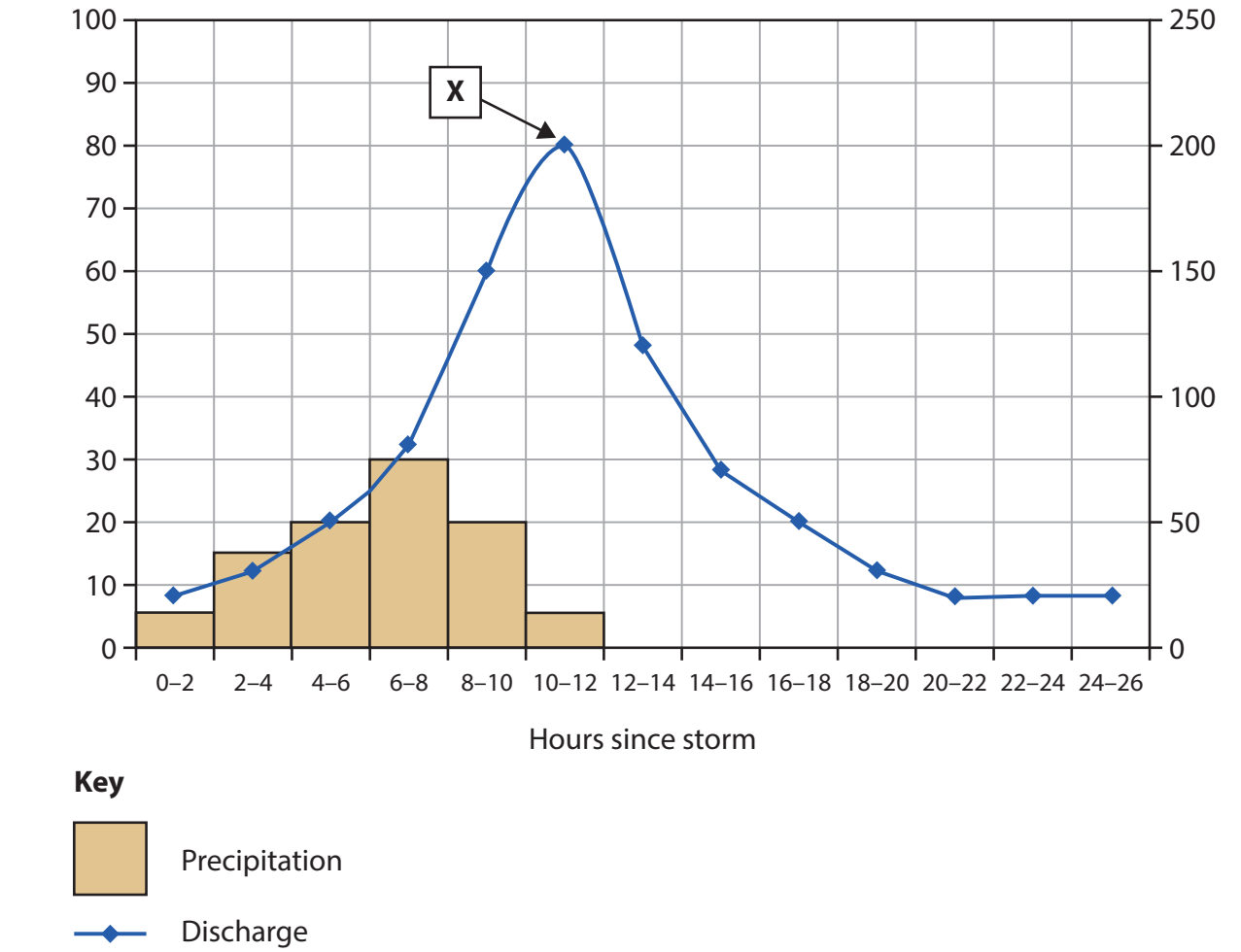


Figure 1b

Storm hydrograph

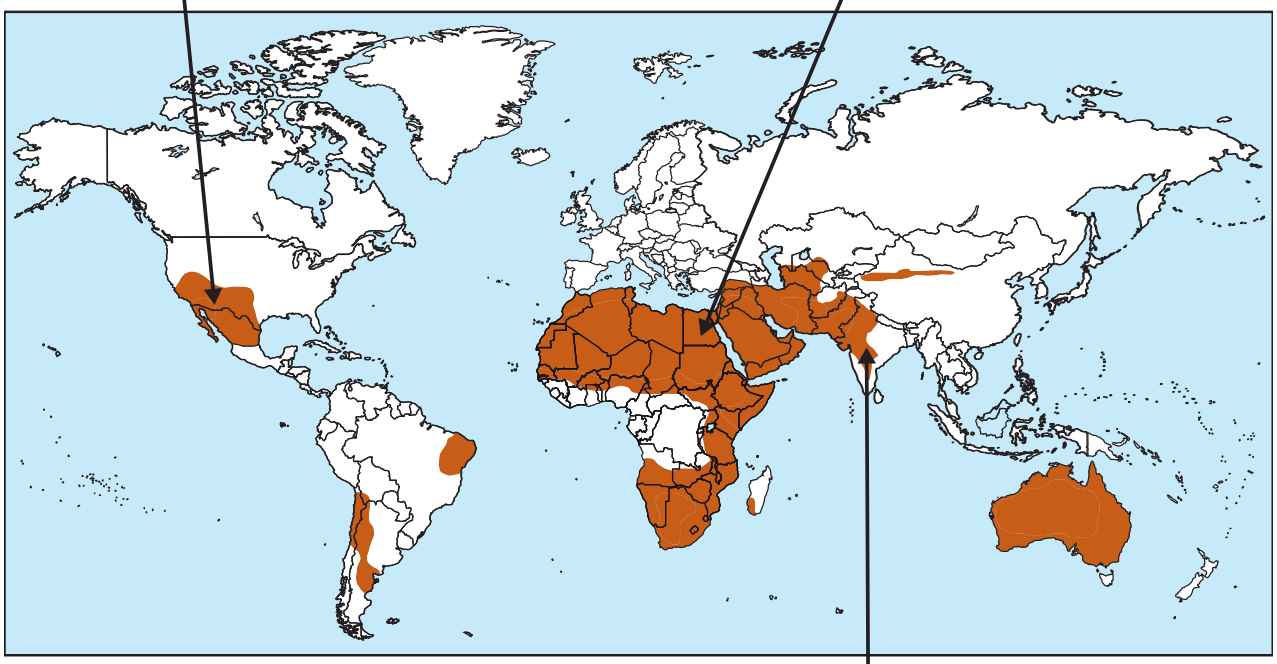


Figure 1c

Areas of water shortage and selected data

If you answer Question 1, put a cross in the box ☒.

1 River environments

(a) Identify the best definition of the term precipitation.

(1)

- ☒ **A** any form of water that falls from the sky
- ☒ **B** the emission of water vapour from leaves
- ☒ **C** water changing from a gas to a liquid
- ☒ **D** water changing from a liquid to a gas

(b) (i) Identify the best definition of abrasion.

(1)

- ☒ **A** particles are dissolved in water
- ☒ **B** particles carried in water wear away river bed and banks
- ☒ **C** rocks bump into each other becoming smaller and rounder
- ☒ **D** sheer power of water increases size of cracks

(ii) State **one** physical cause of river flooding.

(1)

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.....

(iii) Explain **one** way temperature can affect river regimes.

(2)

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(c) Study Figure 1a in the Resource Booklet.

Suggest **two** reasons the river channel cross section changes along a river.

(4)

1 .....

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2 .....

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(d) Study Figure 1b in the Resource Booklet.

Identify the river landform labelled **X**.

(1)

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(e) Explain **one** reason why rivers deposit sediment.

(3)

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(f) Explain **two** ways to prevent river flooding.

(4)

1 .....

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2 .....

(g) Study Figure 1c in the Resource Booklet.

Analyse the possible reasons for water surpluses.

You **must** refer to the resource in your answer.

(8)

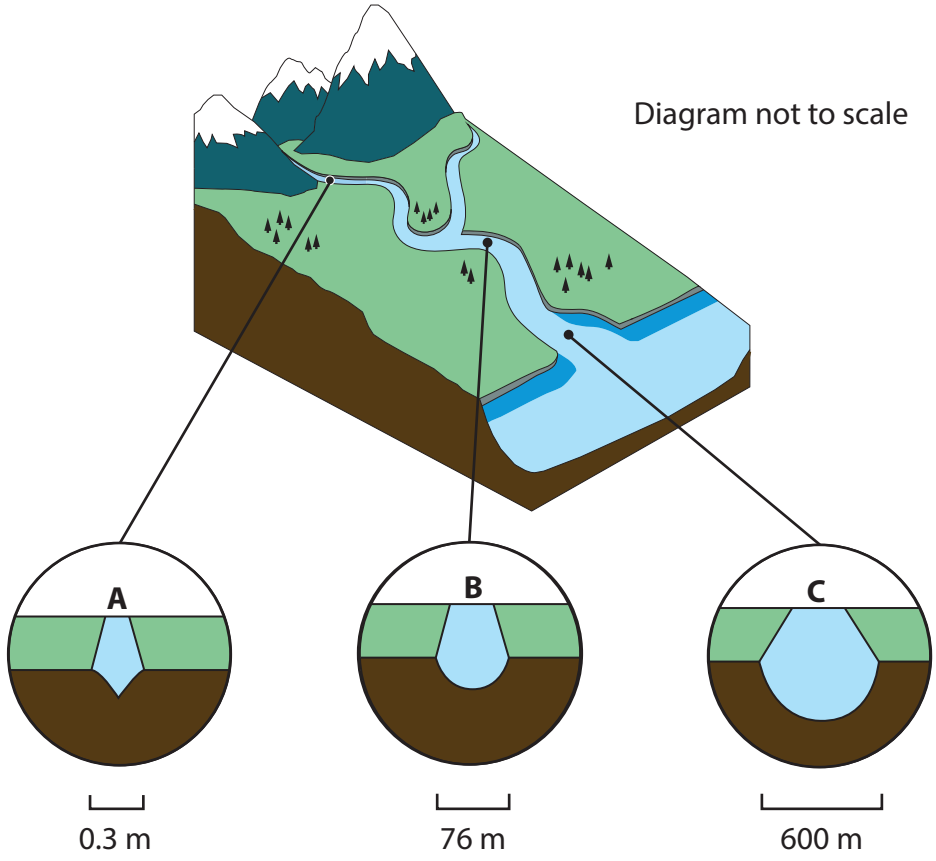


Figure 1a

Changes in channel cross section along a river's long profile (from source to mouth)

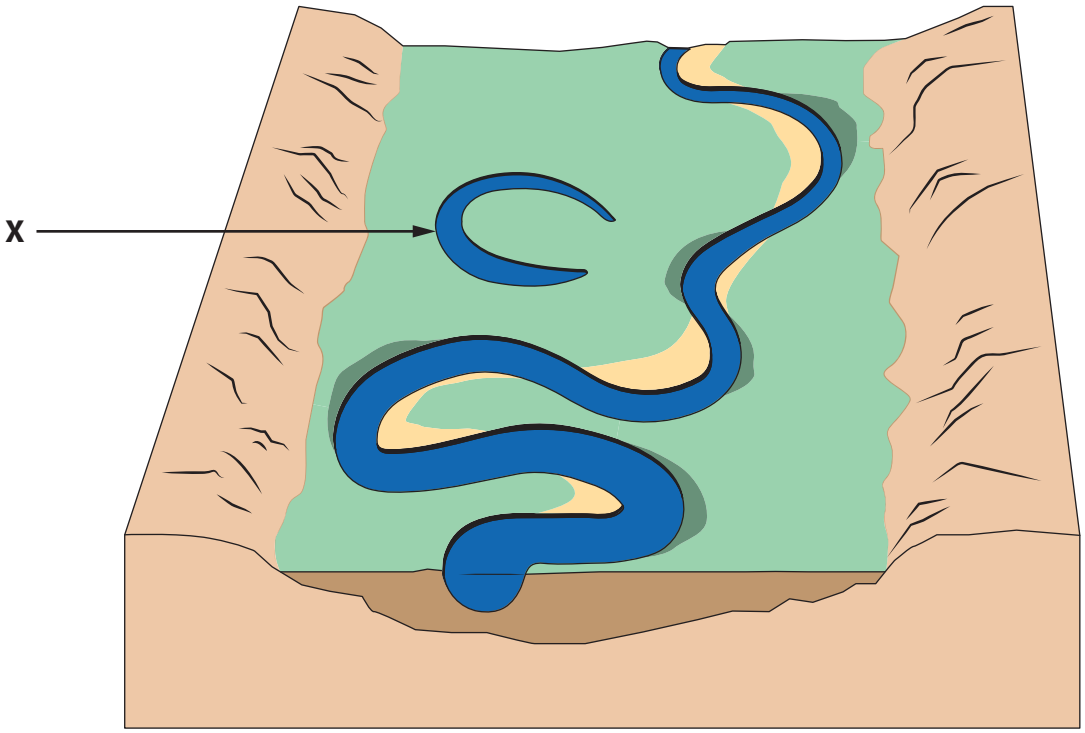


Figure 1b

River landscape

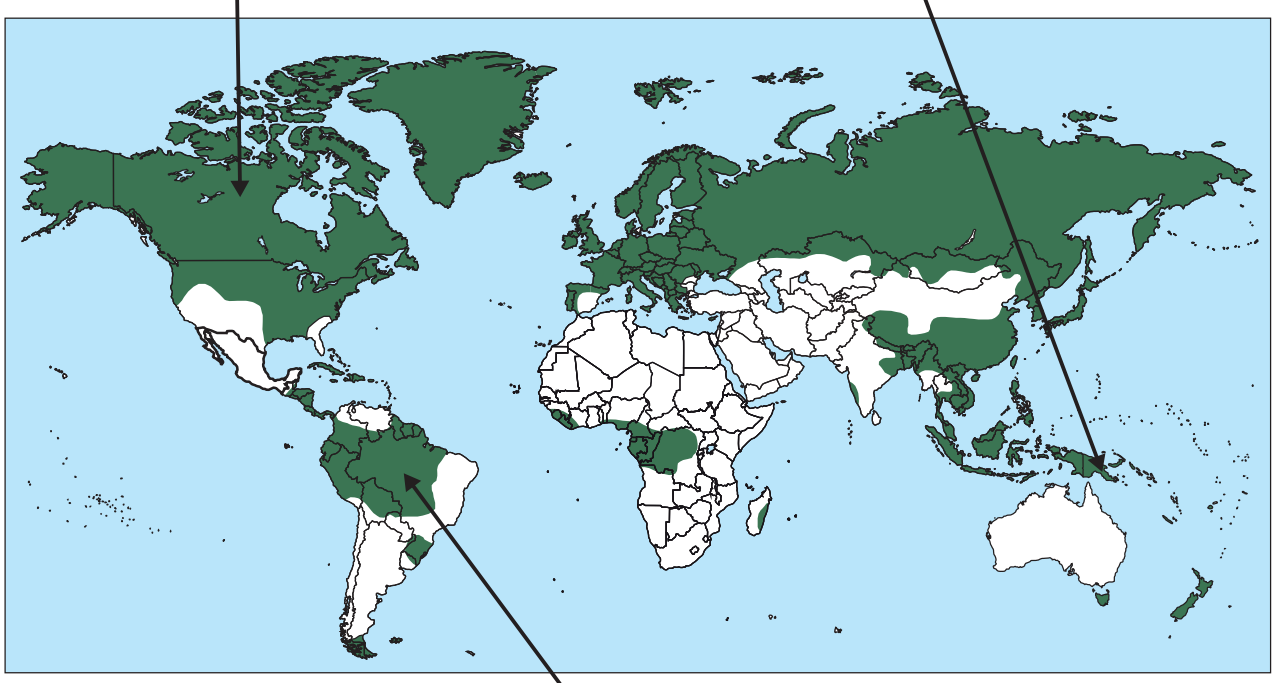


Figure 1c

Map showing areas of water surplus and selected country data

If you answer Question 1, put a cross in the box ☒.

1 River environments

(a) Identify **one** feature of a drainage basin.

(1)

- ☒ **A** atmosphere
- ☒ **B** cloud
- ☒ **C** mouth
- ☒ **D** sun

(b) (i) Identify the best definition of relief.

(1)

- ☒ **A** changes in height of landscape
- ☒ **B** runoff from melting snow
- ☒ **C** the rainy season in South Asia
- ☒ **D** the study of rocks

(ii) Define the term **discharge**.

(1)

.....

.....

(c) Explain **one** way precipitation can affect river regimes.

(2)

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(d) Study Figure 1a in the Resource Booklet.

Identify a store in the hydrological cycle.

(1)

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(e) Study Figure 1b in the Resource Booklet.

Suggest **two** reasons this region may experience water shortages.

You **must** refer to the resource in your answer.

(4)

1 .....

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2 .....

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(f) Explain **two** ways to manage water supply.

(4)

1 .....

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2 .....

(g) Explain **one** human cause of flooding.

(3)

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(h) Study Figure 1c in the Resource Booklet.

Analyse the influence of erosion and transport processes on the river landscape.

You **must** refer to the resource in your answer.

(8)

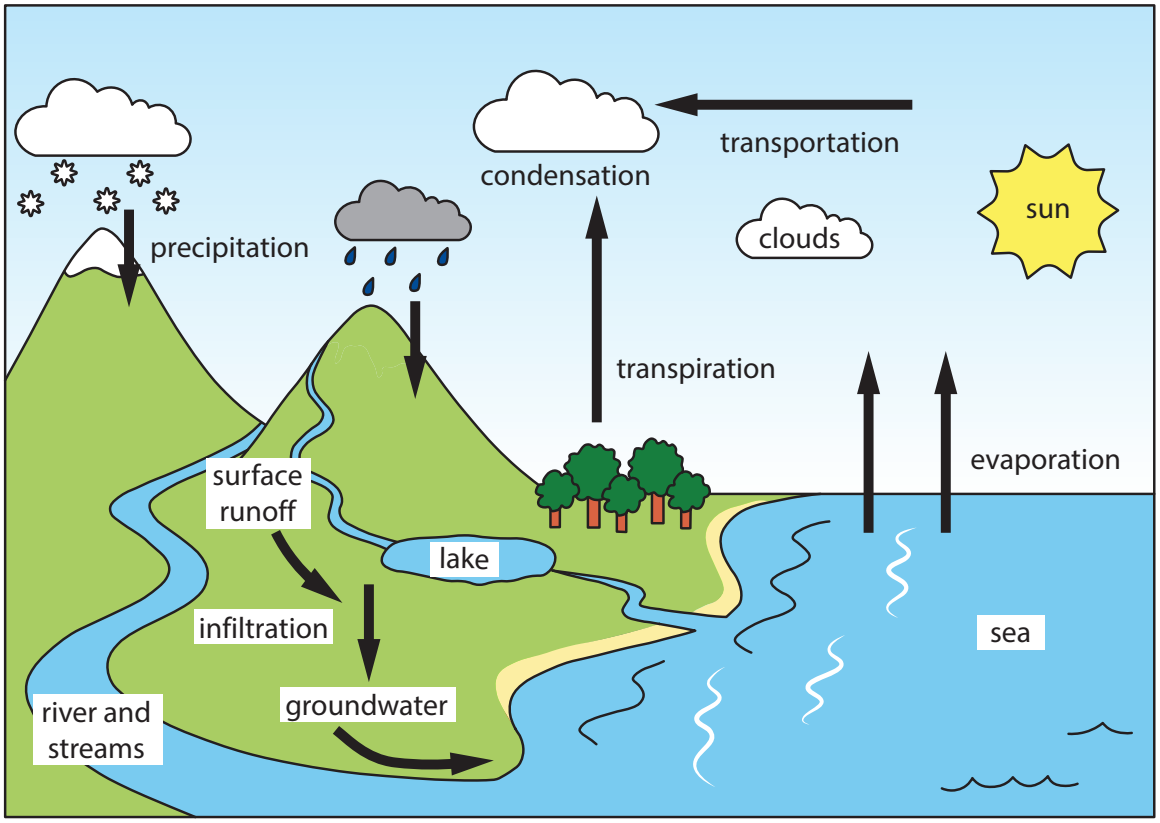


Figure 1a

Hydrological cycle

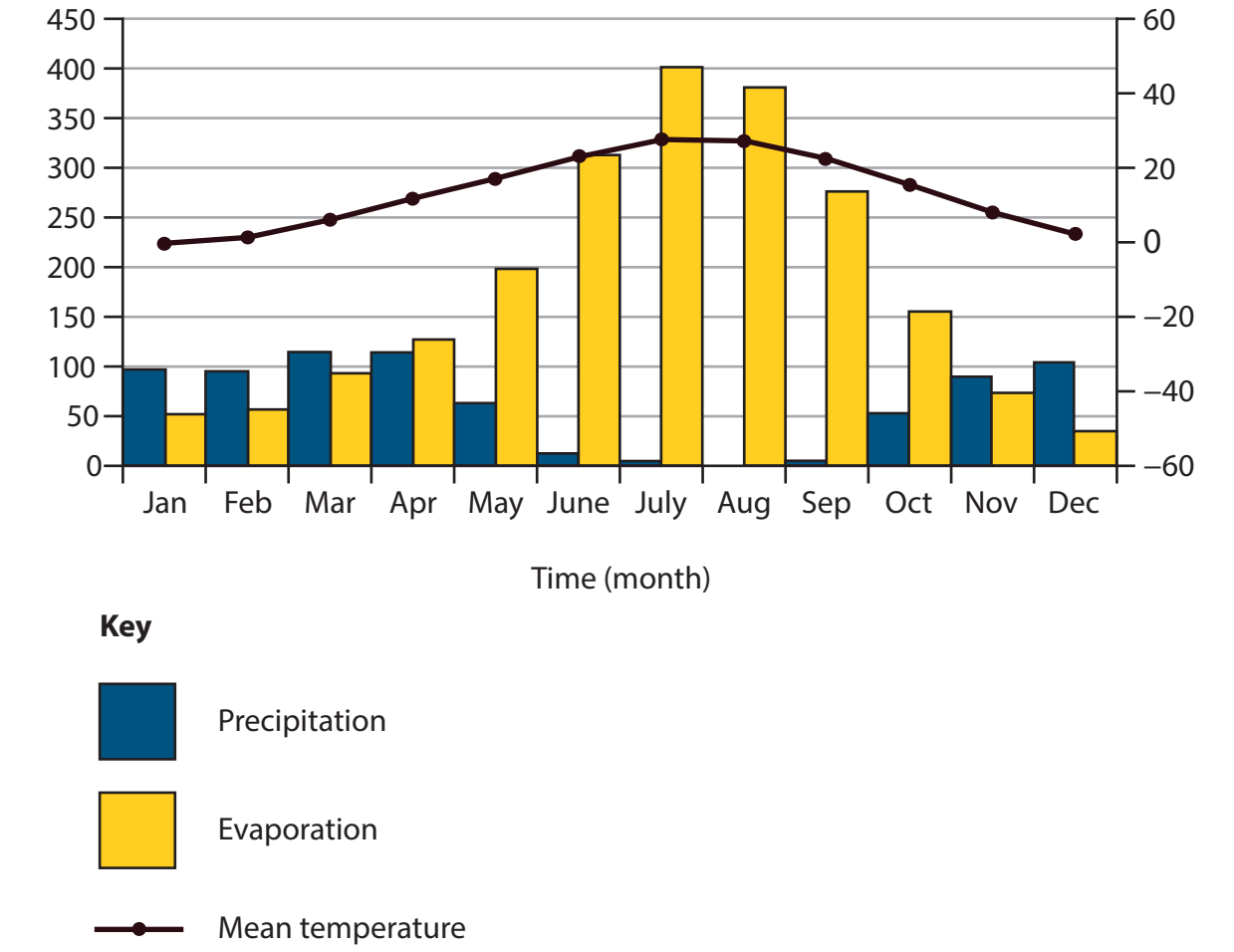
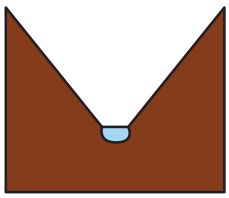


Figure 1b

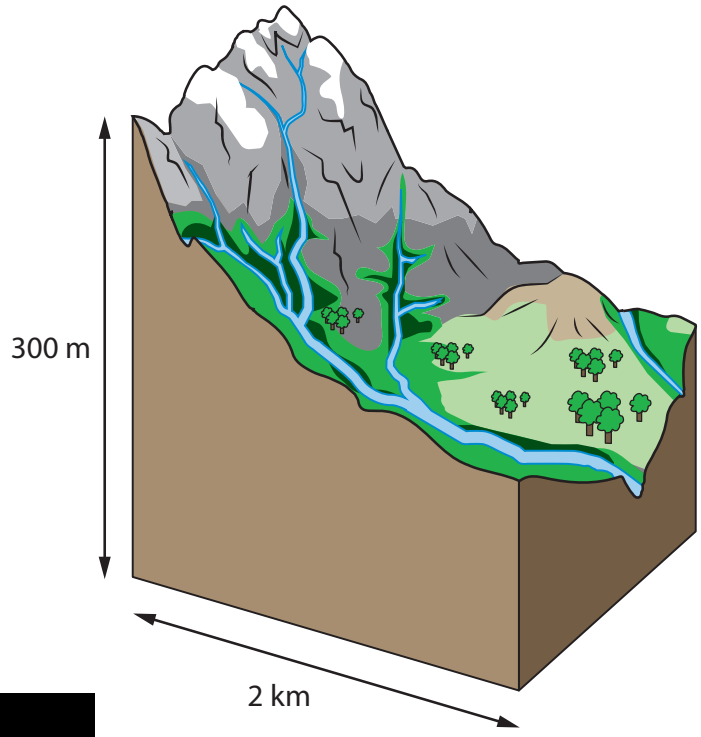
Climate graph of mean precipitation, evaporation and temperature for Tigris basin, Türkiye

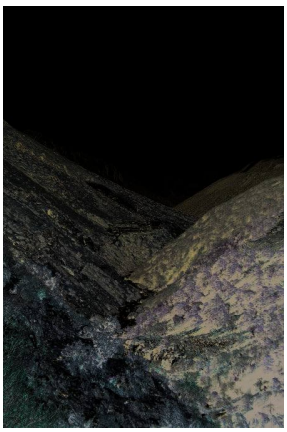


Typical cross profile of an upland river landscape
Gradient: steep
Water depth: shallow

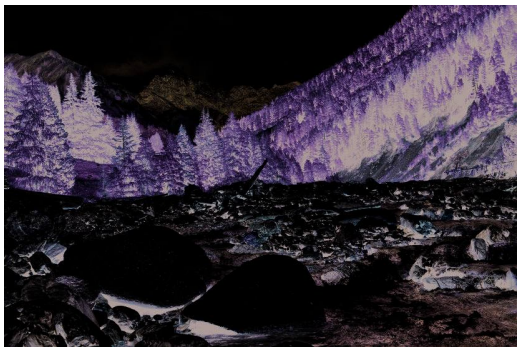


Waterfall





Interlocking spurs



Upper course river sediment

Figure 1c

Characteristics of upland river landscape and selected landforms

If you answer Question 1, put a cross in the box ☒.

1 River environments

(a) Identify the best definition of altitude.

(1)

- ☒ **A** average weather conditions
- ☒ **B** direction a surface faces
- ☒ **C** ground that has a natural incline
- ☒ **D** height above sea level

(b) (i) Identify **one** cause of water surplus.

(1)

- ☒ **A** abstraction
- ☒ **B** drought
- ☒ **C** evaporation
- ☒ **D** monsoon

(ii) State **one** way a river transports sediment.

(1)

.....

(c) Explain **one** flood prevention method used in river environments.

(2)

.....

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.....

(d) Study Figure 1a in the Resource Booklet.

Suggest **two** ways people can affect water quality.

You **must** refer to the resource in your answer.

(4)

1 .....

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2 .....

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(e) Study Figure 1b in the Resource Booklet.

Identify **one** transfer in the hydrological cycle.

(1)

.....

(f) Explain the formation of **two** lowland river landforms.

(4)

landform 1

landform 2

(g) Explain **one** reason for the rising demand for water.

(3)

(h) Study Figure 1c in the Resource Booklet.

Analyse the reasons for differences in river regimes.

You **must** refer to the resource in your answer.

(8)

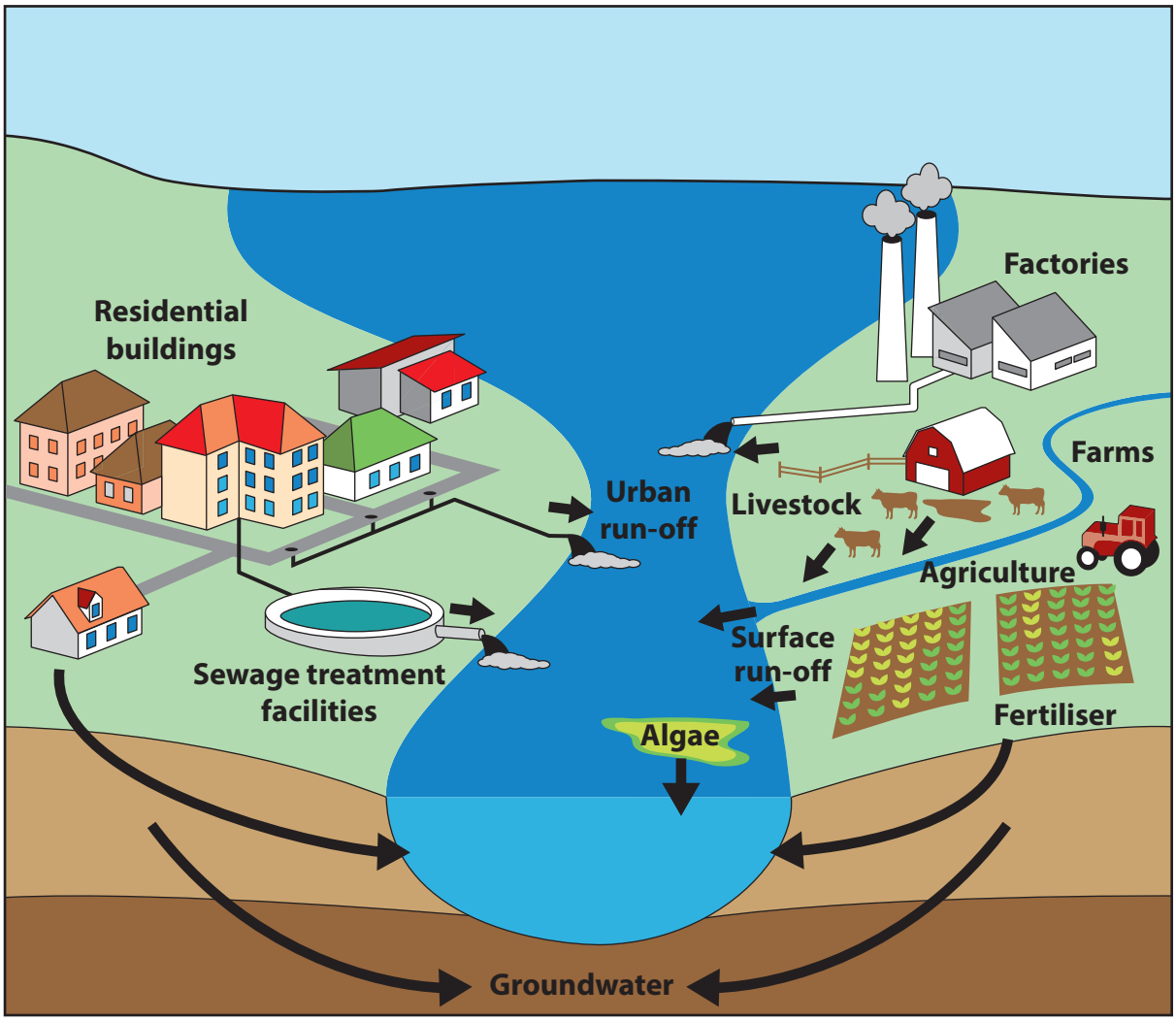


Figure 1a

Causes of variation in water quality

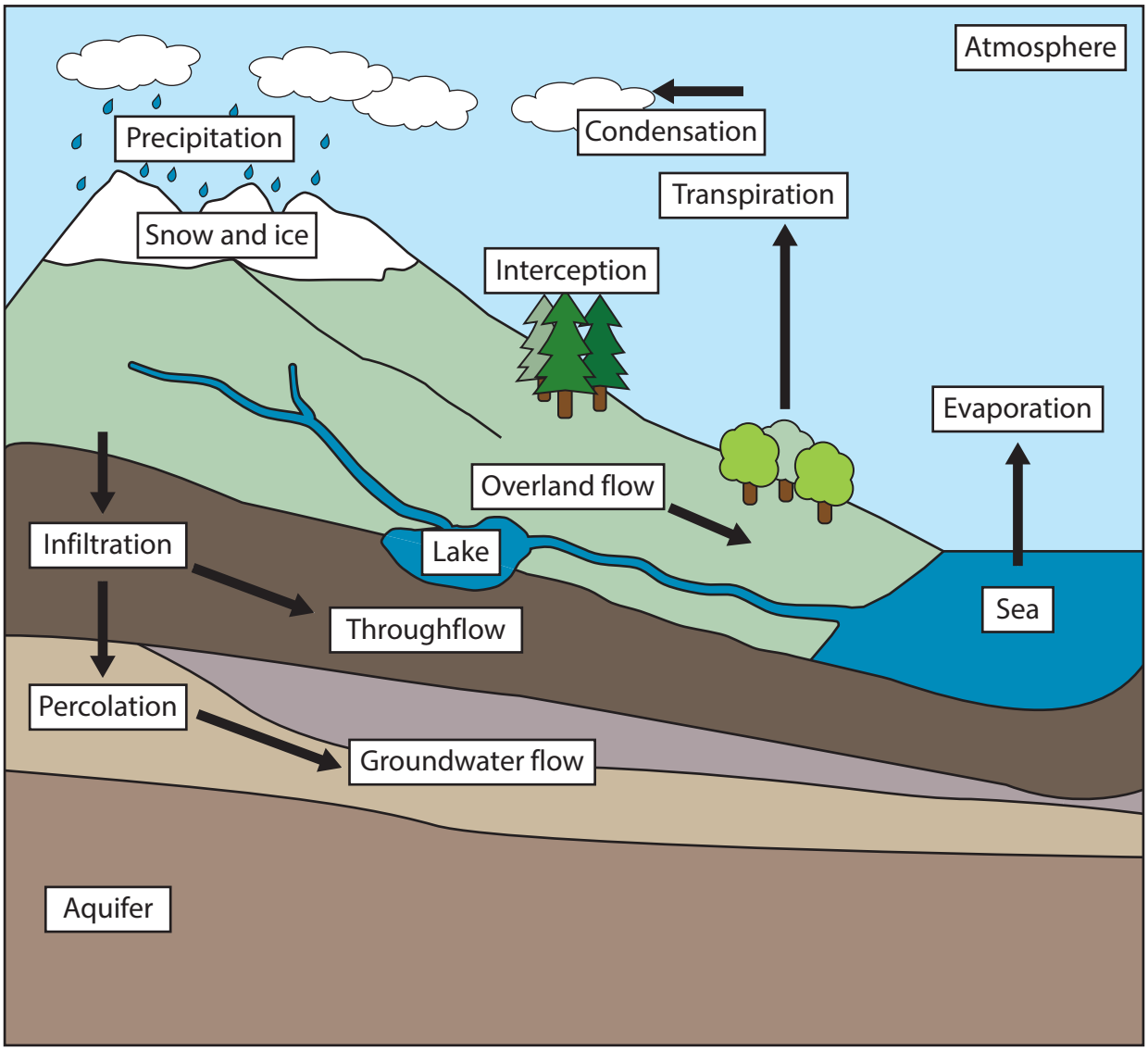
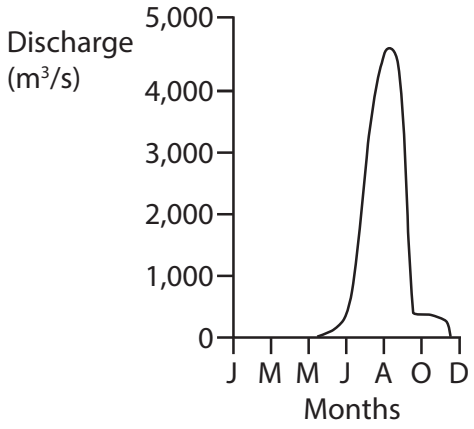
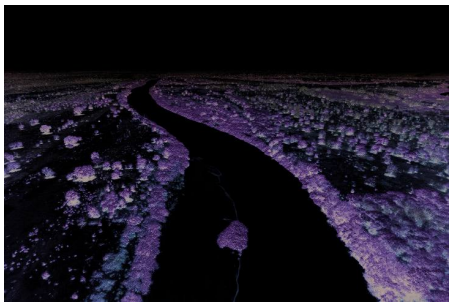


Figure 1b

Hydrological cycle

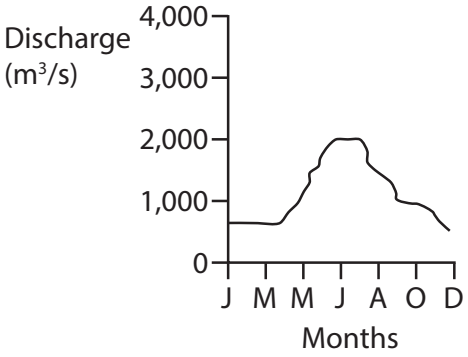
River Volta

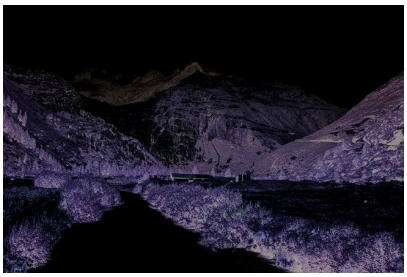




Savanna/grassland regime – River Volta
Average rainfall: 1,000 mm
Average temperature: 29°C
Catchment area: 390,000 km²
Geology: Sandstone/shales - permeable
Water removed for human use:
3 billion m³

River Rhone





Mountain regime – River Rhone
Average rainfall: 825 mm
Average temperature: 13°C
Catchment area: 98,500 km²
Geology: Limestone – permeable
Water removed for human use: 6 billion m³

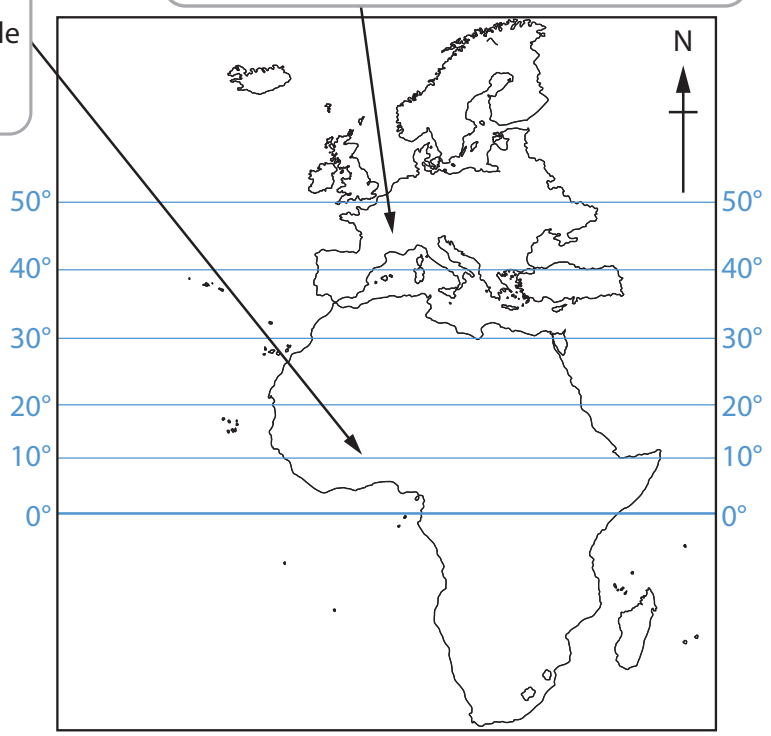


Figure 1c

River regimes for two climatic regions and selected characteristics of their drainage basin

If you answer Question 1, put a cross in the box ☒.

1 River environments

(a) Identify **one** store in the hydrological cycle.

(1)

- ☒ **A** evaporation
- ☒ **B** groundwater
- ☒ **C** infiltration
- ☒ **D** rainfall

(b) (i) Identify the best definition of river velocity.

(1)

- ☒ **A** the cross-section of a river's channel
- ☒ **B** the speed of the water flow
- ☒ **C** the volume of water in the river
- ☒ **D** the wetted perimeter of the river

(ii) State **one** characteristic of the channel shape in the lower course of a river.

(1)

.....

(c) Explain **one** reason why some sediment is transported by traction in rivers.

(2)

.....

.....

.....

.....

(d) Study Figure 1a in the Resource Booklet.

Suggest **two** reasons why demand for water is projected to increase.

You **must** refer to the resource in your answer.

(4)

1 .....

.....

.....

.....

2 .....

.....

.....

.....

(e) Study Figure 1b in the Resource Booklet.

Identify the river landform in the valley shown at X.

(1)

.....

(f) Explain how **one climate** factor and **one slope (gradient)** factor can affect river processes.

(4)

climate

slope (gradient)

(g) Explain how **one** source of river pollution can affect water quality.

(3)

(h) Study Figure 1c in the Resource Booklet.

Analyse the strengths of this flood prevention strategy.

You **must** refer to the resource in your answer.

(8)

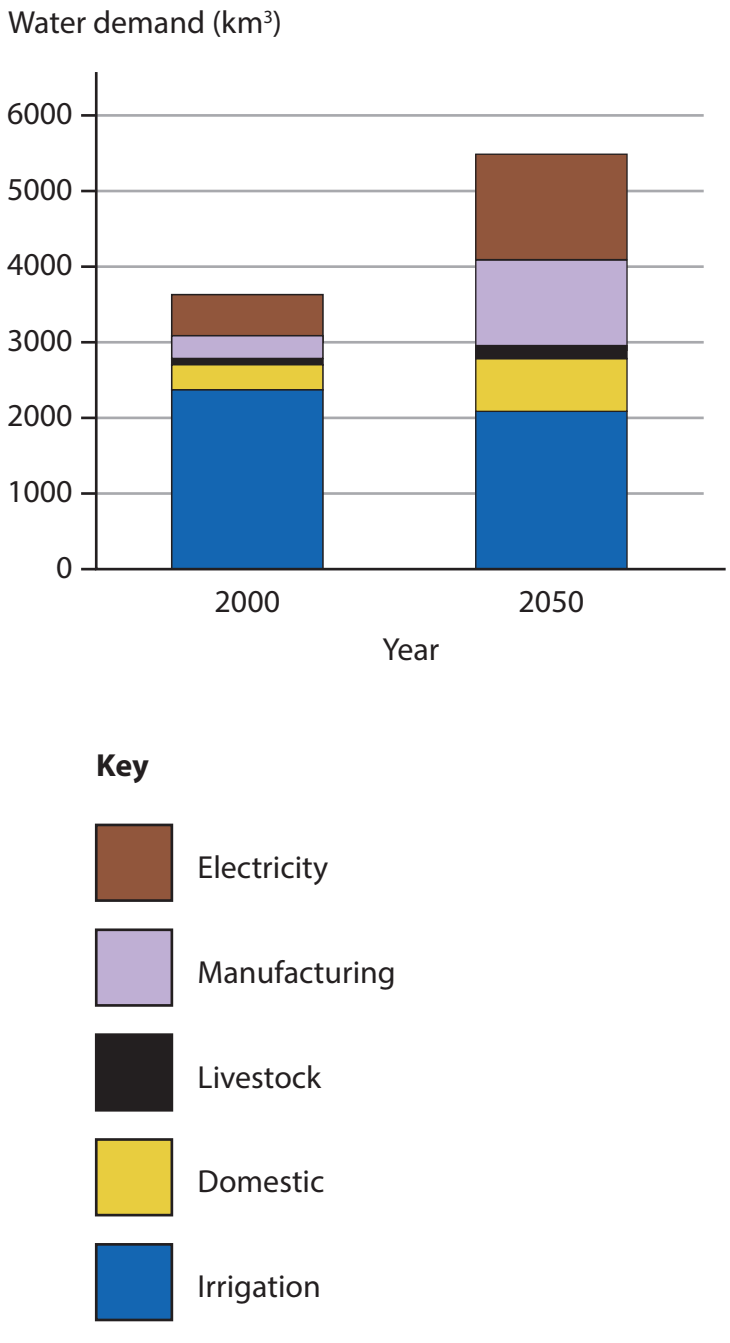


Figure 1a

Global water demand in 2000 and projected for 2050

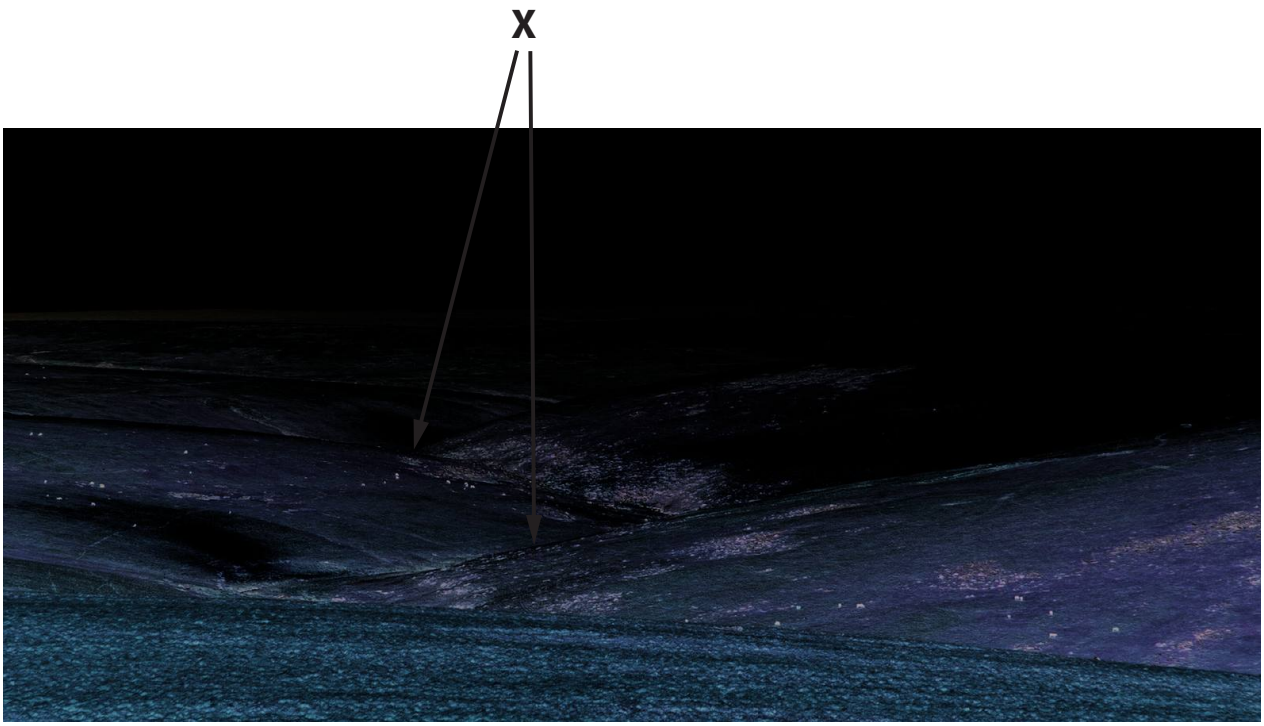


Figure 1b

Upland river landscape

Before Aswan High Dam building completed:

- The River Nile flooding was not controlled effectively prior to the Aswan High Dam, with discharge as high as 14,000 m^3/second.
- These high water periods caused devastating floods affecting agriculture, industry and housing.
- Low water periods during January to May meant discharge could fall to as low as 274 m^3/second leading to severe drought.



After Aswan High Dam building completed:

- The dam regulated the flow of water and provided a year-round supply for irrigation. This meant farmers could grow crops throughout the year.
- Cost US$ 1 billion to build.
- 10 years to complete.
- The flood control of the dam saved lives in 1965, 1975 and 1987.
- Less flooding reduces flood repair and insurance costs.

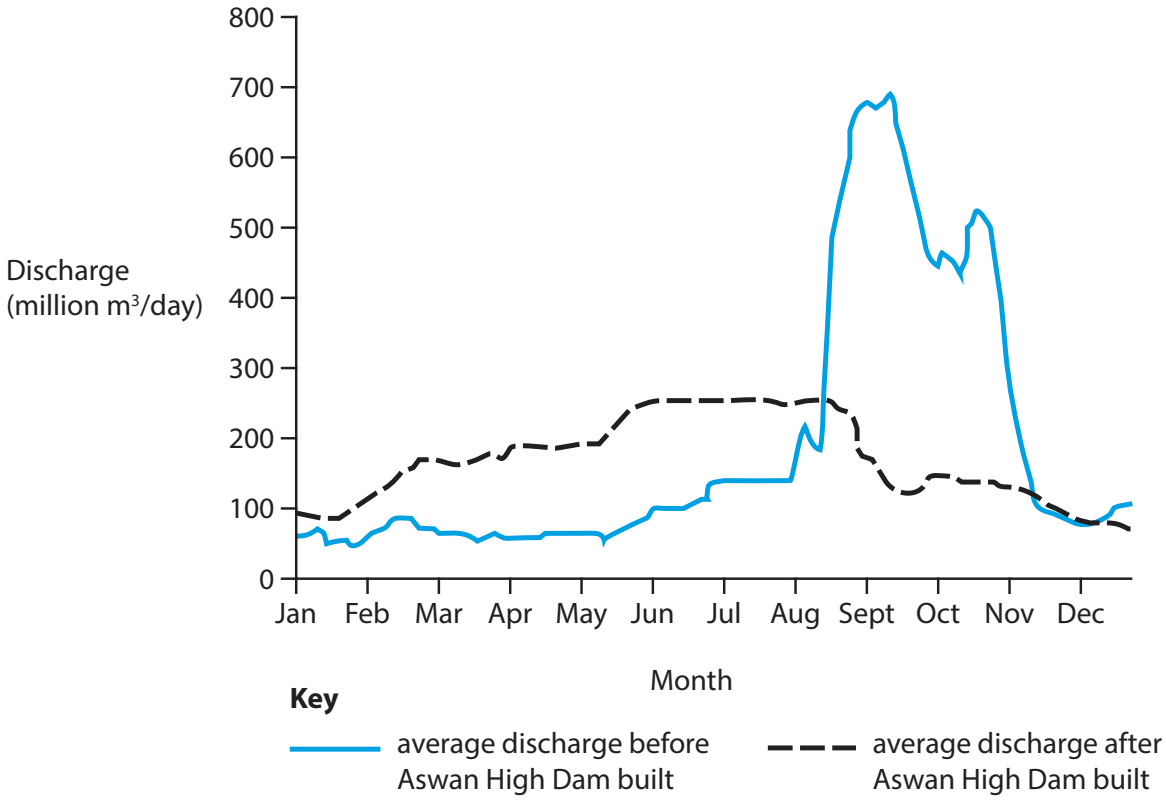


Figure 1c

River regime for River Nile before and after flood prevention strategy (Aswan High Dam) completion

SUB-TOPIC

FIELDWORK: INVESTIGATING RIVER ENVIRONMENTS

16 questions in this booklet

4 Investigating River Environments.

A group of students have undertaken a study exploring changes in a river channel every 100 metres.

(a) (i) Identify the type of sampling method used.

(1)

☒	**A** systematic
☒	**B** random
☒	**C** stratified
☒	**D** opportunistic

(ii) State **one** disadvantage of using one of the sampling methods in the question above, a(i).

(1)

Sampling method .....

.....

.....

Study Figure 4a in the Resource Booklet. It shows sample data on velocity from one site on a river. A cork float was used to measure the time taken to travel between two points, A and B.

(iii) Calculate the mean time taken for the cork float to travel between points A and B.

Give your answer to **one** decimal place.

You must show all your workings in the space below.

(2)

..... seconds

(iv) Using the data in Figure 4a (in the Resource Booklet), complete Figure 4b below for measurements 1 and 4.

(2)

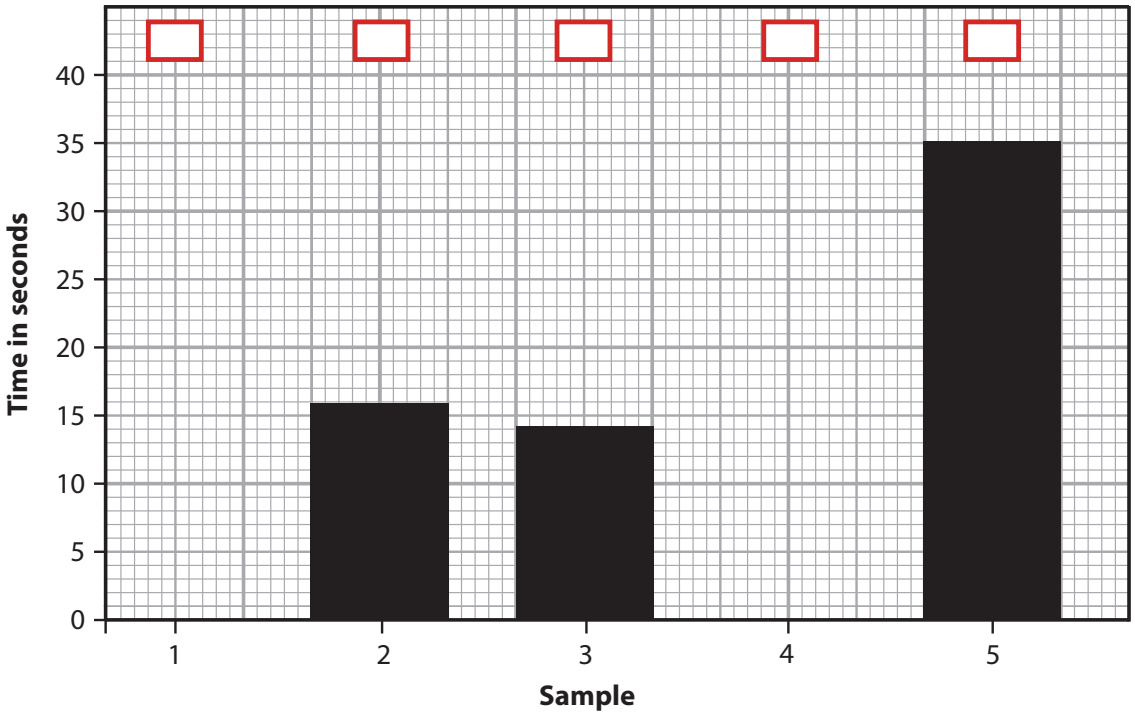


Figure 4b

Measurement times taken for float to travel between points A and B at one site

(v) Mark an x in the box on Figure 4b which represents the float with the anomalous result.

(1)

(vi) Suggest **one** explanation for this anomaly.

(2)

(b) To extend the river study, students were asked to use **one** other primary data method.

Explain **one** other primary data method they might have used.

(3)

You have studied river environments for your geographical enquiry.

(c) Evaluate how successful your chosen data analysis methods were in answering your geographical enquiry question.

(8)

Enquiry question

Sample	Time taken (seconds)
1	21.1
2	16.0
3	14.1
4	15.0
5	35.0

Figure 4a

River data collected by a group of students

4 Investigating River Environments.

A group of students have undertaken a study exploring changes in a river channel.

(a) (i) Identify **one** risk that the students may identify when undertaking a risk assessment for this investigation.

(1)

.....

(ii) State **one** way that this risk could be managed.

(1)

.....

.....

Study Figure 4a in the Resource Booklet. It shows some sample data from one site on a river. A cork float was used to measure the time taken to travel between two points.

(iii) Calculate the mean time taken for the cork float to travel from site A to site B.

Give your answer to one decimal place.

You must show all your workings in the space below.

(2)

..... seconds

(iv) Complete Figure 4b below for samples 1 and 4 using data in Figure 4a (in the Resource Booklet).

(2)

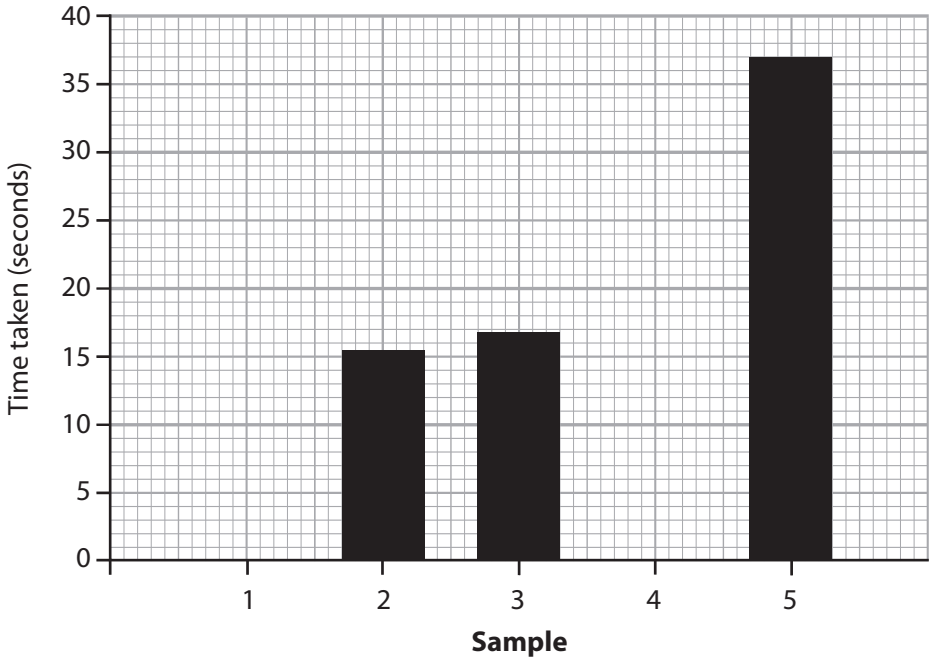


Figure 4b

Time taken for float to travel between site A and B

(v) Sample 5 shows an anomalous result.

Suggest **one** possible explanation for this.

(2)

.....

.....

.....

.....

(b) To extend the river study, students were asked to use one additional quantitative and one qualitative technique.

Describe the **two** additional fieldwork techniques the students may have selected.

(4)

Quantitative

Qualitative

You have studied river processes as part of your own geographical enquiry.

(c) Evaluate the effectiveness of the data collection methods in relation to the purpose of the study.

(8)

Enquiry question

Sample	Time taken (seconds)
1	13.1
2	15.4
3	16.8
4	20.0
5	37.0

Figure 4a

River data collected by a group of students

If you answer Question 4 put a cross in the box ☒.

4 Investigating river environments

A group of students has undertaken a geographical enquiry exploring changes in a river channel.

(a) (i) State **one** secondary data source that the students might have used when undertaking this enquiry.

(1)

.....

.....

(ii) Identify **one** possible disadvantage of the secondary data source identified in 4(a)(i).

(1)

.....

.....

Study Figure 4a in the Resource Booklet. It shows river channel characteristics at three sites.

(iii) Use the data in Figure 4a to find the mean depth of the river at Site 2.

Give your answer to one decimal place.

You must show all your workings in the space below.

(2)

..... cm

(iv) Use the data in Figure 4a to plot the data for sampling points 7 and 8 to complete the graph.

(2)

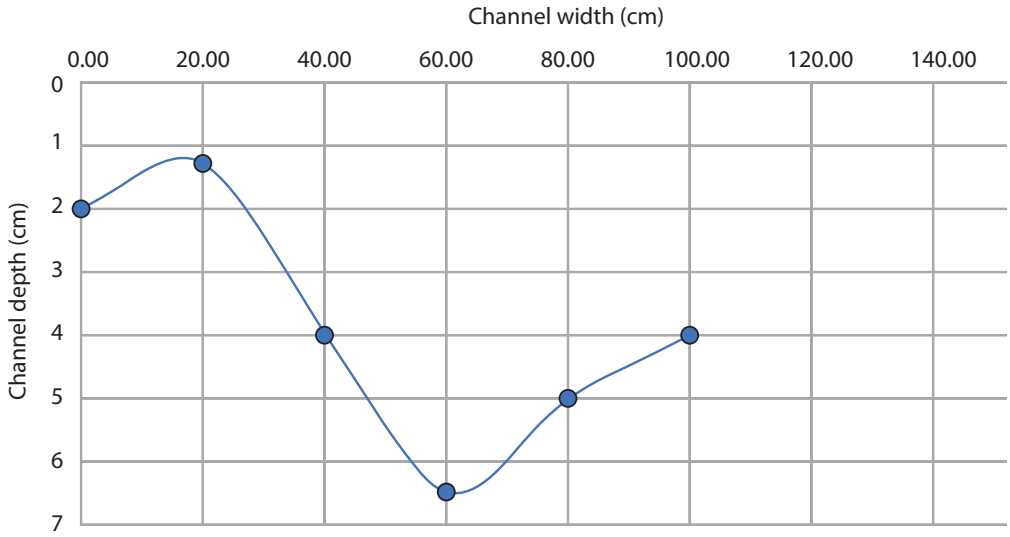


Figure 4b

River cross section at Site 1

(v) The three sites (Sites 1–3) were selected randomly along the river.

Suggest **one** reason why an alternative sampling method might be chosen to select the sites.

(2)

Sampling method .....

.....

.....

.....

.....

(b) The students used annotated field sketches as part of their data collection.

Suggest **one** advantage and **one** disadvantage of this technique.

(4)

Advantage

Disadvantage

You have studied river processes as part of your own geographical enquiry.

(c) Evaluate the effectiveness of the data presentation methods you used.

(8)

Enquiry question

	Site 1 – furthest upstream		Site 2		Site 3 – furthest downstream	
Sampling point	**Channel width (cm)**	**Depth (cm)**	**Channel width (cm)**	**Depth (cm)**	**Channel width (cm)**	**Depth (cm)**
1	0	2.0	0	8.8	0	20.1
2	20	1.3	20	13.0	50	30.4
3	40	4.0	40	14.5	100	40.8
4	60	6.5	60	12.0	150	42.2
5	80	5.0	80	9.0	200	45.1
6	100	4.0	100	10.0	250	47.8
7	120	3.5	120	9.0	300	50.4
8	140	0.6	140	9.5	350	60.3
Mean depth		3.4		?		42.1

Figure 4a

River data collected by a group of students

	Height difference from top of groyne to surface of sand (cm)									
Distance from cliff line (m)	**Groyne 1**		**Groyne 2**		**Groyne 3**		**Groyne 4**		**Groyne 5**	
	North	**South**	**North**	**South**	**North**	**South**	**North**	**South**	**North**	**South**
0	0	0	0	0	0	0	0	0	0	0
10	93	5	120	15	44	81	102	74	50	43
20	94	1	113	10	40	70	80	45	80	40
30	94	14	93	96	51	45	50	122	17	54
Mean height (cm)	70.3	5.0	81.5	30.3	?	49.0	58.0	60.3	36.8	34.3

Figure 5a

Coastal data collected by a group of students

4 Investigating river environments

A group of students has undertaken a geographical enquiry exploring changes in a river channel.

(a) (i) State **one** risk that the students might identify when undertaking this enquiry.

(1)

.....

.....

(ii) State **one** way of managing the risk identified in 4(a)(i).

(1)

.....

.....

Study Figure 4a in the Resource Booklet. It shows river channel characteristics at three sites.

(iii) Use the data in Figure 4a to find the mean depth of the river at Site 3.

Give your answer to one decimal place.

You must show all your workings in the space below.

(2)

..... cm

(iv) Use the data in Figure 4a to plot the data for sampling points at Site 2 to complete the graph.

(2)

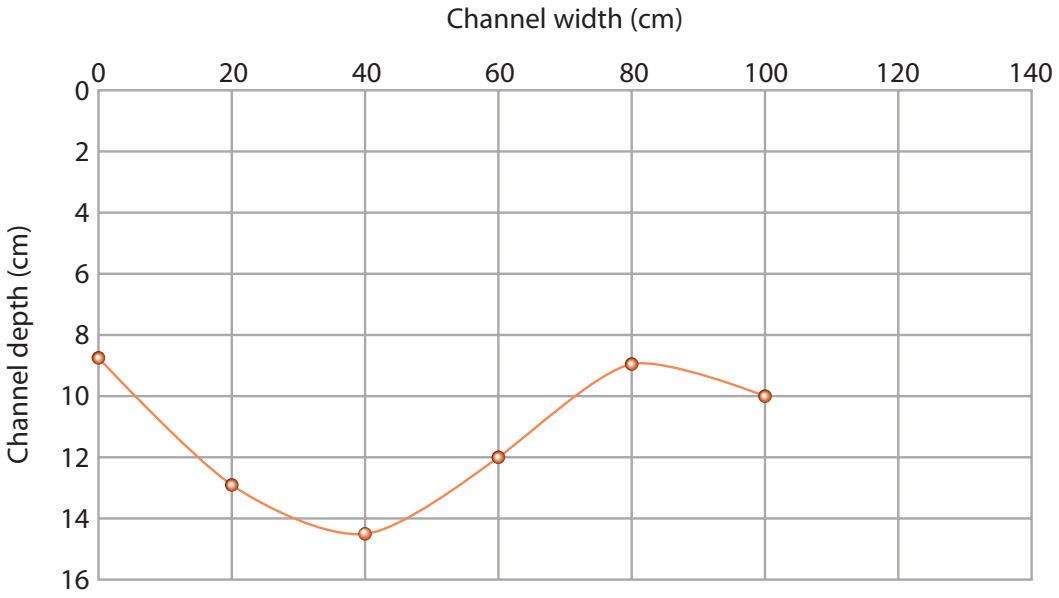


Figure 4b

River cross section at Site 2

(v) The three sites (1–3) were selected randomly along the river.

Suggest **one** reason why the students chose random sampling for the selection of the three sites.

(2)

.....

.....

.....

.....

(b) The students used annotated field sketches as part of their data collection.

Suggest **one** advantage and **one** disadvantage of this technique. (4)

Advantage

Disadvantage

You have studied river processes as part of your own geographical enquiry.

(c) Evaluate the effectiveness of the data analysis techniques you used. (8)

Enquiry question

	Site 1 – Furthest upstream		Site 2		Site 3 – Furthest downstream	
Sampling point	**Distance from bank (cm)**	**Depth (cm)**	**Distance from bank (cm)**	**Depth (cm)**	**Distance from bank (cm)**	**Depth (cm)**
1	0	2.0	0	8.8	0	41.1
2	20	1.3	20	13.0	50	60.5
3	40	4.0	40	14.5	100	78.5
4	60	6.5	60	12.0	150	85.1
5	80	5.0	80	9.0	200	92.3
6	100	4.0	100	10.0	250	95.6
7	120	3.5	120	9.0	300	60.4
8	140	0.6	140	9.5	350	45.3
Mean depth		3.36		10.7		?

Figure 4a

River data collected by a group of students

	Height difference from top of groyne to surface of sand (cm)									
Distance from cliff line (m)	**Groyne 1**		**Groyne 2**		**Groyne 3**		**Groyne 4**		**Groyne 5**	
	North	**South**	**North**	**South**	**North**	**South**	**North**	**South**	**North**	**South**
0	0	0	0	0	0	0	0	0	0	0
10	93	5	120	15	44	81	102	74	50	43
20	94	1	113	10	40	70	80	45	80	40
30	94	14	93	96	51	45	50	122	17	54
Mean depth	70.3	5.0	81.5	30.3	33.8	49.0	58.0	?	36.8	34.3

Figure 5a

Coastal data collected by a group of students measuring beach profile: the height difference from the top of the groyne to the surface of the sand

4 (a) (i) Identify which of the following statements refers to systematic sampling.

(1)

☒	**A** Collecting data at random sites along a river.
☒	**B** Collecting data every 100m along a river.
☒	**C** Collecting data from two different river catchments.
☒	**D** Collecting data from three sites along a river.

(ii) Name **one** piece of equipment you would use to measure river wetted perimeter.

(1)

(iii) Describe **one** health and safety risk it is important to be aware of when carrying out fieldwork near rivers.

(2)

(b) Study Figure 4 in the Resource Booklet. It shows information about some design, some data collection methods used, data presentation and conclusion.

> The aim of the student's enquiry was to examine change in river channel shape along the course of a river.

Evaluate how far the design and the data collection methods provided reliable evidence for the student's conclusions.

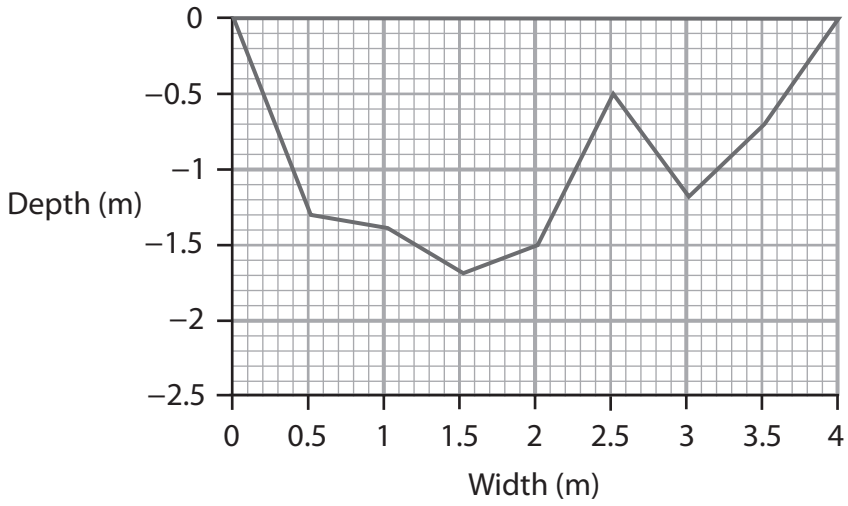
(8)

At two different sites along a river chosen at random on a map:

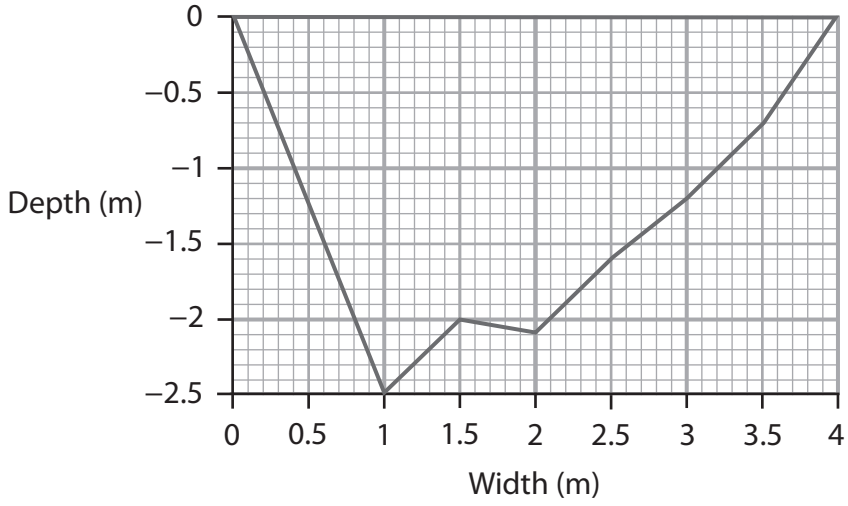
- Measure river width/depth
- Measure river wetted perimeter
- Measure river velocity

Figure 4a

Extract from data collection methods



Site 1



Site 2

	Conclusions
1	I found that the characteristics of the river changed along the course of the river.
2	Calculating river velocity at each site allowed me to find out that river velocity is fastest in the upper course of the river.
3	There was little difference between the width of the river between the fieldwork sites.

Figure 4b

Extracts from student's data presentation and conclusion

4 (a) (i) Identify a suitable piece of equipment to measure river velocity.

(1)

☒	**A** Anemometer
☒	**B** Quadrat
☒	**C** Clinometer
☒	**D** Stopwatch

(ii) Name **one** type of sampling method.

(1)

.....

(iii) Describe **one** way GIS might be used for fieldwork in a river environment.

(2)

.....

.....

.....

.....

(b) Study Figure 4 in the Resource Booklet. It shows some information about methods used, data collected and a conclusion.

> The aim of the student's enquiry was to examine change in river channel shape along the course of a river.

Evaluate how far the student's data presentation methods and analysis helped the student to make their conclusions.

(8)

.....

.....

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.....

.....

4 Investigating river environments

A group of students have undertaken an enquiry that investigates the characteristics of a river along its course.

(a) Study Figure 4a in the Resource Booklet.

(i) Identify **one** type of primary data used by the students.

(1)

- ☒ **A** Environment Agency flood risk map
- ☒ **B** field sketches
- ☒ **C** local historical map
- ☒ **D** newspaper articles

(ii) Name **one** piece of equipment the students could have used in their enquiry.

(1)

.....

(b) Study Figure 4b which shows some data about river velocity at four sites.

(i) Calculate the mean river velocity at Site 2.

Give your answer to one decimal place.

You must show all your workings in the space below.

(2)

..... m/s

(ii) State **one** type of sampling students could have used to choose their data collection sites.

(1)

.....

(iii) Suggest **one** reason why the data for Site 1 may not be reliable.

(2)

.....

.....

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.....

(c) (i) Complete Figure 4d below, using data highlighted in Figure 4c in the Resource Booklet.

(2)

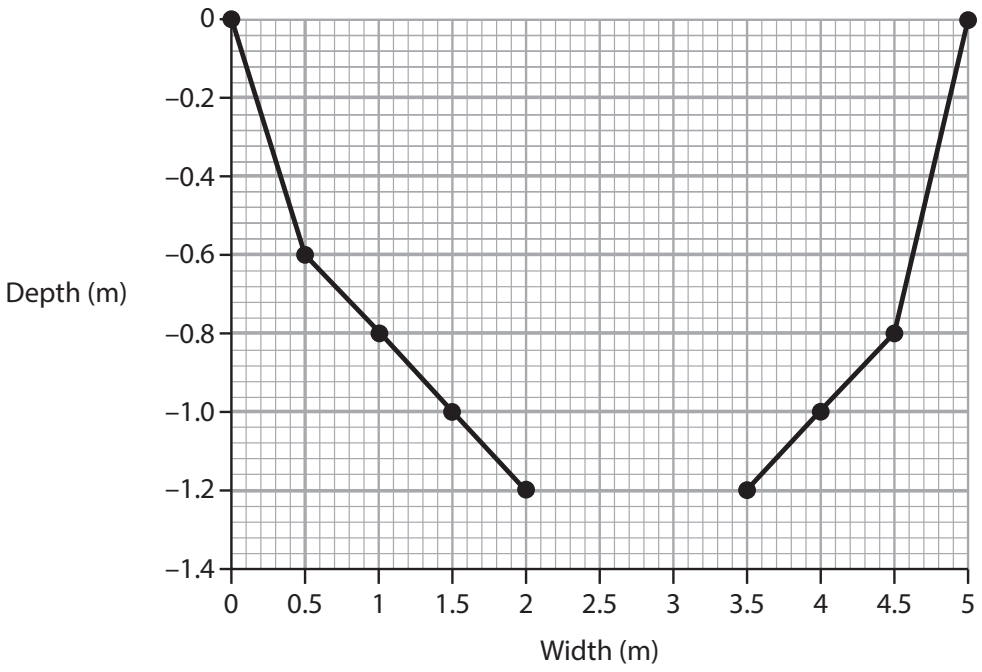


Figure 4d

River channel cross-section

(ii) Explain **one** advantage of using a line graph to present results.

(3)

Data/information used by the students:

- Environment Agency flood risk map
- Newspaper articles
- Local historical map
- Field sketches
- Measurements of: river velocity, river depth and sediment size

Figure 4a

Selected data/information used by the students

	Site 1	Site 2	Site 3	Site 4
Measurement 1	0.2	1.2	0.7	0.5
Measurement 2	0.8	1.0	0.6	0.6
Measurement 3	1.2	1.2	0.6	0.5
Measurement 4	1.3	1.3	0.6	0.4
Mean velocity	0.9	**?**	0.6	0.5
Range in velocity	1.1	0.3	0.1	0.2

Figure 4b

Data collected on river velocity (m/s)

Depth (m)	Width (m)
0	0
–0.6	0.5
–0.8	1
–1	1.5
–1.2	2
–1.4	**2.5**
–0.8	**3**
–1.2	3.5
–1	4
–0.8	4.5
0	5

Figure 4c

Data collected on river channel depth and width

4 Investigating river environments

A group of students have undertaken an enquiry that explores how sediment changes along a river at two sites.

(a) Study Figure 4a in the Resource Booklet.

(i) Identify **one** type of quantitative data used by the students.

(1)

- ☒ **A** annotated photographs
- ☒ **B** newspaper articles
- ☒ **C** amount of rainfall
- ☒ **D** river management plan

(ii) State **one** way maps could be used to support the enquiry.

(1)

.....

.....

(b) Study Figure 4b which shows some data collected about river velocity.

(i) Calculate the mean velocity.

Give your answer to one decimal place.

You must show all your workings in the space below.

(2)

..... m/s

(ii) State **one** piece of equipment that could be used to measure river velocity.

(1)

.....

(c) (i) Complete Figure 4d below, using data highlighted in Figure 4c in the Resource Booklet.

(2)

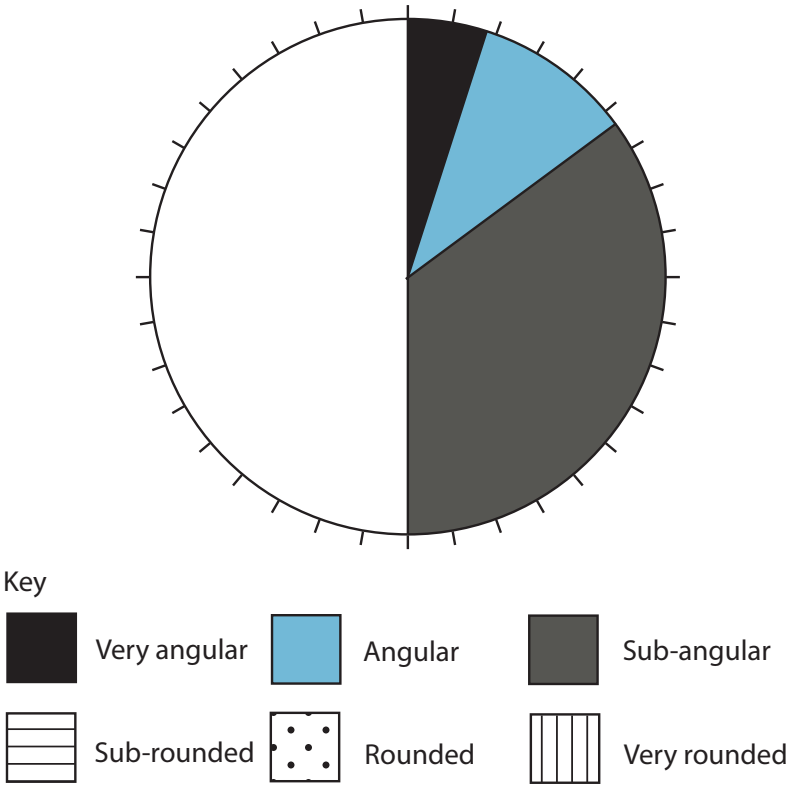


Figure 4d

Pie chart showing pebble shape

(ii) Identify **two** ways the students could have improved the reliability of the data collected.

(2)

1 .....

.....

2 .....

.....

(d) Explain **one other** fieldwork technique the students could have used to explore river channel changes.

(3)

- Annotated photographs
- Newspaper articles
- Amount of rainfall
- River velocity
- River width
- River management plan

Figure 4a

Selected data collection methods

Measurement	River velocity (m/s)
1	1.2
2	2.0
3	1.4
4	1.2
5	1.0

Figure 4b

Data on river velocity at Site 2 (of 2)

	Pebble shape	Percentage (%)
	Very angular	5
	Angular	10
	Sub-angular	35
	Sub-rounded	25
	Rounded	15
	Very-rounded	10

Figure 4c

Data collected on pebble shape (100 pebbles)

4 Investigating river environments

You have carried out a geographical enquiry as part of your work on river environments.

Title of your geographical enquiry

(a) Describe **one** way you managed a risk that you identified during your enquiry.

(2)

(b) Explain **one** way you decided on your sites for data collection.

(3)

(c) Describe **two** types of data collection method you used during your enquiry.

(4)

1 .....

.....

.....

.....

2 .....

.....

.....

.....

(d) Explain **one** technique you used to analyse your data.

(3)

.....

.....

.....

.....

.....

(e) Study Figure 4a and Figure 4b in the Resource Booklet. They show some information about data presentation from a student's enquiry.

> The aim of the student's enquiry was to investigate changes in river characteristics. The student made field sketches of the data collection sites, and collected data on river velocity, river discharge and bedload size.

Evaluate the effectiveness of the data presentation techniques used by the student.

(8)

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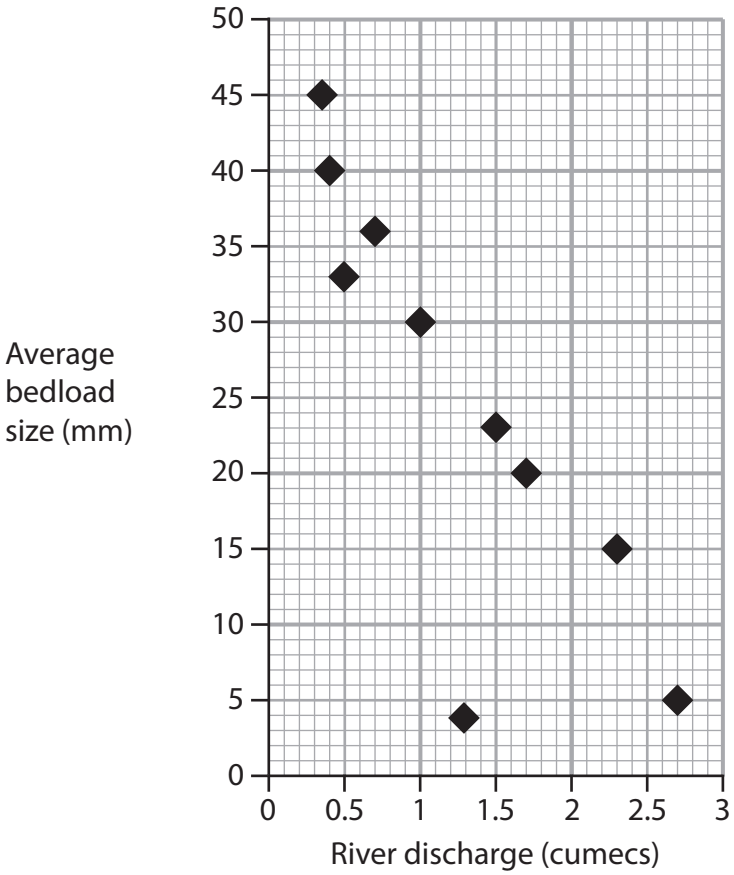


Figure 4a

Extract from student's data presentation

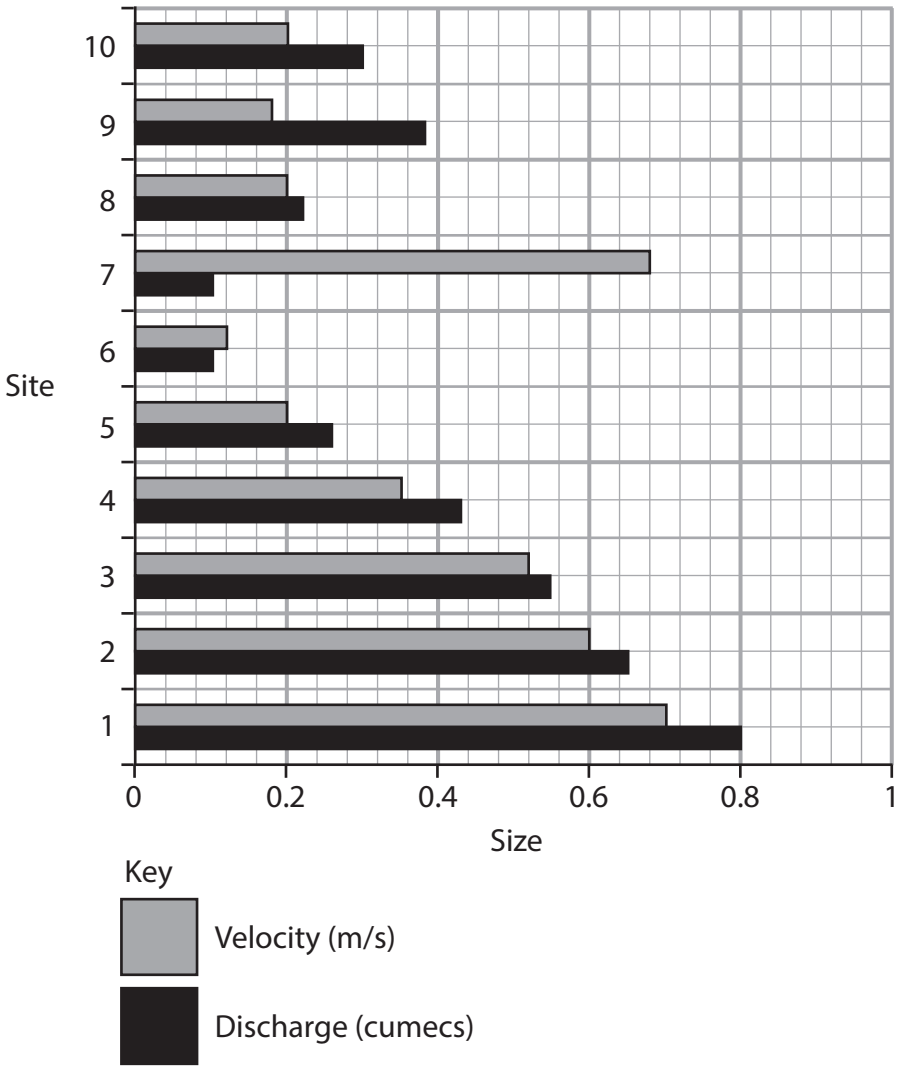


Figure 4b

Extract from student's data presentation

4 Investigating river environments

You have studied a river environment as part of your own geographical enquiry.

Title of your geographical enquiry

(a) Explain why your fieldwork location was suitable for this enquiry.

(2)

(b) Explain **one** quantitative method you chose for data collection.

(3)

(c) Explain **one** advantage of a technique you used to present your fieldwork data.

(3)

(d) Explain **two** techniques you used to analyse your data.

(4)

1

2

(e) Study Figure 4a and Figure 4b in the Resource Booklet. They show some information about data collection methods from a student's enquiry.

> The aim of the student's enquiry was to determine the most important factor affecting river discharge.

Evaluate how far the data collection methods used supported the student in achieving their aim.

(8)

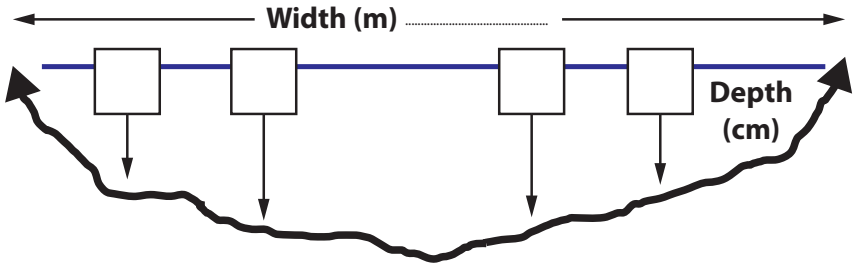
- Choose 5 sites along a river, at 300m intervals.
- Measure river depth, width and velocity.
- Record sediment characteristics.
- Identify land use and draw a field sketch.

Figure 4a

Information on the student's data collection methods

River fieldwork recording sheet

- Measure river depth.



Mean depth (m) .....

- Measuring river velocity.

Site	1	2	3	4	5
Distance					
Time					
Velocity					

- Measure sediment size and roundness at each site.

Site	1	2	3	4	5
Sediment size (cm)					
Sediment roundness					

Figure 4b

Data collection sheet

If you answer Question 4, put a cross in the box ☒.

4 Investigating River Environments

You have carried out a geographical enquiry as part of your work on river environments.

Title of geographical enquiry

.....

.....

(a) Describe **one** of your data presentation techniques.

(2)

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(b) Explain **one** limitation of a secondary data source used in your investigation.

(3)

Secondary data source

.....

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.....

.....

(c) Explain **two** ways you could have improved a primary data collection method to increase its accuracy.

(4)

1 .....

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.....

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2 .....

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(d) Explain **one** pattern you found in your primary data.

(3)

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(e) Study the data in Figure 4a in the Resource Booklet. It shows some information about the results and conclusion from the students' investigation.

> The aim was to investigate how the width and velocity change along a river.

Evaluate the reliability of the students' conclusions.

(8)

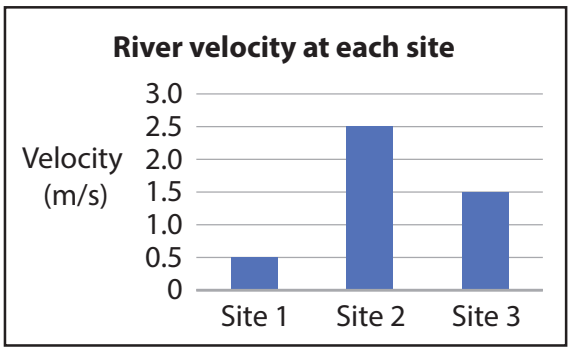
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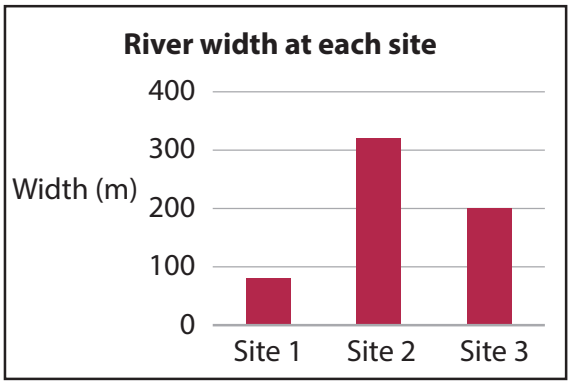
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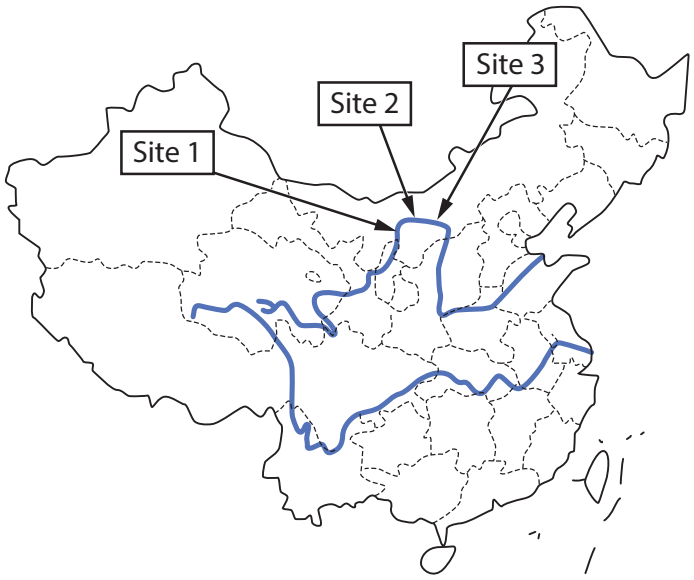
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A group of students carried out an investigation into how river width and velocity change along a river.

Sampling strategy: They chose random sampling to select the three sites where data was collected.

Time of year: The data was collected during one morning in March.

Frequency: To collect their width and velocity data the students recorded one set of data at each site.

Conclusion: The students concluded that river width and velocity do not always increase along a river.

Figure 4a

Details of the students' river investigation

If you answer Question 4, put a cross in the box ☒.

4 Investigating river environments

A group of students has undertaken an enquiry that investigated changes within a river channel along its course.

(a) (i) Identify **one** piece of equipment used to measure gradient.

(1)

☒ **A** calliper

☒ **B** clinometer

☒ **C** compass

☒ **D** quadrat

(ii) State **one** risk the students should have prepared for when carrying out their river fieldwork.

(1)

.....

.....

(b) Study Figure 4a in the Resource Booklet. It shows some data about the average channel depth at the 10 sites where data was collected.

Calculate the range in river depth.

You **must** show all your working in the space below.

(2)

..... cm

(c) (i) Study Figure 4b in the Resource Booklet.

Plot the data for sites 1 and 3, from Figure 4b (shown in the Resource Booklet), on Figure 4c (below).

(2)

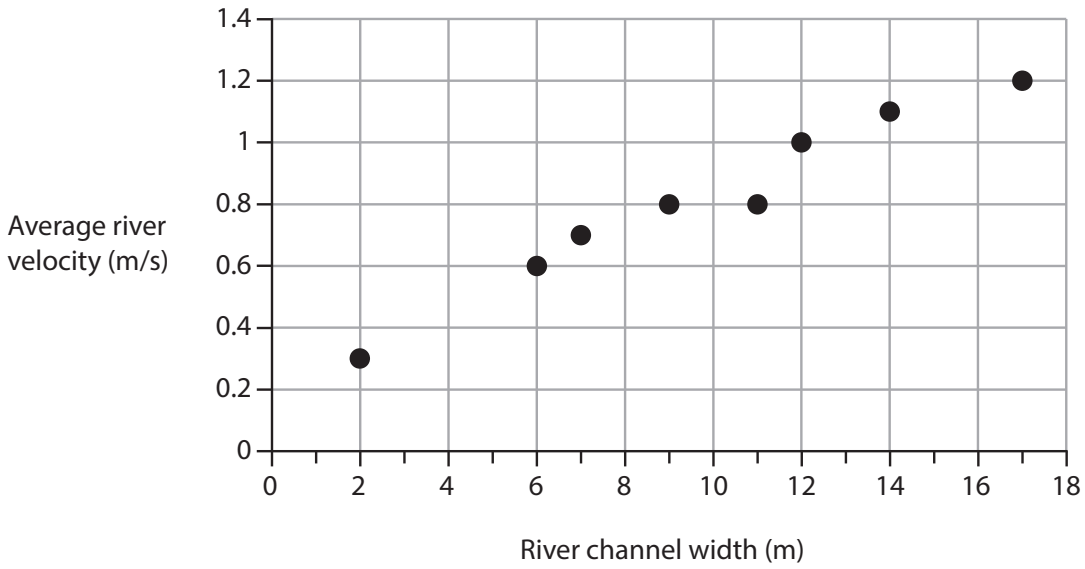


Figure 4c

Relationship between river width and average velocity

(ii) Draw a line of best fit on Figure 4c.

(1)

(iii) Suggest **one** reason for the relationship shown on Figure 4c.

(2)

(d) Explain **one other** primary data collection method students might have found useful in their river enquiry.

(3)

(e) You have studied river processes as part of your own geographical enquiry.

Evaluate the accuracy and reliability of your data collection techniques.

(8)

Geographical enquiry title

Site	Average river channel depth (cm)
1	12
2	5
3	14
4	23
5	41
6	36
7	47
8	51
9	50
10	63

Figure 4a

Average river depth data for each site

Site	River width (m)	Average river velocity (m/s)
1	**1**	**0.2**
2	2	0.3
3	**4**	**0.4**
4	6	0.6
5	7	0.7
6	9	0.8
7	11	0.8
8	12	1.0
9	14	1.1
10	17	1.2

Figure 4b

River width and average velocity data for each site

4 Investigating river environments

A group of students has undertaken an enquiry to investigate changes in a river channel at different points along its course.

(a) (i) Identify the best definition of secondary data.

(1)

- ☒ **A** direct collection of original data
- ☒ **B** information collected by other people
- ☒ **C** information collected by you
- ☒ **D** your own fieldwork data

(ii) State **one** type of qualitative data the students could have used in their enquiry.

(1)

.....

.....

(b) Suggest **one** possible health and safety risk of measuring river depth.

(2)

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(c) Study Figure 4a in the Resource Booklet.

Calculate the median of the river channel widths.

You **must** show all your working in the space below.

(2)

..... cm

(d) (i) Study Figure 4b in the Resource Booklet.

Plot the data for sites 1 and 3, from Figure 4b (shown in the Resource Booklet), on Figure 4c (below).

(2)

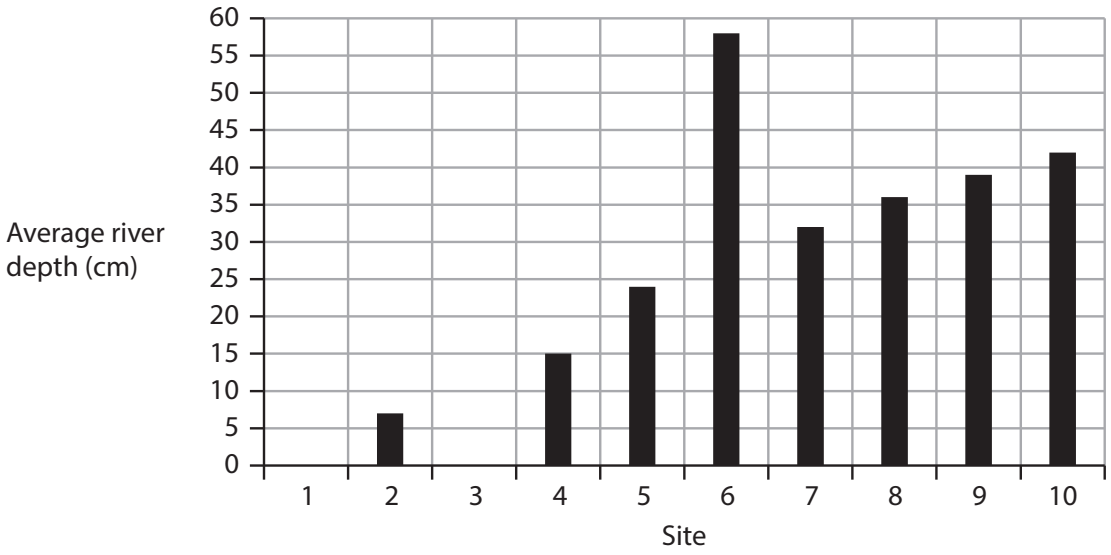


Figure 4c

Average river depth at each site

(ii) Identify at which site there is an anomaly.

(1)

.....

(iii) Suggest **one** possible reason for the anomaly in the river depth on Figure 4c.

(3)

(e) You have studied river processes as part of your own geographical enquiry.

State the title of your geographical enquiry.

Evaluate the accuracy and reliability of your conclusions.

(8)

Geographical enquiry title

Site	Channel width (cm)
1	5
2	12
3	17
4	20
5	31
6	21
7	31
8	40
9	31
10	40

Figure 4a

River channel width data for each site

Site	Average river depth (cm)
1	**5**
2	7
3	**10**
4	15
5	24
6	58
7	32
8	36
9	39
10	42

Figure 4b

Average river depth data for each site

If you answer Question 4, put a cross in the box ☒.

4 Investigating river environments

A group of students has undertaken an enquiry to investigate how processes create a river environment.

(a) State **one** piece of equipment the students could have used in their river enquiry.

(1)

.....

(b) Explain **one** advantage and **one** disadvantage of using annotated field sketches.

(4)

advantage

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disadvantage

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.....

(c) Study Figure 4a in the Resource Booklet.

Calculate the percentage increase in velocity from day 1 to day 6.

You **must** show all your working in the space below.

(2)

..... %

(d) (i) Study Figure 4b in the Resource Booklet.

Plot the data for site 4 from Figure 4b (shown in the Resource Booklet) to complete Figure 4c in the Question Paper.

(2)

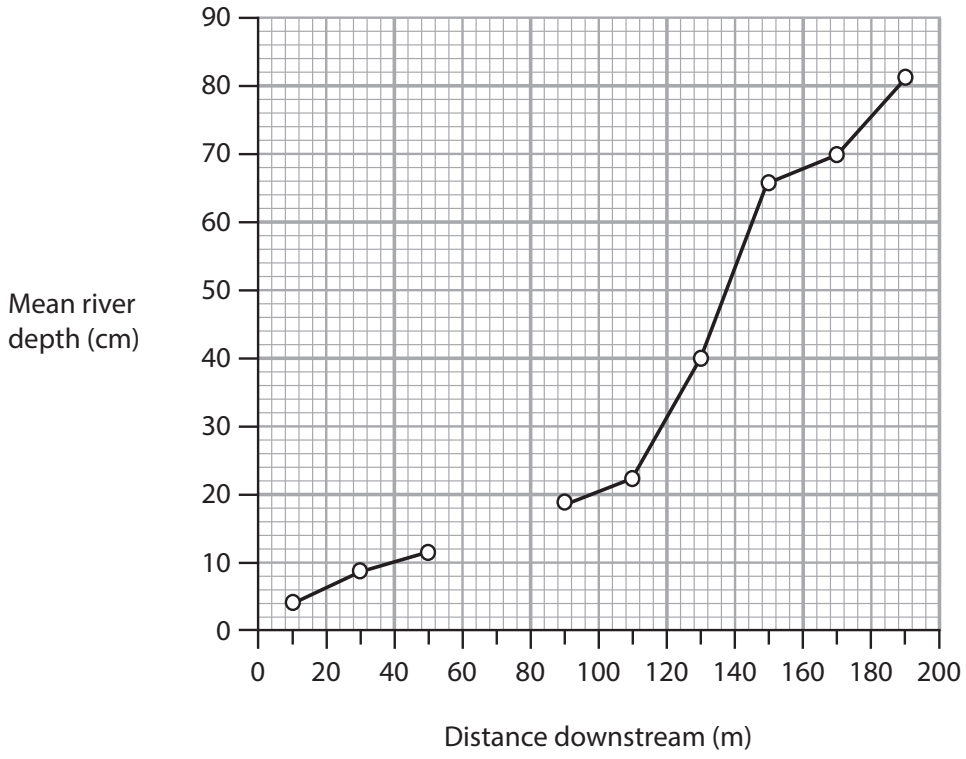


Figure 4c

Graph comparing distance downstream and mean river depth

(ii) Suggest **one** conclusion the students could reach based on the data shown in Figure 4c.

(2)

(iii) Identify the best definition of the term anomaly.

(1)

- ☒ **A** data that can be counted in numbers
- ☒ **B** data that does not fit the pattern
- ☒ **C** the general pattern of data
- ☒ **D** the way data is spread out

(e) You have studied a river environment as part of your own geographical enquiry.

Evaluate how effective your site selection and sampling strategies were in helping you answer your enquiry title.

(8)

Geographical enquiry title

Day	Weather conditions	River velocity (m/s)
1	Dry	0.1
2	Dry	0.3
3	Dry	0.3
4	Rain	0.4
5	Heavy rain	0.6
6	Heavy rain	0.8
7	Dry	0.7
8	Dry	0.6
9	Dry	0.5
10	Dry	0.3

Figure 4a

River velocity and weather conditions data for each day

Site	Distance downstream (m)	Mean river depth (cm)
1	10	4
2	30	9
3	50	11
4	**70**	**20**
5	90	19
6	110	22
7	130	40
8	150	66
9	170	70
10	190	81

Figure 4b

Mean river depth data going downstream

If you answer Question 4, put a cross in the box ☒.

4 Investigating river environments

You have carried out a geographical enquiry as part of your work on river environments.

Title of geographical enquiry

(a) Describe **one** sampling strategy used to select your sites for data collection.

(2)

(b) Explain **one** quantitative method you chose for your data collection.

(3)

(c) Explain why **two** different named data presentation techniques were appropriate for your collected data.

(4)

Name of data presentation technique 1

technique 1

Name of data presentation technique 2

technique 2

(d) Explain **one** reason collecting more data can make your investigation more reliable.

(3)

(e) Study the data in Figure 4 in the Resource Booklet. It shows secondary data collected for background research to help produce a hypothesis.

Students' hypothesis: **As river depth and width increase downstream velocity will increase**.

Note: A hypothesis is a prediction or guess about what is going to happen in the students' fieldwork.

Evaluate how suitable the hypothesis reached by the students is in helping to answer their enquiry question.

You **must** refer to the resource in your answer.

(8)

4 Investigating river environments

You have carried out a geographical enquiry as part of your work on river environments.

Title of geographical enquiry

(a) Describe **one** health and safety risk included in your risk assessment.

(2)

(b) Explain **one** data collection method used to help answer your enquiry title.

(3)

(c) Explain **two** ways you ensured your data presentation was accurate.

(4)

1 .....

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2 .....

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(d) Explain **one** reason why there might be an anomaly in the data you collected.

(3)

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(e) Study the data in Figure 4 in the Resource Booklet. It shows some information about the secondary data the students used to support their enquiry.

Conclusion: **There is very little change to channel width or river course between 1904 to 2013.**

Evaluate the extent to which the secondary data supported the students' conclusion.

You **must** refer to the resource in your answer.

(8)

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MARK SCHEMES

official Pearson Edexcel mark schemes

1(a)	**AO1 (1 mark)** B the correct answer is wide and deep river channel A, C and D all describe the river channel at different parts of its course	**(1)**

Question number	Answer	Mark
1(b)(i)	**AO1 (1 mark)** B the correct answer is abrasion as this is the only erosional process. A is not correct as it is a depositional landform C is not correct as it is a process of transportation D is not correct as it is to do with the amount of water past a given point at a given time	**(1)**

Question number	Answer	Mark
1(b)(ii)	**AO1 (1 mark)** Award 1 mark for any of the following. • saltation • suspension • traction • solution Accept any other appropriate response.	**(1)**

Question number	Answer	Mark
1(b)(iii)	**AO1 (1 mark)/AO2 (1 mark)** Award 1mark (AO1) for a point about how the water is stored and 1 mark (AO2) for further explanation **Ideas from glaciers, oceans, clouds, aquifer, groundwater, surface store, vegetation, ponds** Water is stored in a pond (1) because the water doesn't drain away because of the underlying non-porous rock (1) Water is stored in the soil (1) because it cannot not percolate through the bedrock (1) Do not accept 'ice' or 'water vapour', unless reference to a store e.g. 'cloud' or 'glacier'. Accept any other appropriate response.	**(2)**

Question number	Answer	Mark
1(c)	**AO2 (2 marks)/AO3 (2 marks)** Award 1 mark (AO2) for a way in which people manage water and a further 1 mark (AO3) for how this helps respond to different levels of water needed/supply, up to a maximum of 2 marks each. • Humans build reservoirs/dam to store water (1) the water is fed into the water supply as and when it is need through careful management (1) • Dirty or used water is taken into the treatment plant either through water collection or directly from sewage (1) where it is treated and cleaned before being ready for use again (1) • Desalination plants take water from the ocean (1) where it is treated and salt removed (1) Accept any other appropriate response.	**(4)**

Question number	Answer	Mark
1(d)	**AO2 (3 marks)** Award 1 mark for identification of a way vegetation affects discharge, a second mark explaining 'why' this has an effect, and a third mark for a link to the overall impact of discharge / lag time. • A lack of vegetation exposes bare rock and soil (1) reducing the time taken for water to be soaked up/ overland flow (1) resulting in a shortening of the lag time / increase in discharge (1) • Trees and other plants intercept rainfall (1) this delays the rain water reaching the ground (1) resulting in a lengthening of lag time / reducing discharge (1) Accept any other appropriate response.	**(3)**

Question number	Answer	Mark
1(e)	**AO3 (1 mark)** Award 1 mark for the following. **Waterfall (1)**	**(1)**

Question number	Answer	Mark
1(f)	**AO1 (1 mark) AO2 (3 mark)** Award 1 mark for initial point (AO1), and 3 further marks (AO2) for the extension of this point up to maximum of 4 marks. Needs to identify stages in the development of landform Marks can be awarded for description of stages River flows fastest on the outside bend (1) River flows slowest on the inside bend (1) On the inner bend deposition occurs (1) because there is more friction here (1) Outer bend erosion occurs (1) because hydraulic action occurs here (1) River erodes and deposits laterally (1) Accept any other appropriate response.	**(4)**

Question number	Answer indicative content
1(g)	**AO3 (4 marks) AO4 (4 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the level based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. This question is about investigating the issue of human impact on water quality, candidates should break down the response into components – in this case the factors identified in Fig. 1c and how they might impact on water quality across Europe. Candidates should relate the factors to the map. To access level 3, both Figures 1c and 1d need to be used. **AO3** Human intervention can have a negative effect on water quality for example: Agricultural waste products caused by surface run off be washed into streams and rivers causing pollution of the river ecosystem – this can damage plant and animal life Pesticides and fertilizers from farms can get into the ecosystem this can progress through the food chain and damage fish and plant life deformed fish etc. Industrial spillage can pollute beaches and harm wildlife Warm water from power stations can upset the natural balance of the water causing algae etc. Sewage from domestic use can block beaches Humans can also affect water quality in a positive way through treatment plants/clean-up operations or conservation and local pressure groups **AO4** Fig 1c shows that there are a number of factors that can affect water quality both in a positive way and a negative way Fig 1c shows that there are a variety of pollution sources Fig 1c shows water quality can impact on health Fig 1d shows that water quality varies across geographies Fig 1d shows that water quality over much of Europe is variable

	Fig 1d shows that there is wide variation in water quality across the globe Fig 1d shows that countries in Africa have poorer water quality generally

Question number	**Answer**	
Level	**Mark**	**Descriptor**
	0	No rewardable material.
Level 1	**1–3**	• Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements that are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (AO4)
Level 2	**4–6**	• Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)
Level 3	**7–8**	• Applies understanding to deconstruct information and provide logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

1(a)	**AO1 (1 mark)** **B Narrow river channel with steep sides** A is not the correct response as this describes as rivers in the upper course have steep sides C is not the correct response as this describes the river further down its course D is not the correct response as it describes the river in the lower course	**(1)**

Question number	Answer	Mark
1(b)(i)	**AO1 (1 mark)** **A is the correct answer – Suspension is a process of river transportation** B is not the correct response as abrasion is a process of erosion C is not the correct response as attrition is a process of erosion D is not the correct answer as deposition is the process of depositing rather than transporting material	**(1)**

Question number	Answer	Mark
1(b)(ii)	**AO1 (1 mark)** Award one mark for any of the following: • water storage in soil • aquifer • lake / lagoon / pond / puddle / reservoir / dam • glacier / ice sheet / ice cap / ice • groundwater / groundwater storage • surface water • river / river channels / channel storage • vegetation / vegetation storage • interception / interception storage • sea / ocean • clouds / atmosphere Accept any other appropriate response. **Reject: underground store, surface storage, water, groundwater flow**	**(1)**

Question number	Answer	Mark
1(b)(iii)	**AO1 (1 mark)/AO2 (1 mark)** Award 1 mark for the method of transfer and 1 mark available for explanation. Correct responses include evaporation (1) transpiration (1) condensation (1) precipitation (1) run-off (1) percolation (1) Evaporation is a method of water transfer (1) heat energy causes water to change from water to steam this rises and forms clouds (1) Run off is a method of water transfer (1) when water falls as rain it runs across the ground into rivers and streams (1) To be awarded the second mark it must give the idea of water moving. Accept any other appropriate response.	**(2)**

Question number	Answer	Mark
1(c)	**AO2 (2 marks)/AO3 (2 marks)** Award 1 mark for identification of a human intervention (AO2) and how it could affect water quality (1) and a second mark for a further development (1) (AO3). • Pesticides get washed into the river off fields (1) affecting fish and the river ecosystem (1). • Cooling water from power stations and returning to source (1) can change the temperature of the water and affect river ecosystems (1). • Domestic treated sewage released into rivers (1) this pollutes the water source as chemical balance of river is affected (1). Allow suggestions that are not on the resource specifically but are relevant to water quality. Accept any other appropriate response.	**(4)**

Question number	Answer	Mark
1(d)	**AO2 (3 marks)** Award 1 mark for identification of a way precipitation affects river regimes and 2 marks for development and further explanation, up to a maximum of 3 marks. • High intensity of rainfall (1) doesn't soak into the ground (1) so becomes overland flow and this shortens lag time (1) • Amount of rainfall (1) Heavy rainfall will saturate the ground quickly (1) resulting in higher levels of run off shortening lag time (1) Could develop reverse ideas i.e. limited rainfall Regime is about the whole basin so accept reference to either river regime or storm hydrograph.	**(3)**

	Award 1 mark for identification of type of people impact. No double credit for mirroring. Accept any other appropriate response.	

Question number	Answer	Mark
1(e)	**AO3 (1 mark)** • Meander (1)	**(1)**

Question number	Answer	Mark
1(f)	**AO1 (1 mark) AO3 (3 marks)** Award 1 mark for the initial point (1) (AO1) and 3 further marks for the extension of the point up to 4 marks. (AO2) • Needs to identify stages in the development of landform. • It's important to note that in this case regarding the formation of the oxbow lake we are making the assumption that the river is already meandering. • Can reward processes below in showing how meander is extended and neck created Marks can be awarded for description of stages: • River flows fastest on the outside bend (1) • River flows slowest on the inside bend (1) • On the inner bend deposition occurs (1) because there is more friction here (1) • Outer bend erosion occurs (1) because hydraulic action occurs here (1) • Bank full flow breakthrough (1)	**(4)**

	• Cut off, straight main channel, overtime erosion/deposition separates main channel from old meander (1) • River erodes and deposits laterally (1) • During flooding river takes shortest route eventually cutting off river bend altogether (1) Accept any other appropriate response.	

Question number	Answer indicative content
1(g)	**AO3 (4 marks) AO4 (4 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the level based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. Candidates should use the two resources to identify reasons for the differences in the flood risk in the USA. A range of factors can then be explored from 1d to analyse why there might be an increased flood risk in certain areas. To access level 3, both Figures 1c and 1d need to be used. **AO3** • Levels of flood risk are affected by a range of factors both human and physical. • Different levels of precipitation events will impact the level of run off to rivers increasing the opportunity for floods. • Snow melt in the spring will increase the likely flood risk. • Soil types maybe subject to change dependent on the types of vegetation.

	• In rural areas, land use can affect infiltration rates and, therefore, the flood risk or a river. • Areas of little vegetation or deforestation will mean that there is less interception and the rain reaches the ground faster. The ground is likely to become saturated and surface run-off will increase leading to increased flood risk. • Candidates may explore human and natural causes or may refer to storm events. **AO4** • Fig 1c shows that some areas are more prone to minor or severe flooding. • Fig 1c coastal areas are more prone to severe flooding but there is also a major threat inland this is likely due to a high density of rivers in this area. • Fig 1c Minor flood areas are more evenly distributed could be related to high levels of farming activity affecting flood plains. • Fig 1d tidal storm surges can affect river flooding. • Fig 1d a wide range of factors affect flood risk. • Fig 1d catchment vegetation can have an impact on river discharge. • Fig 1d waterway size can affect flood risk.

Question number	**Answer**	
Level	**Mark**	**Descriptor**
	0	No rewardable material.
Level 1	**1–3**	• Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements that are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (AO4)
Level 2	**4–6**	• Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)

Level 3	**7–8**	• Applies understanding to deconstruct information and provide logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

1(a)	**AO1 (1 mark)** **B** the volume of water carried by a river at any one place is the correct response. A is incorrect as it is just talking about speed of water. C is incorrect as it only identifies depth. D is incorrect as it only identifies width.	**(1)**

Question number	Answer	Mark
1(b)(i)	**AO1 (1 mark)** **D** an area of land drained by a river is the correct response. A is incorrect as this is about storage. B is incorrect as this is about water levels rather than a land area. C is incorrect as the response is about flooding.	**(1)**

Question number	Answer	Mark
1(b)(ii)	**AO1 (1 mark)** Award 1 mark for any of the following. • Rainfall (1) • Vegetation (1) • Soil type (1) • Depth/width of river (1) • Drainage density/number or tributaries (1)	

	• Channel gradient (1) • Geology (1) • Velocity / river speed (1) Accept any other appropriate response.	**(1)**

Question number	Answer	Mark
1(b)(iii)	**AO1 (1 mark)/AO2 (1 mark)** Award 1 mark for the idea of a time difference/delay (AO1) and a mark for further development (AO2) up to a maximum of 2 marks: • The lag time is the delay (1) between the peak rainfall and the peak discharge (1). • Rainwater is delayed in reaching the river (1) due to interception from trees (1). Accept any other appropriate response.	**(2)**

Question number	Answer	Mark
1(c)	**AO2 (2 marks)/AO3 (2 marks)** Award 1 mark (AO3) for identification of any idea from Fig 1a and a further mark for explanation of the reason (AO2) up to a maximum of two marks each. • Urbanisation (1) high levels of urbanisation will increase the speed at which water is transferred into stores (1). • Deforestation/removal of woodland (1) will increase run off rates from slopes increasing water transfer speeds (1). Accept any other appropriate response.	**(4)**

Question number	Answer	Mark
1(d)	**AO2 (3 marks)** Award 1 mark for the identification of a cause of pollution and 2 marks for further explanation up to a maximum of 3 marks. Candidates could identify: • Wastewater from agriculture (1) can cause increased eutrophication of the water (1) because of the high concentration of chemicals (1). • Plastics dumped in rivers (1) can cause a decrease in water quality (1) damaging river ecosystems / affects the food chain (1). • Discharge of sewage (1) lowers water quality/making water dirty (1) threatening human health (1). • Chemicals have been added to the water (1) downstream impact on wildlife (1) which could disrupt food chains (1). Accept any other appropriate response.	**(3)**

Question number	Answer	Mark
1(e)	**AO3 (1 mark)** Award 1 mark for the following: Spur/Interlocking Spur	**(1)**

Question number	Answer	Mark
1(f)	**AO1 (1 mark) AO2 (3 marks)** Award 1 mark for initial point (AO1), and 3 further marks (AO2) for the extension of this point up to maximum of 4 marks. • A floodplain is the area directly adjacent to the river bank (1) and occurs in the lower course of the river (1) forms when the river discharge is high (1) and the river bursts its banks (1) water may infiltrate the soil it leaving behind a layer of material which builds up to form the flood plain (1). • Lateral erosion on the outside of meander bends (1) wears away valley sides / slopes (1) so that the valley floor becomes wider and flatter (1) and covered in alluvium when the river is in flood (1). • Erosion on the outside of the meander bend (1) results in meander migration across a flood plain (1). When river floods it deposits sediment on valley bottom (1) building up the floodplain (1). NB: Maximum of 1 mark for description. Accept any other appropriate response.	**(4)**

Question number	Answer indicative content
1(g)	**AO3 (4 marks) AO4 (4 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the level-based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive, and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. This question is about identifying and analysing why it is important to use flood prevention techniques on the river Thames. Candidates will need to be able to identify why it is important and what has been done through interrogation of the resources. **AO3** • There is a clear link between the impact of flooding and what has been done to reduce and manage the Thames. • By introducing several weirs, the Thames scheme is able to manage the flow of water more effectively reducing the possibility of flooding. • This was clearly a major issue as many people responded to the consultation on the subject, this was potentially to do with the large amounts of homes at risk. • It is likely that the scheme was invested in due to the high cost of flood damage. • The Thames management scheme also had several other benefits although it is unlikely that new wildlife habitats being formed was a high priority for the project. **AO4** • Fig 1c suggest that £850 million pounds' worth of damage could result from a flood. • Fig 1c 15000 properties at risk from flooding.

	• Fig 1c flood management results in better recreation facilities and new habitats created. • Fig 1c suggest high level of importance as 800 people responded to consultation. • Fig 1c gives resident views of the scheme.

Question number	**Answer**	
Level	**Mark**	**Descriptor**
	0	No rewardable material.
Level 1	**1–3**	• Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements that are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (AO4)
Level 2	**4–6**	• Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)
Level 3	**7–8**	• Applies understanding to deconstruct information and provide logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

1(a)	**AO1 (1 mark)** **A** The variation in river discharge throughout the year (1) is the correct response. B, C, and D are all incorrect as they have time scales which are too short.	**(1)**

Question number	Answer	Mark
1(b)(i)	**AO1 (1 mark)** **C** A closed system made up of stores and flows (1) is the correct response A and D are incorrect as the describe open systems. B is incorrect as it only identifies part of the system.	**(1)**

Question number	Answer	Mark
1(b)(ii)	**AO1 (1 mark)** Award 1 mark for any of the following. • Watershed (1) • Channel network (1) • Catchment (1) • Source (1) • Idea of inputs/outputs (1) Accept any other appropriate response.	**(1)**

Question number	Answer	Mark
1(b)(iii)	**AO1 (1 mark)/AO2 (1 mark)** Award one mark for a point about how urbanisation affects river discharge (AO1) and 1 mark (AO2) for further explanation. • Increased urbanisation can increase rates of surface runoff (1) this will decrease the lag time and increase the peak in river discharge (1).	

	• Less interception by trees means faster surface run off (1) causing shorter lag time (1). Accept any other appropriate response.	**(2)**

Question number	Answer	Mark
1(c)	**AO2 (2 marks)/AO3 (2 marks)** Award 1 mark (AO3) for identification of any idea from Fig 1a and a further mark for explanation of the reason (AO2) up to a maximum of two marks each. • Rock type this can impact the hydrological cycle by changing rates of surface run off (1). Non-porous rock will increase run off rates (1). • Vegetation will affect storage in the hydrological cycle (1) a larger number of trees will increase the amount of water intercepted and evaporated (1). • Atmosphere global warming reduces ice and snow storage (1) but raises ocean storage evaporation and precipitation (1). Accept any other appropriate response.	**(4)**

Question number	Answer	Mark
1(d)	**AO2 (3 mark)** Award 1 mark for the identification of a feature of the river profile and 2 marks for further explanation up to a maximum of 3 marks. Candidates could identify : • Downstream river becomes wider (1) due to erosion of river channel (1) by bedload (1). • Wider channel downstream (1) due to greater discharge (1) creating more lateral erosion (1). • Meanders are formed (1) due to erosion/deposition (1) moving laterally across the lower course of the river (1).	

	• The river channel gets deeper (1) in the upper course of the river (1) due to vertical erosion (1). Reward answers that refer to gradient differences, or landforms that lead to different shapes due to erosion and deposition. Accept any other appropriate response.	**(3)**

Question number	Answer	Mark
1(e)	**AO3 (1 mark)** Award 1 mark for the following: • Ox bow lake (1)	**(1)**

Question number	Answer	Mark
1(f)	**AO1 (1 mark) AO2 (3 marks)** Award 1 mark for initial point (AO1), and 3 further marks (AO2) for the extension of this point up to maximum of 4 marks. • A waterfall occurs where a band of hard rock overlies softer rock (1). This softer rock erodes more quickly than the harder rock (1) and over time this creates an overhang of hard rock (1) This overhang is unsupported, so it collapses (1) headward erosion (1). Candidates can be awarded marks for a diagram with appropriate annotations, which develop an explanation. Accept any other appropriate response.	**(4)**

Question number	Answer indicative content
1(g)	**AO3 (4 marks) AO4 (4 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the level-based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive, and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. This question is about analysis of the positive and negative aspects of a river management scheme. Candidates should be able to identify linkages between the development of the scheme and the viewpoints of different types of people. They should also be able to identify both positive and negative aspects of the scheme and make judgements about it. AO3 • River management schemes have different effects on different people. • Top down approaches often don't reach the levels of impact they were first meant to. • Energy production will increase through investment in HEP but this may have a negative effect on the environment. • Large scale developments often rely on a large labour force and create a variety of different jobs for people. • The view of people affected by the project can change over time depending on how schemes like this affect them. • The level of consultation on a project like this is variable. • The project may have effects across a wider area outside of the initial project. AO4 • Fig 1d tells us that the scheme has lots of different viewpoints which could be in conflict. • Fig 1d Villagers may have different views depending on where they are located. • Fig 1c tells us that there has been a variety of viewpoints on the value of the project Fig 1d. • Fig 1c tells us that initial projects to increase irrigation failed and actually had negative effects.

	• The scheme has positive aspects which could increase farm productivity. • Fig 1c potential impact on Gulf of Cambay reducing water reaching lower regime. • Fig 1d tells us that there may be overall countrywide improvements with increased energy.

Question number	**Answer**	
Level	**Mark**	**Descriptor**
	0	No rewardable material.
Level 1	**1–3**	• Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements that are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (AO4)
Level 2	**4–6**	• Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)
Level 3	**7–8**	• Applies understanding to deconstruct information and provide logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

1(a)(i)	**AO1 (1 mark)** C (Lake) (1) The answer cannot be A, B or D as these are all flows in the hydrological cycle and not stores.	**(1)**

Question number	Answer	Mark
1(a)(ii)	**AO1 (1 mark)** B (Plants take up water from the soil and release it into the atmosphere as water vapour). (1) The answer cannot be A (precipitation), C (throughflow) or D (condensation).	**(1)**

Question number	Answer	Mark
1(b)(i)	**AO1 (1 mark)** Award 1 mark for any of the following. • Sediment size (1). • River velocity/speed (1). • Gradient (1). • Confluences (1). • Idea of blockage or barrier (Natural) (1). • Climatic factor period of low rainfall (1). Accept any other appropriate response.	**(1)**

Question number	Answer	Mark
1(b)(ii)	**AO1 (1 mark)/AO2 (1 mark)** Award 1 mark (AO1) for identification of correct process and a further mark for explanation of the reason (AO2) up to a maximum of two marks. • Material carried by the river rubs the side/floor of river (1) creating a wider/deeper channel (1). • Sandpaper action (1) widens and deepens the channel (1).	

	• Undercutting of a river cliff (1) by rocks rubbing against the bank (1). Accept any other appropriate response.	**(2)**

Question number	Answer	Mark
1(c)	**AO2 (2 marks)/AO3 (2 marks)** Award 1 mark (AO3) for identification of any reason from Fig 1a and a further mark for explanation of the reason (AO2) up to a maximum of two marks each. • Short/Shorter lag time in urban areas (1) because of concrete paths (1). • Short/Shorter lag time in urban areas (1) due to steeper slopes (1). • Difference in rising limb (1) due to rock type or land shape (1) • Long/Longer lag time in rural area (1) because vegetation intercepts rainfall (1). • Long/Longer lag time in rural area (1) due to water taking time to infiltrate through rocks (1). Candidates could reference rainfall amount/intensity/deforestation/urbanisation but they need to talk about shape to access the marks. Accept any other appropriate response.	**(4)**

Question number	Answer	Mark
1(d)	**AO2 (3 marks)** Award 1 mark for the identification of a way in which agriculture can affect water quality and 2 marks for further explanation up to a maximum of 3 marks. Candidates could identify: • Fertilisers/pesticides (1) could seep into the ground (1) and contaminate ground water (1). • Liquid from farm slurry (1) could enter the river (1) causing eutrophication (1). • Deforestation (1) could increase run off (1) carrying more soil and silt into rivers (1). • Cattle waste/cattle in river (1) directly into the river (1) contaminating the water (1). Accept any other appropriate response.	**(3)**

Question number	Answer	Mark
1(e)	**AO3 (1 mark)** Award 1 mark for the following: • Meander (1).	**(1)**

Question number	Answer	Mark
1(f)	**AO1 (1 mark) AO2 (3 marks)** Award 1 mark for initial point (AO1), and 3 further marks (AO2) for the extension of this point up to maximum of 4 marks. • Waterfalls flows over hard rock with softer rock below it (1) and the soft rock is more easily eroded (1). Over time this continues to create an overhang (1) which eventually collapses (1). Annotated diagrams are acceptable but must explain the process and ensure there is no double reward. Accept any other appropriate response.	**(4)**

Question number	Answer indicative content
1(g)	**AO3 (4 marks) AO4 (4 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the level-based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive, and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. This question is about identifying and analysing factors that affect flood risk. There are a range of human and physical factors that can affect flood risk. **AO3** • Physical factors that affect flood risk include density of river network, level of rainfall, gradient of the river, existing saturation of the soil from previous flood events. • Seasonality/time of year will have a bearing on flood risk in different parts of the country. • Human factors that affect flood risk include population distribution and density, land use and flood management strategies. • While physical factors can present an increased risk of flood, this is often exacerbated by human activity for example urban areas have more impermeable surfaces such as roads and pavements, reducing infiltration, increasing surface run-off and increasing the risk of flash floods. **Physical factors affecting flood risk** **AO4** • Figure 1c shows there is reduced risk of flood on the east of the USA. • Figure 1c shows there is reduced risk of flood in the areas of high elevation such as the Rocky Mountains. • Figure 1c shows the risk of flood is highest in areas of dense river networks. • Figure 1c shows how some cities are located in areas of major flood risk e.g. New Orleans or St Louis. • Figure 1c indicates there are other physical factors such as snowmelt which may affect the level of flood risk.

	• Figure 1c gives a number of points that relate to flood risks that could be referenced. Candidates may use compass bearings and scale to indicate patterns.

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	**1–3**	• Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements that are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (AO4)
Level 2	**4–6**	• Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)
Level 3	**7–8**	• Applies understanding to deconstruct information and provide logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

Question number	Answer	Mark

1(a)(i)	**AO1 (1 mark)** B (Infiltration) (1) The answer cannot be A (store), C (store), D (store)	**(1)**

Question number	Answer	Mark
1(a)(ii)	**AO1 (1 mark)** A (Loss of water from ground water stores and plants) (1). The answer cannot be B, C or D as these incorrect or transfers.	**(1)**

Question number	Answer	Mark
1(b)(i)	**AO1 (1 mark)** Award 1 mark for any of the following. • Sediment size (1). • River velocity/speed (1). • Gradient (1). • Type of bedrock (hard/soft) (1) • Rainfall level (1) • Levels of river discharge (1) Accept any other appropriate response.	**(1)**

Question number	Answer	Mark
1(b)(ii)	**AO1 (1 mark)/AO2 (1 mark)** Award 1 mark (AO1) for identification of correct process and a further mark for explanation of the reason (AO2) up to a maximum of two marks. • Water hits the river bed / banks with great force (1) which dislodges material (1). • Air is trapped in cracks (1) due to the force of the water (1). Accept any other appropriate response.	**(2)**

Question number	Answer	Mark
1(c)	**AO2 (2 marks)/AO3 (2 marks)** Award 1 mark (AO3) for identification of any factor from Fig 1a and a further mark for explanation of the reason (AO2) up to a maximum of two marks each. • Steep slopes (1) creating rapid run off and a short lag time (1). • Rock type (1) with permeable rocks allowing infiltration increasing lag time (1). • Size of drainage basin (1) with larger drainage basin leading to increasing lag time (1). • Vegetation (1) will increase the time it takes water to reach the river (1). • Saturated soil (1) increasing run off shortening lag time (1). Accept any other appropriate response.	**(4)**

Question number	Answer	Mark
1(d)	**AO2 (3 marks)** Award 1 mark for the identification of a way in which industry can affect water quality and 2 marks for further explanation up to a maximum of 3 marks. Candidates could identify: • Industrial waste can reach water sources (1) causing water pollution (1) and killing aquatic wildlife (1). • Water flowing through old industrial sites (1) could pick up traces of heavy metals (1) affecting oxygen levels in the water (1). • Construction of industrial site (1) and discharge of warm water (1) affects freshwater wildlife (1). • Agricultural run-off from fertilizers (1) leading to eutrophication (1) reducing biodiversity (1). Accept any other appropriate response.	**(3)**

Question number	Answer	Mark
1(e)	**AO3 (1 mark)** Award 1 mark for the following: • Waterfall (1).	**(1)**

Question number	Answer	Mark
1(f)	**AO1 (1 mark) AO2 (3 marks)** Award 1 mark for initial point (AO1), and 3 further marks (AO2) for the extension of this point up to maximum of 4 marks. • When water levels in the river rise and flood (1) larger sediment is deposited on the channel edges (1) and smaller sediment is spread over the floodplain (1), as this repeats the levee grows taller (1). Accept any other appropriate response. Accept responses that use annotated diagrams.	**(4)**

Question number	Answer indicative content	Mark (8)
1(g)	**AO3 (4 marks) AO4 (4 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the level-based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive, and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. This question is about identifying and analysing which factors have affected the flood risk in Bangladesh. Candidates will need to be able to identify that there are a mix of physical and human factors that affect the flood risk. **AO3** • There are many physical processes that affect flood risk in Bangladesh: there is a dense river network which runs through the country; a large proportion of the country is only a small height above sea level. • The Monsoon season and snow melt from the Himalayas contribute greatly to the risk of flood. • Flooding risks are exacerbated by high population densities, particularly along flood plain areas. • Flooding is not necessarily managed effectively; greater flood prevention schemes are needed to protect livelihoods. **AO4** • Figure 1c shows how a large proportion of the country is at risk from flooding. • Figure 1c indicates how around 70% percentage of the country is not at risk of flood during the monsoon season. It shows how areas such as Sylhet in the north should remain flood free. • Figure 1c shows how the Eastern part the country is more affected by flooding caused by rainfall. • Figure 1c indicates how there is limited management of the river. It suggests there is are flood defenses on the eastern side of the Brahmaputra.	

Question number	Answer	
Level	**Mark**	**Descriptor**
	0	No rewardable material.
Level 1	**1–3**	• Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements that are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (AO4)
Level 2	**4–6**	• Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)
Level 3	**7–8**	• Applies understanding to deconstruct information and provide logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

Question number	Answer	Mark

1(a)	**AO1 (1 mark)** D interlocking spurs (1) The answer cannot be A as these are usually found in the lower course, or B or C as these are usually found in the middle course.	**(1)**

Question number	Answer	Mark
1(b)(i)	**AO1 (1 mark)** A boundary of a drainage basin (1) The answer cannot be B (source), C (mouth) or D (confluence)	**(1)**

Question number	Answer	Mark
1(b)(ii)	**AO1 (1 mark)** Award 1 mark for any of the following. • Evaporation (1) • Transpiration (1) • Evapotranspiration (1) • Condensation (1) • Precipitation (1) • Overland flow / surface runoff (1) • Throughflow (1) • Groundwater flow (1) • Stream flow (1) / river flow (1) / river (1) Accept any other appropriate response.	**(1)**

Question number	Answer	Mark
1(c)	**AO1 (1 mark)/AO2 (1 mark)** Award 1 mark (AO1) for initial point and a further mark for explanation (AO2) up to a maximum of two marks. • Minerals in the rock on the sides of the river are dissolved (1) as water flows past (1). • Soluble particles are dissolved in the water (1) due to weak acids in the water (1). Accept any other appropriate response.	**(2)**

Question number	Answer	Mark
1(d)	**AO2 (2 marks)/AO3 (2 marks)** Award 1 mark (AO3) for the identification of an advantage and a disadvantage and a further mark for explanation (AO2) up to a maximum of two marks each. Advantages: • Flood walls can reduce the level of damage caused by floods (1) which can save lives (1). • Hard engineering strategies such as flood walls can be adapted once in place (1) for example increased height as flood events become more severe (1). Disadvantages: • Building a flood embankment can be very expensive (1) as it often involves large scale building programs (1). • Installing new flood embankments can affect ecosystems (1) for example through tree removal which could also remove habitats for wildlife (1). **No credit for just naming a strategy given in the resource e.g. 'Flood walls will be raised' or 'trees will be removed'.** Accept any other appropriate response.	**(4)**

Question number	Answer	Mark
1(e)	**AO2 (3 marks)** Award 1 mark for the initial explanation and 2 marks for further explanation up to a maximum of 3 marks. • Urban land use usually increases the amount of land covered by impermeable surfaces (1) which means increased run-off when it rains (1) which can lead to a river regime with higher chances of floods (1). • Urban land use can lead to deforestation (1) which reduces the amount of interception from vegetation (1) which means the regime can be more flashy (1). Accept any other appropriate response.	**(3)**

Question number	Answer	Mark
1(f)	**AO3 (1 mark)** Award 1 mark for the following: • Peak rainfall (1).	**(1)**

Question number	Answer	Mark
1(g)	**AO1 (1 mark) AO2 (3 marks)** Award 1 mark for initial point (AO1), and 3 further marks (AO2) for the extension of this point up to maximum of 4 marks. Candidates should identify the different stages in the formation of the landform. Credit annotated diagrams where provided, but do not double credit ideas if repeated in the written text. • Where there is an area of hard rock above soft rock, the soft rock is eroded by the flow of water (1). This erosion undercuts the hard rock (1) until there is an overhang as the softer rock is eroded more easily (1). Through erosion and hydraulic action a plunge pool is created which deepens the waterfall (1). • The force of the water erodes the soft rock (1) as it falls over the hard cap rock (1). The force of the water creates a plunge pool at the bottom (1). The hard rock is eroded back slowly (1). Accept any other appropriate response.	**(4)**

Question number	Indicative Content
1(h)	**AO3 (4 marks) AO4 (4 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the level-based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive, and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. This question is about analysing the importance of dams for managing the demand and supply of water. Candidates will need to be able to identify the different ways dams are used, how dams can affect different areas of water supply through interrogation of the resource. **AO3** • Dams are used to typically to store water in a reservoir and allow the release of water in a controlled way, which can be used to generate hydroelectric power (HEP). This is a technique used widely across the globe: in Africa there are over 600 dams, in Europe there are nearly 1200. • The storage of water in reservoirs behind dams, gives countries greater control over the flow of water so can reduce the chance of flooding in some areas, but can also controls flows of water in periods where supplies are lower (e.g. during a drought). This can reduce water insecurity, particularly where rainfall is seasonal. • Dams such as the Grand Renaissance Dam have been controversial since their inception because of the potential impacts of their creation, as well as the physical changes required for its construction. There are concerns from Egypt around the lack of control over their water supplies which are vital for the livelihoods and survival of its people. There are concerns from Sudan that when water is released from the dam it may overwhelm dams and rivers which have a much smaller capacity. • The ability of dams to control water supplies where rivers cross international boundaries means there are potential issues created about who controls the supply of water, as seen in the GRD example. **AO4**

	• Figure 1c shows the location of the Grand Renaissance Dam in Ethiopia holding back 74 billion cubic metres of water demonstrating its importance for water supply. • Figure 1c shows how the Grand Renaissance Dam affects a river that flows through several countries (Ethiopia, Sudan, and Egypt for the Blue Nile) and indicates where water can be held back to affect supply. • Figure 1c shows dams have a purpose beyond water supply through the creation of hydroelectricity. • Figure 1c highlights how there is the potential for conflicts to be created by dams and their control over water supplies.

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–3	• Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements that are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (AO4)
Level 2	4–6	• Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)
Level 3	7–8	• Applies understanding to deconstruct information and provide logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

Question number	Answer	Mark

1(a)	**AO1 (1 mark)** C Steep valley sides (1) The answer cannot be A or B (found in middle course), B or C (found in lower course).	**(1)**

Question number	Answer	Mark
1(b)(i)	**AO1 (1 mark)** D Where a river meets the sea (1) The answer cannot be A (meander), B (source) or C (confluence)	**(1)**

Question number	Answer	Mark
1(b)(ii)	**AO1 (1 mark)** Award 1 mark for any of the following. • Lake (1) • Sea / Ocean (1) • River (1) • Soil (1) • Groundwater (1) • Aquifer (1) • Surface water (1) • Atmosphere / clouds (1) • Glaciers / Ice (1) Accept any other appropriate response.	**(1)**

Question number	Answer	Mark
1(c)	**AO1 (1 mark)/AO2 (1 mark)** Award 1 mark (AO1) for initial point and a further mark for explanation (AO2) up to a maximum of two marks. • Roots grow into small cracks in the rock (1) and as the roots grow the crack becomes larger and causes pieces of rocks to break off (1). • Rainwater which can be slightly acidic (1) can break down some of the rock on the river bank (1). • Water which goes into cracks in the rock can freeze (1) pushing cracks wider apart (1). Accept any other appropriate response.	**(2)**

Question number	Answer	Mark
1(d)	**AO2 (2 marks)/AO3 (2 marks)** Award 1 mark (AO3) for the identification initial point for how human activity can affect water quality, and a further mark for explanation (AO2) up to a maximum of two marks each. • Discharge of untreated sewage from houses (1) can enter the river to cause pollution (1). • Leakages from sewage treatment plants (1) can enter the river course and contaminate rivers (1). • Water treatment facilities can process the water (1) to ensure there is a higher amount of water suitable for household use (1). Accept any other appropriate response.	**(4)**

Question number	Answer	Mark
1(e)	**AO2 (3 marks)** Award 1 mark for the initial explanation and 2 marks for further explanation up to a maximum of 3 marks. • Hard-engineering structures such as flood embankments (1) hold back flood water (1) to prevent it reaching certain areas (1). • Soft engineering strategies such as flood control schemes (1) can involve preserving marshes, wetlands, or flood plains (1) to act as temporary stores of water (1). • Prediction of river floods (1) particularly knowing how high or wide a river might become during flood conditions (1) can help people decide how high to build embankments or stop building in a particular area (1). Accept any other appropriate response.	**(3)**

Question number	Answer	Mark
1(f)	**AO3 (1 mark)** Award 1 mark for the following: • Landslide (1).	**(1)**

Question number	Answer	Mark
1(g)	**AO1 (1 mark) AO2 (3 marks)** Award 1 mark for initial point (AO1), and 3 further marks (AO2) for the extension of this point up to maximum of 4 marks. Candidates should identify the different stages in the formation of the landform. • In upland areas where the long profile is steep / V-shaped valley (1) the river cuts downwards (by hydraulic action and abrasion) (1). As the river swings side to side (1) it leaves higher land on each side creating interlocking spurs (1). • As a river moves through the upper course it cuts downwards (1) through erosion (such as abrasion) (1). The river winds and bends to avoid areas of hard rock (1). Continued / repeated vertical erosion means that parts of land stick out to create the interlocking spurs (1). Accept any other appropriate response.	**(4)**

Question number	Indicative Content
1(h)	**AO3 (4 marks) AO4 (4 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the level-based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive, and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. This question is about analysing the factors that affect river regimes. Candidates will need to be able to identify the different ways features of a drainage basin can affect river regimes, including how this is reflected in a storm hydrograph. **AO3** • A river regime is the way in which the discharge changes over time. Factors affecting river regimes can include precipitation, temperature, vegetation, land-use, water abstraction and dams. • In areas with a lot of tree coverage there will be greater interception of rainwater, leading to slower infiltration and as such a longer lag time before the water reaches the river. • Urbanisation is associated with more 'flashy' river regimes due to an increase of impermeable surfaces. Higher levels of surface run off reach rivers much quicker to create shorter lag times. • River regimes can also be affected by human intervention, for example depending on the capacity of sewers, or diversion canals which may delay water reaching the river channel. **AO4** • Figure 1c shows how a drainage basin can include a range of rivers which connect to each other, each of which may travel through different land uses. • Figure 1c shows rivers travelling through areas of forested land, land used for pastoral farming as well as urban areas. • Figure 1c shows two storm hydrographs located at two points in the drainage basin with two different shapes due to the areas

	where they are located. • Figure 1c shows how urban areas can lead to faster run off and higher discharge in rivers after a storm event, while rural areas (indicated by forested land) lead to much lower peak discharge and a longer lag time.

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–3	• Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements that are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (AO4)
Level 2	4–6	• Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)
Level 3	7–8	• Applies understanding to deconstruct information and provide logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

Question number	Answer	Mark

1(a)	**AO1 (1 mark)** A Amount of rainfall (1) The answer cannot be B, C or D as these are human factors.	**(1)**

Question number	Answer	Mark
1(b)(i)	**AO1 (1 mark)** B A bend in a river (1) The answer cannot be A (sediment), C (river source), or D (river mouth).	**(1)**

Question number	Answer	Mark
1(b)(ii)	**AO1 (1 mark)** Award 1 mark for any of the following. • Hydraulic action (1) • Abrasion / corrasion (1) • Attrition (1) • Solution / corrosion (1) • Vertical / lateral / horizontal (1) Accept any other appropriate response.	**(1)**

Question number	Answer	Mark
1(c)	**AO1 (1 mark)/AO2 (1 mark)** Award 1 mark (AO1) for identification of a suitable way and a further mark for explanation of the reason (AO2) up to a maximum of two marks. • Agriculture can lead to run off of chemicals into the river (1) which can cause eutrophication (1) . • Industries can leak waste into rivers (1) causing pollution (1). • Sewage works can lead to treated water entering rivers (1) which can change the biotic/abiotic characteristics of rivers (1). • Presence of a power station can lead to warming of water (1) which changes the type of plants and animals that can live in the river (1). • Water treatment works clean the water (1) which can increase water quality (1).	

	• Fuel leaking from boats (1) can decrease water quality (1). Accept any other appropriate response.	**(2)**

Question Number	Answer	Mark
1(d)	**AO2 (2 marks)/AO3 (2 marks)** Award 1 mark (AO3) for the identification of a way river changes and a further mark for explanation of how this changes long a river course (AO2) up to a maximum of two marks each. • Velocity increases from upper to lower course (1) due to less friction with river bed and banks (1). • Deposition increases (1) due to decrease in energy (1). • Steep slopes in the upper course (1) creating rapid run off and a short lag time (1). • River channel can become wider (1) as erosion occurs (1). • River begins to form meanders (1) as more lateral erosion takes place (1). • River increases in depth (1) as not tributaries join (1). Accept any other appropriate response.	**(4)**

Question number	Answer	Mark
1(e)	**AO2 (3 marks)** Award 1 mark for the initial explanation and 2 marks for further explanation up to a maximum of 3 marks. Candidates could identify: • An increase in river volume can lead to floods (1) which deposits silt on sides of rivers (1) and this builds up over time (1). • When a flood occurs, water burst the river banks (1) and deposits silt on each side (1) and further floods add each time to change the height of the river bank (1). Accept any other appropriate response. Credit an annotated diagram but avoid double crediting marks awarded in text written on lines provided.	**(3)**

Question number	Answer	Mark
1(f)	**AO3 (1 mark)** Award 1 mark for the following: • River mouth / mouth (1).	**(1)**

Question number	Answer	Mark
1(g)	**AO1 (2 marks) AO2 (2 marks)** Award 1 mark for initial point (AO1), and a further mark (AO2) for the extension of this point. Candidates may focus on either human or physical causes of flooding. • Heavy rainfall (1) which can transfer to river channels to cause an increase in discharge (1). • Steep slopes (1) which can reduce infiltration so more overland flow (1). • Melting glaciers/ice caps (1) can an increase in run off which makes river discharge higher (1). • Expanding urban areas (1) which increase impermeable surface and surface run off (1). • Deforestation (1) reducing interception of rainfall by plants (1). • Storm surges (1) can increase water levels in estuaries causing flooding (1). • Poorly maintained flood defences (1) are often unable to cope with the pressure of increased discharge causing them to break (1). Accept any other appropriate response.	**(4)**

Question number	Answer indicative content
1(h)	**AO3 (4 marks) AO4 (4 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the level-based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive, and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. This question is about analysing why water supplies need to be managed. Candidates will need to be able to identify the different ways water is used, and why it is important that water resources are conserved through interrogation of the resource. **AO3** • Water is used in various activities from providing drinking water, to as a resource for different industrial sector, from water for irrigation and livestock to providing water for factories. • Consumption habits in many developed countries can mean that high quantities of water are consumed frequently, for daily activities (e.g. washing machines), but also leisure activities (e.g. swimming pools). But many of these countries also experience water shortages in different areas of the country and at different times of the year. • Rainfall is not even across the year so dry periods can lead to water shortages if water is not managed effectively. Climate change may lead to different rainfall patterns or longer periods with less rainfall, in extreme circumstances causing shortages. • Population patterns will lead to higher patterns of water consumption which might not correspond to where water supplies are abundant so the ability to transfer water to areas where there is a deficit is important. **AO4** • Figure 1c shows the different levels of water use across the USA. • Figure 1d shows how human activities drive a range of water uses, for different economic sectors, but also as a vital part of daily lives. • Figure 1d shows how the water consumption of the USA is significantly higher than those from countries which could be considered developing countries. • Figure 1d highlights how consumption in the USA may not be recognised as such, for example through electricity consumption or along the supply chain of beef production.

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	**1–3**	• Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements that are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (AO4)
Level 2	**4–6**	• Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)
Level 3	**7–8**	• Applies understanding to deconstruct information and provide logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

Question number	Answer	Mark

1(a)	**AO1 (1 mark)** **B Meander** The answer cannot be A, C or D as these are not features created by erosion.	**(1)**

Question number	Answer	Mark
1(b)(i)	**AO1 (1 mark)** **D** when a river has a slow velocity The answer cannot be A, B or C as these are usually associated with fast flowing river and erosion rather deposition.	**(1)**

Question number	Answer	Mark
1(b)(ii)	**AO1 (1 mark)** Award one mark for a suitable definition. • An area of land around the river that is drained by the river and its tributaries (1). Accept any other appropriate response.	**(1)**

Question number	Answer	Mark
1(b)(iii)	**AO1 (1 mark)/AO2 (1 mark)** Award 1 mark for a suitable reason and a further 1 mark available for explanation. • Presence of industry (1) can lead to pollution from industrial waste reaching the river (1). • Agriculture nearby (1) can lead to fertiliser reaching the river causing eutrophication (1). • Leakage from sewage pipes (1) can cause polluted water (1). Accept any other appropriate response.	**(2)**

Question number	Answer	Mark
1(c)	**AO2 (2 marks)/AO3 (2 marks)** Award 1 mark for identification of a transfer (AO2) and a second mark for a further development or explanation (AO3). • Evaporation is a transfer (1) this occurs when water changes from a liquid to water vapour due to increased temperatures (1). • Condensation is a transfer (1) occurs when water vapour turns into liquid (1). • Precipitation is a transfer (1) this occurs when water forms in the atmosphere and falls to earth (1). • Snowmelt (1) occurs when water changes from a solid to a liquid as temperature increases (1). Accept any other appropriate response.	**(4)**

Question number	Answer	Mark
1(d)	**AO2 (3 marks)** Award 1 mark for identification of a way physical factors can affect river regimes and 2 marks for development and further explanation, up to a maximum of 3 marks. • Steep slopes (1) cause fast run off (1) leading to greater river discharge (1). • Impermeable rock (1) creating fast run off (1) which leads to flashy river regimes (1). • Climate change (1) can reduce amounts of precipitation (1) which leaders to lower river discharge (1). Regime is about the whole basin so accept reference to either river regimes or storm hydrograph. Accept any other appropriate response. **No credit for references to water quality.**	**(3)**

Question number	Answer	Mark
1(e)	**AO3 (1 mark)** Flood plain (1)	**(1)**

Question number	Answer	Mark
1(f)	**AO1/AO2 (4 marks)** Award 1 mark for each initial point (AO1), and 3 further marks (AO2) for the extension of this point up to maximum of 4 marks, or up to 2 marks for different initial points and a further mark for extension of these points up to a maximum of 4 marks. • Construction of dam (1) which can withhold water from further downstream (1). • Industrialisation (1) leading to high use of water sources as part of industrial processes such as cooling (1). • Persistent drought conditions (1) which mean that waters sources dry up/are not replenished (1). Accept any other appropriate response.	**(4)**

Question number	Answer indicative content
1(g)	**AO3 (4 marks) AO4 (4 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the level based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. To access level 3 candidates will be able to link the increased intensity of rainfall in a short space of time with stress on water management. If response only focuses on impacts shown in Figure 1d rather than causes cap at Level 2, 4 marks. **AO3** • Levels of flood risk are affected by a range of factors both human and physical.

	• Urban areas can increase flood risk as they increase surface run off reducing lag time. • Dams are put in place to help manage water supply, but they only have a certain capacity. • Forecasts are not always correct increasing the flood risk. • High relief around urban areas can increase the flood risk. • High drainage density/large number of tributaries leading to increased flood risk. **AO4** • Figure 1c shows that a large amount of rainfall fell in a short space of time. • Figure 1c shows that the actual rainfall was much higher than predicted. The low forecast meant that preparation had not been made for a flood event, therefore taking the catchment by surprise. • Figure 1c shows that the rainfall was at its highest intensity over a 2-day period. • Figure 1d suggests that the Winvenhoe dam was opened to release swollen flood storage. • Figure 1d shows the Bremer river runs through a very densely populated area. • Figure 1d shows that even in areas outside the main population areas flash floods occurred.

Question number	**Answer**	
Level	**Mark**	**Descriptor**
	0	No rewardable material.
Level 1	**1–3**	• Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements that are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (AO4)

Level 2	**4–6**	• Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)
Level 3	**7–8**	• Applies understanding to deconstruct information and provide logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

1(a)	**AO1 (1 mark)** B The other examples are all other types of weather data.	**(1)**

Question number	Answer	Mark
1(b)(i)	**AO1 (1 mark)** D The answer cannot be A (reservoir), B (water treatment), C (rainwater harvesting)	**(1)**

Question number	Answer	Mark
1(b)(ii)	**AO1 (1 mark)** Award one mark for any of the following: • No inputs • No outputs • No water added • No water lost	**(1)**

Question number	Answer	Mark
1(b)(iii)	**AO1 (1 mark)/AO2 (1 mark)** Award 1 mark (AO1) for initial point and a further mark for explanation (AO2) up to a maximum of two marks. River depth increases downstream (1) as more tributaries join the main channel increasing erosion (1) Rivers are shallow in the uplands (1) because velocity is lower (1) Rivers are deep in the lowlands (1) as velocity is higher (1) Accept any other appropriate response	**(2)**

Question number	Answer	Mark
1(c)	**AO2 (2 mark)/AO3 (2 mark)** Award 1 mark (AO3) for the identification of a difference between developed and developing/emerging countries and a further mark for explanation (AO2) up to a maximum of two marks each. • A bigger domestic usage in developed countries (1) as they have more income (1) • The biggest use in developed countries is industrial (1) as high amounts of electricity is used which uses water for generation (1) • A bigger agricultural usage in developing countries (1) as there is higher primary industry (1) • Domestic use is lowest in developing/emerging countries (1) as many homes do not have a mains water supply (1) • Developing countries have more use on farms (1) which means high water use for crops/livestock (1) Accept any other appropriate response	**(4)**

Question number	Answer	Mark
1(d)	**AO3 (1 mark)** Award one mark for the following: • Watershed (1)	**(1)**

Question number	Answer	Mark
1(e)	**AO1 (2 mark)/AO2 (2 mark)** Award 1 mark (AO1) for the identification of a physical factor and a further mark for explanation (AO2) up to a maximum of two marks each. • High levels of rainfall (1) increase amount of surface runoff increasing discharge (1) • Snowmelt (1) will increase discharge during spring as lots of water reaches river at same time (1) • Drainage basins with steep relief (1) can increase river discharge because it causes rapid surface runoff (1). • Drainage basins with lots of vegetation (1) increase	

	interception which reduces overland flow (1). • Drainage basins with permeable rock (1) can decrease river discharge as it encourages groundwater flow. • High stream density drainage basins (1) increase discharge as the tributaries deliver water quickly to the main channel (1). Accept any other appropriate response.	**(4)**

Question number	Answer	Mark
1(f)	**AO2 (3 mark)** Award 1 mark for the initial explanation and 2 marks for further explanation up to a maximum of 3 marks. • Using flood/weather forecasting (1) by collecting data on amounts of precipitation in a drainage basin (1) allow warnings to be given to people at risk (1) • Monitoring the discharge of a river (1) to know whether water levels are high or low (1) to understand the impact precipitation could have river flow (1) • To record antecedent conditions in the drainage basin (1) to understand how saturated the ground is (1) and its capacity to absorb future rainfall (1) • Using historical records/hydrographs (1) to understand conditions that caused a flood (1) to know whether flooding is likely to occur (1) Accept any other appropriate response	**(3)**

Question number	Answer	Mark
1(g)	**AO3 (4 mark)/AO4 (4 mark)**	
	Marking instructions Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the level-based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive, and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. This question is about analysing the impacts of China's south-north water transfer project as an example of a water supply strategy. Candidates will need to interpret the map to understand how water is being moved and consider whether the benefits in the north outweigh the costs in the south.	**(8)**

	AO3 • People in the south may not have enough water to drink leading to ill health. • People in the south may not have enough water for crops leading to food shortages. • The supply of water in the south may not meet demand in the future if population rises. • Climate change might change rainfall patterns in the region meaning the south is no longer a region of surplus. • The north of China has more cities and so a bigger population meaning the need is greater. • The project is likely to be very expensive. • The farming in the north will be maintained which is important for maintaining high crop yields. • Cities will be protected from land subsidence which will prevent expensive repair costs. **AO4** • Figure 1c shows four/five new water routes in China. • Figure 1C shows a Western, Central and Eastern water route. • Figure 1c shows water being moved from the Yangtze River to the Yellow River. • Figure 1c shows water being moved from Danjiangkou to Beijing. • Figure 1c shows the south have experienced drought. • Figure 1C shows water routes taking water to bigger cities on the east coast.	

Question number	**Answer**	
Level	**Mark**	**Descriptor**
	0	No rewardable material.
Level 1	**1–3**	• Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements that are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (AO4)

Level 2	**4–6**	• Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)
Level 3	**7–8**	• Applies understanding to deconstruct information and provide logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

Question number	Answer	Mark

1(a)	**AO1 (1 mark)** **D** (water changing from a liquid to a gas) The answer cannot be A (precipitation), B (transpiration), C (condensation).	**(1)**

Question number	Answer	Mark
1(b)(i)	**AO1 (1 mark)** **C** (where the river starts) The answer cannot be A (tributary), B (mouth), D (confluence)	**(1)**

Question number	Answer	Mark
1(b)(ii)	**AO1 (1 mark)** Award one mark for any of the following: • Urbanisation / building houses (1) • Deforestation / cutting down trees (1) • Change in land use (1) • Conversion to farmland (1) • Poorly maintained / lack of defences/management (1) • Climate change (1) • Glacial / ice cap melting (1) • Dams breaking / constructing dams (1) **No credit for just stating 'dams'.** Accept any other appropriate response	**(1)**

Question number	Answer	Mark
1(b)(iii)	**AO2 (2 marks)** Award 1 mark for initial explanation and a further mark for explanation up to a maximum of two marks. Particles bounce (1) when another particle hits it transferring energy (1). Pebbles bounce along the riverbed (1) when there is an increase in river velocity (1). After rainfall episodes discharge increases (1) allowing particles to be bounced along the riverbed (1). **No credit for just stating saltation is a type of transport.**	**(2)**

	Accept any other appropriate response	

Question number	Answer	Mark
1(c)	**AO2 (2 marks)/AO3 (2 marks)** Award 1 mark (AO3) for the identification of relevant piece of evidence that this is an upland area from the resource and a further mark for explanation (AO2) up to a maximum of two marks each. • The contour lines are close together (1) because the land is steep (1). • The numbers on the contour lines are high (1) with lots being over 500 m (1). • In square 70 27 the contour lines are close together (1) showing land is steep (1). • The source of a river are in upland areas (1) the Little Millstone Sike source is in square 75 27 (1). • There is a waterfall in square 70 28 (1) which is an upper course landform (1). • All the rivers are very narrow (1) which is an upper course characteristic (1). • There are lots of river sources (1) because there is higher rainfall in areas of high land (1). Accept any other appropriate response	**(4)**

Question number	Answer	Mark
1(d)	**AO3 (1 mark)** Award one mark for the following: • Peak / highest / maximum discharge (1) **Response must state discharge for credit.** **No credit for just stating 'peak', 'highest', 'maximum'**	**(1)**

Question number	Answer	Mark
1(e)	**AO1 (2 marks)/AO2 (2 marks)** Award 1 mark (AO1) for the identification of a cause of water pollution and a further mark for explanation (AO2) up to a maximum of two marks each. • Clothes factories (1) use dye which is often released into rivers without being cleaned (1). • Industrial waste (1) releases toxic chemicals into the water (1). • Many farms (1) use pesticides which washes off during heavy rain directly into rivers (1). • After periods of heavy rainfall sewage (1) can often be released into rivers without being treated (1). • Deforestation leaves large areas of soil bare (1) during heavy rainfall sediment is washed into rivers (1). • Acid rain (1) caused by sulphur emissions (1). Accept any other appropriate response. **Do not double credit the same source of pollution** e.g., fuel leaks from car and fuel leak from boats given as two different causes would only gain 1 mark for cause and 1 mark for further explanation.	**(4)**

Question number	Answer	Mark
1(f)	**AO2 (3 marks)** Award 1 mark for the initial explanation and 2 marks for further explanation up to a maximum of 3 marks. • Dams could make a river regime more consistent throughout the year (1) as water is held during wetter months (1) and released downstream during drier months (1). • Dams can reduce discharge (1) as the reservoir is being filled (1) but could return to its normal flow conditions downstream once filling is complete (1). • Dams can balance out the impact of dry and wet seasons (1) by releasing water during summer months increasing flow (1) and reducing flow in winter months by storing water in the reservoir (1). **Do not accept reference to changes in water quality.** Accept any other appropriate response	**(3)**

Question number	Answer	Mark
1(g)	**AO3 (4 mark)/AO4 (4 mark)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the level-based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive, and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. This question is about analysing the reasons for water shortages around the world in contrasting countries. Candidates will need to interpret the map to recognise the areas of water shortage and make justification for the causes of these. **AO3** • Water shortage is the lack of access to available fresh water. • Water surplus is when water supply exceeds demand. • Population density is an important factor when determining level of water shortage as highly populated areas are often areas with lower precipitation levels. • Amount of precipitation is the most significant factor as this cannot be controlled or altered by people. • Areas of higher rainfall are often upland where it is difficult to build. • Temperature has an influence on both amount of precipitation and evaporation as very hot areas often have little rainfall due to high pressure. • People have a responsibility to use water carefully to manage the supplies they receive by using water saving irrigation and avoiding wasting water for things like golf courses and fountains. • The biggest challenge for Egypt is the amount of precipitation they receive. • The biggest challenge for SW USA is a combination of precipitation and sunshine hours. • The biggest challenge for India is their population density. **AO4** • Figure 1c shows that Africa is the continent with the largest area of water shortage. • Figure 1c shows SW USA has high rates of water shortage. • Figure 1c shows India has considerable levels of water shortage. • Figure 1c shows that India has the highest population density of the three countries. • Figure 1c shows that Australia has high water	(8)

	shortage. • Figure 1c shows that the Middle East has high water shortages. • Figure 1c shows that Egypt has the lowest precipitation of the three countries. Figure 1c shows that Egypt has the highest average annual sunshine hours.	

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	**1–3**	• Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements that are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (AO4)
Level 2	**4–6**	• Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)
Level 3	**7–8**	• Applies understanding to deconstruct information and provide logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

Question number	Answer	Mark

1(a)	**AO1 (1 mark)** **A** (any form of water that falls from the sky) The answer cannot be B (transpiration), C (condensation), D (evaporation).	**(1)**

Question number	Answer	Mark
1(b)(i)	**AO1 (1 mark)** **B** (particles carried in water wear away riverbed and banks The answer cannot be A (solution/corrosion), C (attrition), D (hydraulic action)	**(1)**

Question number	Answer	Mark
1(b)(ii)	**AO1 (1 mark)** Award one mark for any of the following: • heavy/more/increased rainfall (1) • antecedent/previous/prolonged rainfall (1) • snowmelt (1) • monsoon (1) • steep relief (1) • impermeable soil/geology (1) • glacial/ice cap melt (1) **No credit for deforestation or just stating 'impermeable surface'** Accept any other appropriate response.	**(1)**

Question number	Answer	Mark
1(b)(iii)	**AO1 (1 mark)/AO2 (1 mark)** Award 1 mark (AO1) for initial point and a further mark for explanation (AO2) up to a maximum of two marks. • Higher temperatures (during summer months) increase evaporation (1) which reduces discharge (1). • Lower temperatures (in winter months) can increase precipitation/rainfall (1) which increases river flow (1). • Freezing temperatures means snow does not melt (1) reducing discharge (1). Accept any other appropriate response.	**(2)**

Question number	Answer	Mark
1(c)	**AO2 (2 mark)/AO3 (2 mark)** Award 1 mark (AO3) for the identification of a difference in river channel and a further mark for explanation (AO2) up to a maximum of two marks each. • River channels at A are narrower than B/C (1) because the river has a lower velocity upstream (1). • River channels are shallower in the uplands than lowlands (1) because they have less energy to erode (1). • River channels get wider between upland and lowland areas (1) because discharge increases as tributaries join (1). • The channel at A is V-shaped but much flatter in lowlands (1) because lateral erosion is more dominant downstream (1). Accept any other appropriate response.	(4)

Question number	Answer	Mark
1(d)	**AO3 (1 mark)** Award one mark for the following: • Ox-bow Lake (1)	(1)

Question number	Answer	Mark
1(e)	**AO2 (3 mark)** Award 1 mark for the initial explanation and 2 marks for further explanation up to a maximum of 3 marks. • Deposition occurs when the river loses energy (1) at its mouth (1) as it comes into contact with waves (1). • Deposition occurs when the river enters shallow areas (1) as there is an increase in friction (with the riverbed) (1) means the river loses energy and drops sediment (1). • Deposition happens on the inner bends of meanders (1) because the water flows more slowly around this bend (1) meaning it does not have enough energy to carry sediment (1). • Deposition occurs when the volume of water decreases (1) during a drought (1) meaning there is not enough energy to carry sediment (1). • Deposition occurs during a flood (when water flows over floodplain) (1) there is increased friction with the ground (1) meaning the water does not have enough	(3)

	energy to carry (large/heavy) sediment (1). **No credit for identifying the result of the deposition e.g., stating a slip-off slope is formed.** Accept any other appropriate response.	

Question number	Answer	Mark
1(f)	**AO1 (2 mark)/AO2 (2 mark)** Award 1 mark (AO1) for the identification of a strategy and a further mark for explanation (AO2) up to a maximum of two marks each. • You can build a dam (1) which can control the flow of water (1). • Channel straightening (1) which helps the water to flow downstream more quickly (1). • Embankments (1) allow the river to hold more water before it floods (1). • River restoration (1) which allows for the establishment of floodplains (1). Accept any other appropriate response.	(4)

Question number	Answer	Mark
1(g)	**AO3 (4 mark)/AO4 (4 mark)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the level-based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive, and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. This question is about analysing the reasons for water surpluses around the world in contrasting countries. Candidates will need to interpret the map to synthesise the reasons for water surplus and make justification for the causes of these. **AO3** • Water surplus is when water supply exceeds demand. • Population density is an important factor when determining level of water surplus as sparsely populated areas are often areas with higher precipitation levels. • Amount of precipitation is the most significant factor as this cannot be controlled or altered by people.	(8)

- Areas of higher rainfall are often upland where it is difficult to build.
- Temperature has an influence on both the amount of precipitation and evaporation which is why latitude is a significant factor in areas of surplus.
- People have a responsibility to use water carefully to manage the supplies they receive by using water saving irrigation and avoiding wasting water for things like golf courses and fountains.
- The biggest reason for the surplus in Brazil is the Amazon rainforest which causes very high levels of evapotranspiration.
- The biggest reason for the surplus in Canada is the low population density which reduces demand for water.
- The biggest reason for the surplus in Papua New Guinea is the high precipitation increasing supply.

AO4

- Figure 1c shows large areas in the north of the world have water surpluses.
- Figure 1c shows Papua New Guinea has the highest precipitation.
- Figure 1c shows Brazil has the highest population density.
- Figure 1c shows Canada has the lowest population density.
- Figure 3c shows Papua New Guinea has the highest difference between precipitation and evaporation.
- Figure 3c shows Canada has the smallest difference between precipitation and evaporation.

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	**1–3**	• Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements that are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (AO4)
Level 2	**4–6**	• Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)
Level 3	**7–8**	• Applies understanding to deconstruct information and provide logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant

		understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

Question number	Answer	Mark

Question 1

Question number	Answer	Mark
1(a)	**AO1 (1 mark)** **C** (mouth) The answer cannot be A, B OR D as they do not occur on earth's surface.	**(1)**

Question number	Answer	Mark
1(b)(i)	**AO1 (1 mark)** **A** (changes in height of landscape) The answer cannot be B (snowmelt), C (monsoon), D (geology)	**(1)**

Question number	Answer	Mark
1(b)(ii)	**AO1 (1 mark)** Award one mark a suitable definition of the term discharge: • The quantity of water flowing in a river at a particular time (1). • The volume of water flowing through a river channel (1). • Volume of water in a river (1). Accept any other appropriate response	**(1)**

Question number	Answer	Mark
1(c)	**AO2 (2 marks)** Award 1 mark for initial point and a further mark for explanation up to a maximum of two marks. • Long steady prolonged rainfall (1) will mean discharge will rise slowly (1) • Prolonged steady rainfall (1) will produce rivers with a long lag time / low peak discharge (1). • Heavy short showers (1) can cause rivers to rise quickly (1). • Flashy rivers with short lag time / high peak discharge (1) can be caused by heavy rainfall (1). • Heavy rainfall leads to river channel becoming full (1) overflowing creating a flood (1). Accept any other appropriate response	**(2)**

Question number	Answer	Mark
1(d)	**AO3 (1 mark)** Award one mark for the following: • River (1) • Stream (1) • Sea / Ocean (1) • Lake (1) • Snow (1) • Cloud(s) (1) • Groundwater (1) Accept any other appropriate response	**(1)**

Question number	Answer	Mark
1(e)	**AO2 (2 marks)/AO3 (2 marks)** Award 1 mark (AO3) for the identification of a specific feature in climate and a further mark for explanation (AO2) up to a maximum of two marks each. • June – August have very high levels of evaporation (1) meaning there will be less water in rivers for people to use (1). • There is no rainfall in August (1) but water demand increases as there will be lots of tourists (1). • Rainfall levels are very low all year (around 700 mm) (1) which means stores do not get refilled regularly (1). • The temperature is very high in summer (1) which will increase demand for drinking water (1). • There is a deficit between evaporation and rainfall overall (1) which reduces supply as more is lost than gained each year (1). **Do not credit high temperature all year.** Accept any other appropriate response.	**(4)**

Question number	Answer	Mark
1(f)	**AO1 (2 marks)/AO2 (2 marks)** Award 1 mark (AO1) for the identification of a water management strategy and a further mark for explanation (AO2) up to a maximum of two marks each. • Dams are built across a river (1) this helps to control the flow which reduces flooding and droughts (1). • Reservoirs are created (1) this stores large amounts of water which can be released during drier periods/ makes stores of water more easily accessible (1). • Pipelines can be built to transfer water/redistribute water between regions (1) this ensures water reaches areas with the highest demand to avoid water shortages (1). • Water treatment works increase the amount of water available (1) as a higher quantity of water is safe for drinking / human use (1). • Government policies to limit water use (e.g. hose pipe ban) (1) which reduces domestic consumption (1). Accept any other appropriate response.	**(4)**

Question number	Answer	Mark
1(g)	**AO2 (3 mark)** Award 1 mark for the initial cause and 2 marks for further explanation up to a maximum of 3 marks. • Deforestation (1) reduces interception (1) which increases surface runoff making flooding more likely (1). • Deforestation (1) reduce the amount of water taken up by plants (1) which leads to increase surface runoff which increases discharge (1). • Deforestation (1) can lead to soil erosion this reduces infiltration (1) resulting in more surface runoff which makes flooding more likely (1). • Urbanisation (1) results in large areas of impermeable surface (1) this results in water reaching the river quickly causing flooding (1). • Building impermeable surface (1) reduces lag time (1) this rapidly increases discharge to exceed capacity of the river (1). • Climate change (1) which increases frequency of storms (1) causing flash flooding (1). Accept any other appropriate response	**(3)**

Question number	Answer	Mark
1(h)	**AO3 (4 marks)/AO4 (4 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the level-based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive, and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. This question is about analysing the significance of erosion and transport processes in the creation of upland river landscapes. Candidates should discuss the role of processes and make some judgement regarding which process is dominant. **AO3** • Erosion is the wearing away and removal of rock. • There are four types of erosion: abrasion, attrition, hydraulic action, solution. • Transport is the movement of sediment from one place to another. • There are four types of transport: traction, saltation, suspension, solution. • The method of transport is dependent on the size of the material and the amount of energy the river has. • Rivers need higher discharge/velocity to erode material more quickly. • Upland areas have mainly erosional landforms such as: waterfalls, gorges, interlocking spurs, v-shaped valleys. • Upland areas are very steep and this suggests vertical erosion is more dominant. • All fluvial processes occur at this stage but erosion is likely the most dominant. • Other processes such as deposition, mass movement and weathering are likely to influence the river landform created. **AO4** • Figure 1c shows very steep land around heights of 300m. • Figure 1c shows very narrow valleys around widths of 2km. • Figure 1c shows the rivers are very narrow. • Figure 1c shows the river is shallow. • Figure 1c shows the bedload is large in size. • Figure 1c shows there is a mixture of sizes in the rivers bedload. • Figure 1c shows a waterfall. • Figures 1c shows interlocking spurs.	(8)

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	**1–3**	• Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements that are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (AO4)
Level 2	**4–6**	• Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)
Level 3	**7–8**	• Applies understanding to deconstruct information and provide logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

1(a)	**AO1 (1 mark)** **D** (height above sea level) The answer cannot be A (slope), B (climate) OR C (aspect).	**(1)**

Question number	Answer	Mark
1(b)(i)	**AO1 (1 mark)** **D** (monsoon) The answer cannot be A, B or C as all causes of water shortage	**(1)**

Question number	Answer	Mark
1(b)(ii)	**AO1 (1 mark)** Award one mark for any of the following: • Traction (1) • Suspension (1) • Saltation (1) • Solution (1) Accept any other appropriate response	**(1)**

Question number	Answer	Mark
1(c)	**AO2 (2 marks)** Award 1 mark for identification of a flood prevention method and a further mark for explanation up to a maximum of two marks. • Levees (1) (increase the height of the banks) meaning the river can hold move water before flooding (1). • Afforestation (1) to reduce surface runoff/increase infiltration/interception (1). • River straightening (1) (can increase the velocity of the river) ensuring water is carried away quickly to (reduce flood risk) (1). • Dams (1) (can hold back water) which can delay increases in discharge (until the level decreases) (1).	

	• Flood walls (1) (can be built along river banks which confine the water to the channel) which prevents it spilling onto vulnerable areas (1). Accept any other appropriate response	**(2)**

Question number	Answer	Mark
1(d)	**AO2 (2 marks)/AO3 (2 marks)** Award 1 mark (AO3) for the identification of a human factor affecting water quality and a further mark for explanation (AO2) up to a maximum of two marks each. • Fertilisers sprayed on crops (1) can be washed into the river creating algal blooms (1). • Water from sewage treatment works is released into the river (1) which can include human waste which can kill animals/plants in the river (1). • Factories dump water into the river (1) this can often contain oil/dye which will reduce the clarity of the river water (1). • Urban runoff can include high levels of salt (if the weather has been very cold) (1) and this increases the salinity levels of the river water (1). Accept any other appropriate response	**(4)**

Question number	Answer	Mark
1(e)	**AO3 (1 mark)** Award one mark for the following: • Precipitation (1) • Evaporation (1) • Condensation (1) • Infiltration (1) • Percolation (1) • Throughflow (1) • Groundwater flow (1) • Overland flow / surface runoff (1) • Evapotranspiration (1)	**(1)**

Question number	Answer	Mark
1(f)	**AO1 (2 mark)/AO2 (2 mark)** Award 1 mark (AO1) for the identification of a lower course landform and a further mark for explanation (AO2) up to a maximum of two marks each. • Floodplains (1) formed when alluvium is deposited during floods (1). • Levees (1) are formed when heavy sediment is deposited nearest the river bank during a flood (1). • Meanders (1) form when the velocity increases on the outside bend causing erosion (1). • Oxbow lakes (1) are created when two outside meander bends erode towards each other (1). • Deltas (1) as river drops sediment at mouth as energy is dissipated (by the sea) (1). • Estuary (1) form where sea water flows into the river and mixes with freshwater (1). Accept any other appropriate response. **No credit for river mouth.**	**(4)**

Question number	Answer	Mark
1(g)	**AO2 (3 mark)** Award 1 mark for the initial cause and 2 marks for further explanation up to a maximum of 3 marks. • The global population is increasing (1) this means more water is required for drinking (1) to maintain public health (1). • Increasing affluence (1) means people can afford more white goods (1) can be used multiple times a day/frequently (1). • Increasing affluence (1) means more people desire a meat based diet (1) which means more crops need to be grown (to feed livestock) (1). • A warming climate (1) can mean more demand for domestic gardens (1) in order to keep plants alive (1). Accept any other appropriate response	**(3)**

Question number	Answer	Mark
1(h)	**AO3 (4 marks)/AO4 (4 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the level-based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive, and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. This question is about analysing the significance of climate and drainage basin characteristics in determining how river discharge varies annually. Candidates should discuss the role of each factor and make some judgement regarding which factor is dominant. **AO3** • A river regime is the annual variation in discharge of a river. • Climate is a significant factor influencing the river regime as this determines the input into the river system. • Physical factors play a key role in influencing the river regime. • Human factors can also influence a river regime. • Drainage basins in areas with high average temperatures will likely have more evaporation and therefore see lower discharge. • Drainage basins with high snowmelt input will often receive all their water at a similar time of year. • Drainage basins with large catchment areas often have lots of tributaries increasing discharge. **AO4** • Figure 1c shows a very big peak discharge in the savanna climate zone. • Figure 1c shows the savanna climate have very low discharge for more of the year. • Figure 1c shows the alpine climate has its peak discharge in May and June. • Figure 1c shows the River Volta has the highest average rainfall and temperature. • Figure 1c shows the alpine regime has the lowest average rainfall and temperature.	**(8)**

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	**1–3**	• Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements that are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (AO4)
Level 2	**4–6**	• Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)
Level 3	**7–8**	• Applies understanding to deconstruct information and provide logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

QUESTION 2

Question number	Answer	Mark

1(a)	**AO1 (1 mark)** **B** (groundwater) The answer cannot be A, C, D (all transfers)	**(1)**

Question number	Answer	Mark
1(b)(i)	**AO1 (1 mark)** **B** (the speed of the water flow) The answer cannot be A (cross profile), C (discharge), D (cross sectional area)	**(1)**

Question number	Answer	Mark
1(b)(ii)	**AO1 (1 mark)** Award one mark for any of the following: • Wide(er) (1) • Deep(er) (1) • Flat(er) (1) • Gentle/smooth slope/gradient (1) Accept any other appropriate response	**(1)**

Question number	Answer	Mark
1(c)	**AO2 (2 marks)** Award 1 mark for initial point and a further mark for explanation up to a maximum of two marks. • Large pebbles are heavy (1) and can only be rolled/dragged/pushed along the riverbed (1). • In the upper course sediment is large (1) meaning it cannot be picked up by the river as it is too heavy (1). • Traction is when material is rolled along (1) this is when the river's energy is too weak to lift the heavy sediment (1). • The upper course has little energy (1) which means	

	large material is rolled along when velocity is large enough (1). Accept any other appropriate response	**(2)**

Question number	Answer	Mark
1(d)	**AO2 (2 marks)/AO3 (2 marks)** Award 1 mark (AO3) for the identification of a reason for increasing demand shown in the resource and a further mark for explanation (AO2) up to a maximum of two marks each. • There has been an increase in water used for electricity (1) as more countries gain access to a centralised, piped system (1). • There has been an increase in water used for manufacturing (1) as some countries move from a primary to secondary dominant employment sector (1). • There has been a 1,000 km^3 increase in water used for electricity (1) as emerging countries develop create large-scale distribution networks/National Grid (1). • There has been an increase in water used for livestock (1) as emerging country populations demand a meat based diet (1). Accept any other appropriate response	**(4)**

Question number	Answer	Mark
1(e)	**AO3 (1 mark)** Award one mark for: • Interlocking spur (1)	**(1)**

Question number	Answer	Mark
1(f)	**AO1 (2 marks)/AO2 (2 marks)** Award 1 mark (AO1) for the identification of a climate/slope factor and a further mark for explanation (AO2) up to a maximum of two marks each. **Climate:** • High temperatures (lower discharge) (1) decreasing erosion (1). • Areas with higher precipitation (increases discharge) (1) increasing erosion (1). • Very cold areas will experience freeze thaw weathering (1) increasing size of cracks (in river valley sides) (1). • Periods of drought (lowers discharge) (1) increasing deposition (1). **Slope:** • Steep slopes (decreases lag time) (1) increasing erosion (1). • Gentle slopes (decrease river velocity) (1) increasing deposition (1). • Steep slopes (decreases lag time) (1) decreasing deposition (1). • Gentle slopes (decreases river velocity) (1) decreasing erosion (1). Accept any other appropriate response. **Credit river valley processes (i.e. mass movement and weathering) as river processes if linked to a climate and slope factor.**	**(4)**

Question number	Answer	Mark
1(g)	**AO2 (3 mark)** Award 1 mark for the initial cause and 2 marks for further explanation up to a maximum of 3 marks. • Releasing sewage (1) introduces large amounts of nutrients (1) reducing levels of oxygen (1). • Industry (1) releases heavy metals in the water (1) this is poisonous to wildlife/kill fish/reduce biodiversity (1). • Agricultural (1)(runoff from fields) increases nitrates in water (1) this causes increased algae growth (1).	

	• Oil leaks (1) block out sunlight (1) reducing water quality (1). Accept any other appropriate response	**(3)**

Question number	Answer	Mark
1(h)	**AO3 (4 marks)/AO4 (4 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the level-based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive, and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. This question is about analysing how effective the strategy has been at reducing the risk of flooding. Candidates should discuss the strengths and limitations and make some judgement regarding overall effectiveness of the strategy. **AO3** • A river regime is the annual variation in discharge of a river. • Hard engineering flood prevention strategies often involve building a concrete barrier to stop flooding. • Soft engineering flood prevention strategies often involve working with natural processes to reduce flooding. • Dams are hard engineering which control the flow of water stopping flooding during high precipitation periods. • Dams control the flow of water reducing impacts of drought during extended dry periods. • Dams alter the natural river regime affecting how the river processes operate. • Dams can reduce the severity of impacts caused by flooding. • Dams are very expensive and take years to build. **AO4** • Figure 1c shows a very big peak discharge in August to November before the Aswan Dam was built. • Figure 1c shows very low discharge January to July before the Aswan Dam was built. • Figure 1c shows a higher base flow between January to July after the Aswan Dam was built. • Figure 1c shows a reduced discharge during August to October after the Aswan Dam was built. • Figure 1c shows the River Nile was prone to flooding often before the Aswan Dam was completed. • Figure 1c shows Egypt experienced drought frequently	**(8)**

	before the Aswan Dam was built. • Figure 1c shows the Aswan dam reduced the number of people killed by floods after the dam was built.	

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	**1–3**	• Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements that are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (AO4)
Level 2	**4–6**	• Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)
Level 3	**7–8**	• Applies understanding to deconstruct information and provide logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

QUESTION 2

Question number	Answer	Mark

4(a)(i)	**AO3 (1 mark)** A systematic (1) B,C and D are all incorrect	**(1)**

Question number	Answer	Mark
4(a)(ii)	**AO3 (1 mark)** Poor representation of overall investigation (1) Time constraints (1) Can be biased (1) Can be under representative (1) Unreliable (1) Inaccurate (1) Accept any other appropriate response	**(1)**

Question number	Answer	Mark
4(a)(iii)	**AO4 (2 mark)** Correct method of working, showing addition, and then division by 5 (1) and one mark for the correct mean, written to one decimal place, 20.2 (1)	**(2)**

Question number	Answer	Mark
4(a)(iv)	**AO4 (2 mark)** Award 1 mark for each correct bar. To be awarded the mark for the first bar, line must be drawn between 21-22. The second bar needs to be right on the line. Shading is not required.	**(2)**

Question number	Answer	Mark
4(a)(v)	**AO4 (1 mark)** One mark for an 'x' in box 5	**(1)**

Question number	Answer	Mark
4(a)(vi)	**AO3 (2 mark)** Award 1 mark for an initial reason, and a further mark for extension of this point. E.g. the cork could have got stuck as it flowed down the river (1) this would have slowed the cork down (1) there could have been a strong wind blowing upstream (1) which would have slowed down the cork / which would have led to unreliable results (1) Human error with the operation of the stop watch (1) which meant that the timing was inaccurately recorded at this site (1) Accept any other appropriate response	**(2)**

Question number	Answer	Mark
4(b)	**AO3 (3 mark)** Award 1 mark for identification of primary data method and award 2 further marks for development of explanation Candidates could identify a number of sources of primary data to help them extend their study including: (Annotated) field sketches (1) to show features of the river valley / channel (1) to help establish landforms and features on the river profile (1) River depth – tape measure is stretched across the river (1) measure the depth of the water at 25 cm intervals (1) using a meter rule and then record the results. (1) All of the ideas below are relevant: • Use of hydroprop i.e. other methods to measure velocity (other than cork float) • Width • Sediment shape and shape • Gradient • Wetted perimeter Accept any other appropriate response	**(3)**

Question number	Answer indicative content
4(c)	AO3 (4 marks) AO4 (4 marks) Marking instructions Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the level based mark scheme below. Indicative content guidance The indicative content below is not prescriptive and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. Relevant points may include the following. **AO3** • Accuracy is about making judgements about how close conclusions are to the actual changes occurring in the river environment where the fieldwork was carried out.

- Recognition of the extent to which there were equipment errors, e.g. faulty or uncalibrated equipment, and/or operator errors, e.g. misinterpreting the data being recorded, and how this might have affected that might have affected whether they were able to answer their enquiry questions.
- Recognition of whether there were issues with the design of the data collection and/or sampling methodologies, which may be flawed in terms of the location/number of sites (spatial), the time of year (temporal), or the equipment chosen.

AO4

- There is evidence of using different skills and techniques to measure changes in a river channel.
- There is evidence of using different skills and techniques to reach conclusions about changes occurring in a river channel.
- There is evidence of using different skills and techniques to evaluate conclusions about changes occurring in a river channel.
- There is evidence of own fieldwork conclusions, i.e. reference to field data collected by the student.

If he enquiry question isn't present do not penalise

This question is about the candidates making a judgement of the success of their data analysis techniques. Candidates are expected to make a judgement. Candidates should identify strengths, weaknesses, alternative ways of analysing the data

In this response there would be an expectation for the candidates to evaluate a number of different data analysis techniques.

Candidates should look to identify the appropriateness of data analysis techniques.

A view should be given on how successful or unsuccessful the data analysis techniques were and how they could be improved to help candidates understand the data collected more effectively

For level 2 responses the candidate response will need to link to the evaluation to their study directly.

For level 3 response there should be a greater depth of evaluation.

Recognition of whether or not the data analysis was less successful because of the way it was designed/technique used.

	How far data analysis helped draw a significant conclusion for the study An evaluation of how far the outcomes can be trusted (or repeated to obtain the same results).

Question number	**Answer**	
Level	**Mark**	**Descriptor**
	0	No rewardable material.
Level 1	**1–3**	• Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements that are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (AO4)
Level 2	**4–6**	• Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)
Level 3	**7–8**	• Applies understanding to deconstruct information and provide logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

Question number	**Answer**	**Mark**

4(a)(i)	**AO3 (1 mark)** Award 1 mark for any reasonable risk in the context of this environment: • Falling in the river / drowning (1) • Exposure / sunburn / heat exhaustion (1) • Slips / trips / bumps (1) • Fast flowing water (1) • Infection from water / diseases / polluted water (1) • Animals in the water (1) • Steep ground / river banks (1) • Deep water / flash floods (1) Accept any other appropriate response. **Reject inaccurate measurements, loosing equipment etc as not part of risk assessment.**	**(1)**

Question number	Answer	Mark
4(a)(ii)	**AO3 (1 mark)** Award 1 mark for any reasonable risk in the context of what was identified in (4ai): • Wearing strong shoes / walking boots (1) • Wear lots of layers to keep warm (1) • Check the weather forecast / reports (1) • Checking local requirements / plans etc (1) • Waking with care / avoiding slippery places (1) • Working in groups / warning others (1) • Wearing lifejacket / life vest (1) • Avoid drinking contaminated water (1) • Covering exposed cuts on skin (1) • Use a shallower / slower part of river (1) • Stay away from edge of river / not to close to banks (1) • Choose a safer location to work in (1).	**(1)**

	Accept any other appropriate response. **Reject approaches that do not match (4ai).**	

Question number	Answer	Mark
4(a)(iii)	**AO4 (2 marks)** Award 1 mark for: Correct method of working, showing addition, e.g. 102.3 **or** 13.1+15.4+16.8+20.0+37.0 (1) Correct mean, written to one decimal place, 20.5 (1). **Reject answer to 2dp, i.e. 20.46**	**(2)**

Question number	Answer	Mark
4(a)(iv)	**AO4 (2 marks)** Award 1 mark for each correct bar. To be awarded the mark for the first bar, line must be drawn between 13-14. The second bar needs to be right on the line. **Site 1=13.1** **Site 4=20.0** Note width of bars doesn't matter. There is no need for bars to be shaded.	**(2)**

Question number	Answer	Mark
4(a)(v)	**AO3 (2 mark)** Award 1 mark for an initial reason, and a further mark for extension of this point. E.g. • The cork could have got stuck as it flowed down the river (1) this would have slowed the cork down (1). • There could have been a strong wind blowing upstream (1) which would have slowed down the cork / which would have led to unreliable results (1). • Human error with the operation of the stop watch (1) which meant that the timing was inaccurately recorded at this site (1). • The water was too shallow (1) so the float got stuck (1). • Difficultly with accurately measuring the distance of the float-run (1) leading to inaccurate measurements of speed / velocity (1). Accept any other appropriate response	**(2)**

Question number	Answer	Mark
4(b)	**AO4 (4 mark)** Award 1 mark for a description of the technique and a further mark for a developed description (1). Quantitative • Description of how to calculate the cross section of the river measure from bank to bank and set intervals (1) transfer data onto graph paper to allow the area to be calculated (1). Qualitative • Field sketches can be used to record the main features of the river profile at different sites (1) this will help the students identify differences (1). • Sediment colour/size/shape/form of Power's scale (1) and changes across or downstream (1). • Ask public questions about the river (1), could by interview or questionnaire regarding flooding/litter/ pollution etc. (1). Credit responses for qualitative which discuss questionnaire. Accept any other appropriate response.	**(4)**

Question number	Answer indicative content
4(c)	**AO3 (4 marks) AO4 (4 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the level based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. **AO3** • Recognition of the extent to which there were equipment errors, e.g. faulty or uncalibrated equipment, and/or operator errors, e.g. misinterpreting the data being recorded, and how this might have affected that might have affected whether they were able to answer their enquiry questions. • Recognition of whether there were issues with the design of the data collection and/or sampling methodologies, which may be flawed in terms of the location/number of sites (spatial), the time of year (temporal), or the equipment chosen. • Accuracy is about making judgements about how close conclusions are to the actual changes occurring in the river environment where the fieldwork was carried out. **AO4** • There is evidence of using different skills and techniques to measure changes in a river channel – both design and techniques. • There is evidence of using different skills and techniques to reach conclusions about changes occurring in a river channel. • There is evidence of own fieldwork conclusions, i.e. reference to field data collected by the student. If the enquiry question isn't present do not penalise. • In this response there would be an expectation for the students to evaluate a number of different data collection techniques. • This should an evaluation of primary and secondary data as appropriate.

	• Students should look to identify the appropriateness of data collection techniques. • A view should be given on how successful or unsuccessful the data collection techniques were and how they could be improved to help students gather more effective results. • For level 2 responses the student response will need to link to the evaluation to their study directly. • For level 3 response there should be a greater range or depth of techniques evaluated. • Recognition of whether or not the data collection was less successful because of the way it was designed. • Recognition of any faults in equipment or human error. • How far data-collection methods used produced reliable results • An evaluation of how far the outcomes can be trusted (or repeated to obtain the same results).
Question number	**Answer**
Level	**Mark**

	0	**Descriptor**
Level 1	**1–3**	No rewardable material.
Level 2	**4–6**	• Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements that are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (AO4)
Level 3	**7–8**	• Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)

Question number	**Answer**	**Mark**

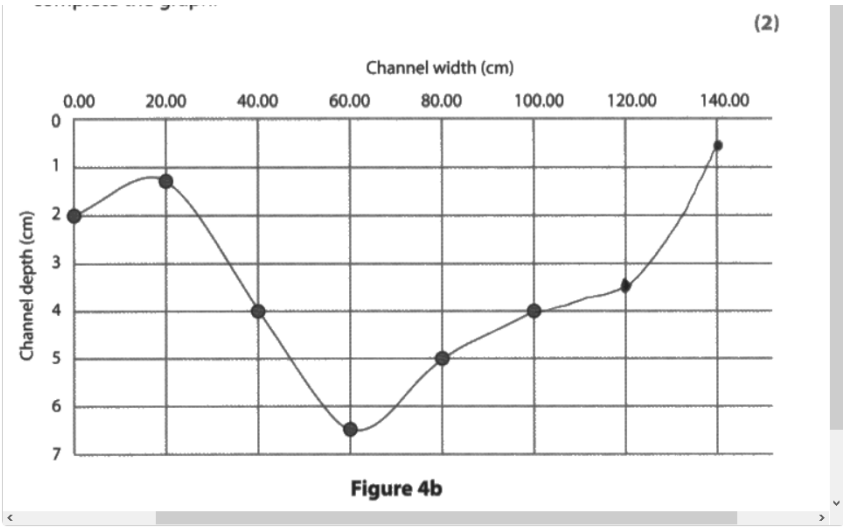
4(ai)	**AO3 (1 mark)** Students could use data from a previous study in the same area (1). Alternatives may include: • National rivers flow archive • (Geology) maps • Local water companies • (GIS) maps • Textbooks • Photos taken by someone else Accept any other appropriate response.	**(1)**

Question number	Answer	Mark
4(aii)	**AO3 (1 mark)** Award one mark for a suitable disadvantage. • The data could be inaccurate/bias (1). • The data could be from a different location (1). • They may not have collected the data over the same time period (1). In this response candidates must relate the answer for 4aii to the response given in 4ai.	

	If candidates do not put in a response for 4ai and then state a generic disadvantage allow mark. Accept any other appropriate response.	**(1)**

Question number	Answer	Mark
4(aiii)	**AO4 (2 marks)** Award 1 mark for working and 1 mark for correct answer to one decimal place. Add up all the figures 85.8 /8 = 10.7	**(2)**

Question number	Answer	Mark
4(aiv)	**AO4 (2 marks)** Candidates will need to plot all points correctly • 1 mark for each correctly plotted point with lines complete. • 1 mark for accurately plotted points but no line. • If no points plotted, but accurate line, award 1 mark. Plot points 3.5 and 0.6	

	 Figure 4b	(2)

Question number	Answer	Mark
4(av)	**AO3 (2 marks)** Award 1 mark for describing an alternative sampling method (1) and 1 mark for further development (1). • Stratified – students could use a stratified sampling technique where a proportionate number of observations are taken from each part of an area (1) is more likely reflective of the total population (1). • Systematic - students could pick the first site at random then pick subsequent sites at a set defined distance (1) this would help ensure that the sampling covered a whole range of changes along the river channel (1). Accept any other appropriate response.	(2)

Question number	Answer	Mark
4(b)	**AO3 (4 marks)** Award 1 mark for the initial point (1) and a further mark for further development (1). • Advantage: By using field sketches students can get a quick view of the areas they are working recording key features (1) to support recall later (1). • Advantage: By using field sketches students can highlight features (1) that they want to focus on as part of their study (1). • Disadvantage: Because students are often making sketches quickly, they may not record key features correctly (1) leading to inaccuracies later on (1). • Disadvantage: Because students have different perceptions (1) they may over-exaggerate features (1). Accept any other appropriate response.	**(4)**
Question number	**Answer indicative content**	

4(c)	**AO3 (4 marks) AO4 (4 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the level-based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive, and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. This question is about the candidates making a judgement of the value of their data presentation techniques in achieving the overall aims of their study. This will depend on what data presentation techniques they used. Candidates are expected to make a judgement on more than one technique. Candidates should identify strengths, weaknesses, and alternative resources which would support them in planning the enquiry. For level 2 responses candidates will need to link the evaluation to the purpose of the study directly. For level 3 responses there should be a greater depth of evaluation.

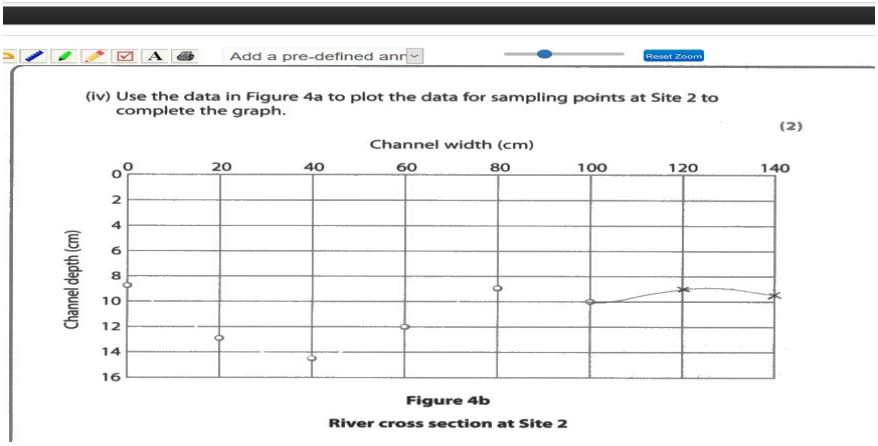
Question number	Answer	
Level	**Mark**	**Descriptor**
	0	No rewardable material.
Level 1	**1–3**	• Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements that are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (AO4)
Level 2	**4–6**	• Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)
Level 3	**7–8**	• Applies understanding to deconstruct information and provide logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

Question number	Answer	Mark

4(ai)	**AO3 (1 mark)** Award 1 mark for a suitable risk identified. • Students could fall into the river (1) • Hypothermia (1) • Heat stroke (1) Accept any other appropriate response.	**(1)**

Question number	Answer	Mark
4(aii)	**AO3 (1 mark)** Award 1 mark for each suitable way to manage risk identified. • Students could work in pairs (1). • Teachers could brief the students about the risks before they undertake the enquiry (1). Accept any other appropriate response.	**(1)**

Question number	Answer	Mark
4(aiii)	**AO4 (2 marks)** Award 1 mark for working and 1 mark for correct answer to one decimal place. Add up all the figures 558 /8 = 69.85 69.9 correct answer to 1 decimal place.	**(2)**

Question number	Answer	Mark
4(aiv)	**AO4 (2 marks)** Candidates will need to plot all points correctly Site 2 120 9.0 Site 2 140 9.5 • 1 mark for correctly plotted points. • 1 mark for accurately drawing cross section. • If no points are plotted, but accurate line award 1 mark.  **Figure 4b** **River cross section at Site 2**	**(2)**

Question number	Answer	Mark
4(av)	**AO3 (2 marks)** Award 1 mark for the initial point (1) and a further mark for further development (1). • Random - students could pick the first site at random to ensure that they reduce bias (1) and therefore don't confirm predetermined theories (1).	

	• Random sampling will ensure choices are not biased (1) so each site had an equal chance of being selected (1). Accept any other appropriate response.	**(2)**

Question number	Answer	Mark
4(b)	**AO3 (4 marks)** Award 1 mark for advantage or disadvantage identified a further mark for development of each point. Max 2 marks for advantage and 2 marks for disadvantage. • Advantage: By using annotated sketches students can get a quick view of the areas they are working recording key features (1) to support recall later (1). • Advantage: By using field sketches students can highlight features (1) that they want to focus on as part of their study (1). • Disadvantage: Because students have different perceptions (1) they may over-exaggerate features (1). • Disadvantage: Students are only taking a view of their area as they see it (1) candidates sketches may not record everything accurately (1). Accept any other appropriate response.	**(4)**

Question number	Answer indicative content

4(c)	**AO3 (4 marks) AO4 (4 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the level-based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive, and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. This question is about the candidates making a judgement of the value of their data analysis techniques in achieving the overall aims of their study. This will depend on what data analysis techniques they used. Candidates are expected to make a judgement on more than one technique. Candidates should identify strengths, weaknesses, and alternative techniques which could have been used in their study. For level 2 responses candidates will need to link the evaluation to the purpose of the study directly. For level 3 responses there should be a greater depth of evaluation.

Question number	Answer	
Level	**Mark**	**Descriptor**
	0	No rewardable material.
Level 1	**1–3**	• Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements that are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (AO4)
Level 2	**4–6**	• Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)
Level 3	**7–8**	• Applies understanding to deconstruct information and provide logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

Question number	Answer	Mark

4(a)(i)	**AO3 (1 mark)** B Collecting data every 100m along a river. The answer cannot be A (random sampling), C and D (does now state how sampled).	**(1)**

Question number	Answer	Mark
4(a)(ii)	**AO3 (1 mark)** Award 1 mark for a suitable piece of equipment. • Measuring tape (1) • Rope / weighted chain (1) Accept any other appropriate response.	**(1)**

Question number	Answer	Mark
4(a)(iii)	**AO3 (2 marks)** Award 1 mark for identification of a suitable risk and a further mark for description of why this was important. For example: • Slipping on rocks (1) as it could lead to injury. (1)	

	• Getting lost (1) as this could lead to being separated from group. (1) • Falling in the river (1) as this could lead to damaged equipment. (1) • Entering river with open cuts (1) could lead to Weils disease. (1) • Variable weather conditions (1) leading to exposure/heat stroke/hypothermia (1). • Velocity/depth or river (1) causing people to lose their footing (1). • Accessibility to sampling site/river bank (1) difficulty getting to site (1) This point could be developed in a number of ways. Accept any other appropriate response.	**(2)**

Question number	Answer indicative content
4(b)	**AO3 (4 marks) AO4 (4 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the level-based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. This question is about candidates making a judgement of the data collection methods that have been used and the conclusions made. Candidates may note the strengths or weaknesses of the fieldwork presented in Figures 4a and b. Responses could include: • Comments on the design regarding sampling method used.(Random sampling used which could lead to anomalies)

	• Comments on the number of data collection sites, relevance of data collected, and the conclusions drawn. (Only 2 sites used) • Comments could address if the student had met their aim.(Conclusions are vague) • Comments on the how the conclusions could have been supported by data. • Comments on how anomalies could have affected the results and therefore the conclusion. (Only 2 sites used.) • Comments on other data that could have been collected. • There is no method or detail around the measurement of river velocity so how reliable are the techniques. For level 2 responses candidates will need to link the evaluation to both data collection methods and conclusions. For level 3 responses there should be a greater depth of evaluation recognising the impacts of the design and the data collection methods on the conclusions made. There is no method or detail around the measurement of river velocity so how reliable are the techniques. Candidates working at this level must provide an evidenced judgment. Candidates may refer to data presentation methods to link the data collection and conclusions this should be credited.

Question number	**Answer**	
Level	**Mark**	**Descriptor**
	0	No rewardable material.
Level 1	**1–3**	• Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements that are supported by limited evidence. (AO3)

		• Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (AO4)
Level 2	**4–6**	• Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)
Level 3	**7–8**	• Applies understanding to deconstruct information and provide logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

Question number	Answer	Mark

4(a)(i)	**AO3 (1 mark)** D Stopwatch The answer cannot be A (measures windspeed), B (measures coverage) or C (measures gradient).	**(1)**

Question number	Answer	Mark
4(a)(ii)	**AO3 (1 mark)** Award one mark for a sampling method identified: • Random sampling (1) • Stratified sampling (1) • Systematic sampling (1) • Pragmatic sampling (1) Accept any other appropriate response.	**(1)**

Question number	Answer	Mark
4(a)(iii)	**AO3 (2 marks)** Award 1 mark for identification of way GIS might be used for fieldwork, and a further mark for description of how it is used. For example: • To plan fieldwork (1) so that suitable data can be collected (1) • To look at data (1) to be able to compare with primary data (1). • To plot data (1) to be able to analyse changes along a river course (1). Accept any other reasonable response.	**(2)**

Question number	Answer indicative content
4(b)	**AO3 (4 marks) AO4 (4 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the level-based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive, and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. This question is about candidates making a judgement of the data presentation methods and analysis that have been used to help students draw conclusions. Candidates may note the extent to which the fieldwork presentation and analysis support the conclusions in Figures 4. Responses could include: • Comments could be made on how relevant the conclusions are based on the presentation and analysis methods. • Comments could address the suitability of the data presentation method to help draw conclusions. • Comments could address the suitability of the data table to help draw conclusions. • Comments on how anomalies could have affected the results and therefore the conclusion. • Comments on the accuracy of students recording the data and the effect on conclusions. • Comment on the distribution of site selection for data collection and the impact this could have on conclusions. • Comments on other data that could have been collected. • Comments on the value of the methods in relation to the aim of the investigation. For level 2 responses candidates will need to link the conclusion to both data presentation methods and analysis. For level 3 responses there should be a greater depth of evaluation recognising the impact of the data collection presentation and analysis on the conclusions made.

Question number	Answer	
Level	**Mark**	**Descriptor**
	0	No rewardable material.
Level 1	**1–3**	• Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements that are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (AO4)
Level 2	**4–6**	• Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)
Level 3	**7–8**	• Applies understanding to deconstruct information and provide logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

Question number	Answer	Mark

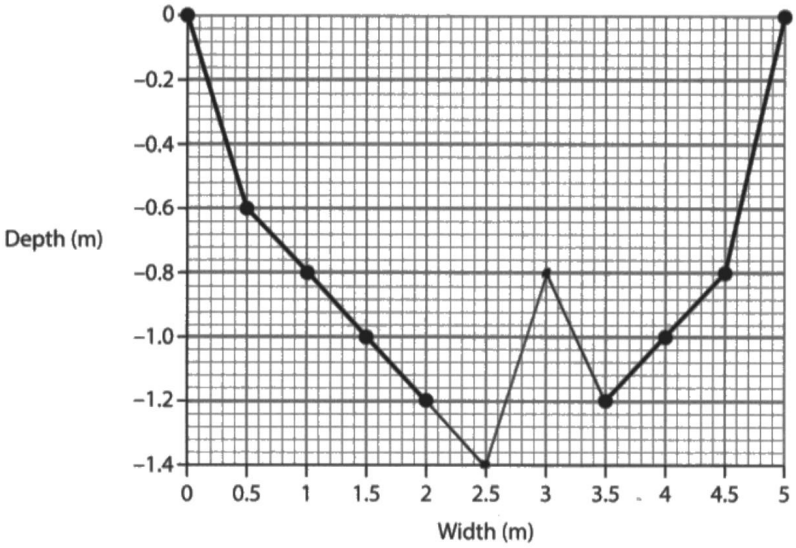
4(a)(i)	**AO3 (1 mark)** B Field sketch (1) It cannot be A, C or D as these are all secondary data sources.	**(1)**

Question number	Answer	Mark
4(a)(ii)	**AO3 (1 mark)** Award one mark for suitable piece of equipment. • Tape measure (1) • Stopwatch (1) • Flow meter (1) • Metre rule (1) • Camera (1) • Phone / tablet (1) **Do not credit pen / paper.** Accept any other appropriate response.	**(1)**

Question number	Answer	Mark
4(b)(i)	**AO4 (2 marks)** Award one mark for correct working, and one mark for correct answer. (1.2+1.0+1.2+1.3)/4 (1) OR 4.7/4 (1) 1.2 (1)	**(2)**

Question number	Answer	Mark
4(b)(ii)	**AO3 (1 mark)** Award one mark for suitable sampling strategy named. • Random (1) • Stratified (1) • Systematic (1) • Opportunistic (1)	**(1)**

Question number	Answer	Mark
4(b)(iii)	**AO3 (2 marks)** Award one mark for suitable reason and a further mark for explanation, up to a maximum of two marks. • Data has a much larger range than other sites (1) which suggest an error may have taken place (in data collection) (1). • As there are only four pieces of data (1) it would have been better to take more readings to reduce the affect of anomalies (1). • The float may have got stuck (1) meaning it took longer to travel (1). • Human error operating the stopwatch (1) resulting in incorrect time recorded (1). Accept any other appropriate response.	**(2)**

Question number	Answer	Mark
4(c)(i)	**AO4 (2 marks)** Award one mark for plotting one data point correctly, and a further mark for plotting second data point and the line. Two correct data points plotted with no line drawn award one mark. Completed version:  	**(2)**

Question number	Answer	Mark
4(c)(ii)	**AO3 (3 marks)** Award 1 mark for identification of a suitable advantage, and a further 2 marks for explanation. • (Line diagrams) allow patterns to be visualized easily (1) and therefore compared to other sites (1) to check if they fit with hypothesis (1). • (River profiles) are easy to construct (1) using Excel / by hand (1) to be able to spot any anomalies in the data (1). • (Line graphs) are easy to understand (1) which means connections are easily spotted (1) and anomalies can be identified (1). Accept any other reasonable response.	**(3)**

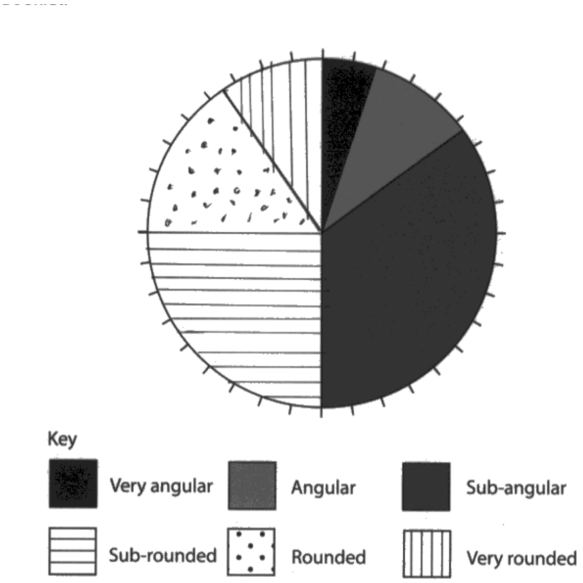
Question number	Answer	Mark

4(a)(i)	**AO3 (1 mark)** C - amount of rainfall (1) It cannot be A, B or D as these are all qualitative type of data.	**(1)**

Question number	Answer	Mark
4(a)(ii)	**AO3 (1 mark)** Award one mark for suitable way maps could be used to support the enquiry. • To plan sites for data collection. (1) • To plot data on to explore patterns. (1) • To understand features of the local environment. (1) Accept any other appropriate response.	**(1)**

Question number	Answer	Mark
4(b)(i)	**AO4 (2 marks)** Award one mark for correct working, and one mark for correct answer. (1.2+2.0+1.4+1.2+1.0) / 5 (1) OR 6.8 / 5 = 1.4 (1)	**(2)**

Question number	Answer	Mark
4(b)(ii)	**AO3 (1 mark)** Award one mark for suitable piece of equipment • Tape measure (1) • Flow meter (1) • Stopwatch (1) • Float (1) • Ping pong ball/other suitable floatable device (1) **Do not credit pen / paper.** Accept any other appropriate response.	**(1)**

Question number	Answer	Mark
4(c)(i)	**AO4 (2 mark)** Award one mark for correct plotting of data (in any order), and a further mark for correct labelling.  	**(2)**

Question number	Answer	Mark
4(c)(ii)	**AO3 (2 marks)** Award one mark each for two suitable ways to improve reliability of the data collected. • Take more measurements. (1) • Compare results to another group. (1) • Ensure one person in the group is responsible for measurements. (1) Accept any other reasonable response.	**(2)**

Question number	Answer	Mark
4(d)	**AO3 (3 marks)** Award 1 mark for identification of a suitable fieldwork technique, and a further two marks for explanation. • They could have measured river depth (1) to create a cross-section (1) to see how the channel shape changes (1). • They could have measured river gradient (1) using a clinometer (1) in order to explore relationships between relationship between gradient along a river's course (1). • They could have measured river depth (1) at regular intervals (1) to allow greater representation of the river channel (1). Accept any other reasonable response.	**(3)**

Question number	Answer	Mark

4(a)	**AO4 (2 marks)** Award 1 mark for a suitable risk identified and 1 further mark for description of how this was managed. • Falling in the river (1) was managed by not getting to close the riverbank (1). • To reduce the risk of exposure (1) I made sure that I had suitable footwear and clothing (1). • There is a risk of slipping over (1) which can be reduced by wearing appropriate footwear (1). • There is a risk of getting lost (1) so we went around in groups (1). Accept any other appropriate response.	**(2)**

Question number	Answer	Mark
4(b)	**AO4 (3 marks)** Award 1 mark for initial point, and a further 2 marks for explanation or development. Candidates may refer to how the choices were made on a practical basis, but also in term of sampling strategy used. • We chose two sites to conduct our fieldwork (1) one which was just after a meander, and one that was on a straight section of the river (1) to see if we could find different characteristics (1). • We selected three sites along the river (1) that were in walking distance (1) as this allowed us time to collect the data one day (1). • We used stratified sampling (1) to collect readings from contrasting locations (1) to see how a river changes downstream (1). Accept any other appropriate response.	**(3)**

Question number	Answer	Mark
4(c)	**AO3 (2 marks) /AO4 (2 marks)** Award 1 mark for identification of a primary or secondary data collection method used and a further mark for development through further description or exemplification. Candidates can describe any two methods (primary and/or secondary) of data collection that are appropriate to their enquiry. • I collected data to look at the depth (1) of the river along its profile. We did this by using a metre ruler and measuring the depth at regular intervals (1). • I collected data on sediment size (1) by measuring pebbles at different points along the river (1). • I used a Power's Roundness Scale (1) to identify the shape of the sediment (1). • I drew field sketches (1) to record the landforms/characteristics of each site (1). Accept any other appropriate response.	**(4)**

Question number	Answer	Mark
4(d)	**AO4 (3 marks)** Award 1 mark for identification of data analysis technique used, and a further mark for development through further description or exemplification. • I calculated the mean (1) by adding up each of the velocity readings and dividing by 5 (the number of times I recorded data) (1) to try and smooth out any variations in the data (1). • Used Spearman's rank (1) to compare sediment size and shape (1) to determine if the correlation is significant (1). • Calculated a percentage (1) as they are relative (1) which means different sets of data can be compared (1).	

	• Calculated the interquartile range (1) to remove the outliers in the data (1) in case they caused by human error in data collection (1). Accept any other appropriate response. **No credit awarded for identifying a data presentation technique.**	**(3**

Question number	Answer indicative content
4(e)	**AO3 (4 marks) AO4 (4 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the level based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. This question is about the candidates being able to evaluate whether the data presentation techniques used are effective in helping them analyse and identify patterns in the data. The data presentation techniques may be regarded as not appropriate for the data being presented leading to a judgement being made on how helpful they would be in analysis. • At level 1 candidates will be likely describe the data presentation methods that are used and may make simple statements about how they can be used for analysis at the top of the level. • At level 2 candidates may describe all of the techniques used as well as make simple statements about how they demonstrate patterns. • For level 3 candidates would be expected to make a judgement on the suitability of the presentation techniques and how they establish patterns or not. **AO3** • Recognition that the data presentation techniques used are appropriate to the data that is being presented – and can help to identify trends and anomalies. • Recognition of the importance of having accurate/specific axis labels on the data presentation techniques. • Recognition that there are improvements/alternatives which could increase the usefulness of the data presentation techniques provided.

	• Recognition that there are limitations to the data presentation techniques used. • An evaluation of how far the student's data presentation methods can be trusted / may be provided. **AO4** • Figure 4a shows a scatter graph comparing river discharge and average bedload size. • Figure 4a does not show which plot represents which site along the river the data was collected. • Figure 4a shows average sediment size but does not give detail about how many data points this is based on. • Figure 4b shows a bar graph showing velocity and discharge at each site. • Figure 4b has an X axis labelled size which is not very clear for discharge/velocity data. • Figure 4b numbers the sites but does not identify where the sites were located.

Question number	**Answer**	
Level	**Mark**	**Descriptor**
	0	No rewardable material.
Level 1	**1–3**	• Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements that are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (AO4)
Level 2	**4–6**	• Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)

Level 3	**7–8**	• Applies understanding to deconstruct information and provide logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

Question number	Answer	Mark

Question 4

Question number	Answer	Mark
4(a)	**AO4 (2 marks)** Award 1 mark for a suitable reason and 1 further mark for explanation or development. • There was a river which had different landforms which were accessible (1) which meant that I could compare characteristics (1). • I wanted to investigate river depth (1) and this river was close to school so we could access it a number of times easily (1). Accept any other appropriate response.	**(2)**

Question number	Answer	Mark
4(b)	**AO4 (3 marks)** Award 1 mark for identification of suitable method, and a further 2 marks for explanation or development. • Measuring river velocity (1) which meant we had to collect quantitative data on velocity and a specific distance of the river (1) which we could then use to calculate river discharge (1). • Measuring river channel depth (1) we had to use a measuring stick at various points across the river (1) and then record the depths so they could be used to create a graph (1). Accept any other appropriate response.	**(3)**

Question number	Answer	Mark
4(c)	**AO4 (3 marks)** Award 1 mark for identification of a suitable advantage, and a further mark for development through further description or exemplification. • I used a scattergraph (1) which allowed me to see a correlation between factors (1) which meant I could produce a clear conclusion (1). • I used graphs to create river profiles (1) which meant I could easily compare across different sites (1) and recognise any differences (1). Accept any other appropriate response.	**(3)**

Question number	Answer	Mark
4(d)	**AO3 (2 marks) /AO4 (2 marks)** Award 1 mark for identification of data analysis technique used and a further mark for development through further description or exemplification. • I calculated the mean (1) to try and smooth out any variations in the data (1). • I created a scattergraph of bedload size and velocity to be able to analyse the data for any correlations (1) and identify anomalies/outliers (1). • I used Spearman's rank correlation (1) to be able to indicate any strong or weak correlations between my data on discharge and bedload (1). • Calculated a percentage (1) which means different sets of data can be compared (1). • Calculated the interquartile range (1) to remove the outliers in the data (1). Accept any other appropriate response.	**(4)**

Question number	Answer indicative content
4(e)	**AO3 (4 marks) AO4 (4 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the level based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. This question is about the candidates being able to evaluate whether the data collection methods used were effective in helping the student achieve their aim. • At level 1 candidates will likely describe the data collection methods that are used and may make simple statements about how they can be used for analysis at the top of the level. • At level 2 candidates may describe all of the techniques used as well as making simple statements about how they could be used to by the candidate to reach their aim. • For level 3 candidates would be expected to make a judgement on the suitability of the collection methods and how they would support the analysis for the student to be able to achieve their aim. **AO3** • Recognition of limitations in the data collection/sampling techniques may be flawed in terms of the number of sites and the time of year. • Recognition that the data collection methods used are appropriate to support a range of data presentation methods. • Reliability and accuracy of the student's methods may be evaluated with reference to the potential evaluation, including equipment errors and operator errors. • Recognition of sampling strategy e.g. random, stratified and/or systematic is important, and could have affected data collected. • An evaluation of how far the student's data collection methods would also depend on the accuracy of how they were carried out could also be included.

	AO4 • In this response there would be an expectation for the students to evaluate the different data collection methods and how they relate to later stages of the enquiry (data analysis and reaching conclusions). • Students should look to identify the appropriateness of data collection methods. • There could be an evaluation of the lack of secondary data to support primary data. • A view could be given on how successful or unsuccessful the data collection methods were and how they could be improved to help students gather more effective results.

Question number	**Answer**	
Level	**Mark**	**Descriptor**
	0	No rewardable material.
Level 1	**1–3**	• Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements that are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (AO4)
Level 2	**4–6**	• Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)
Level 3	**7–8**	• Applies understanding to deconstruct information and provide logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

4(a)	**AO4 (2 mark)** Award 1 mark for identifying a relevant data presentation type and a further mark for development up to a maximum of two marks. • Used pie charts (1) to show sediment shape data (1) • Used bar graphs (1) to show sediment size data (1) • Used land use map (1) to show different geology (1) Accept any other acceptable response.	**(2)**

Question number	Answer	Mark
4(b)	**AO3 (2 marks) / AO4 (1 mark)** Award 1 mark for the initial explanation and 2 marks for further explanation up to a maximum of 3 marks. • Using data from other investigations carried out along the same river could be unreliable (1) as we do not know how accurately the previous groups collected the data (1) making comparisons to own data inaccurate (1). • Using topographic maps of the drainage basin could be difficult to identify the exact location of the study sites (1) meaning the incorrect geology could be identified (1) making comparing data sets unreliable (1). Accept any other acceptable response.	**(3)**

Question number	Answer	Mark
4(c)	**AO3 (2 marks) / AO4 (2 marks)** Award 1 mark for the identification of an improvement and a further mark for explanation up to a maximum of two marks each. • Use a calliper (1) to measure the size of pebbles to avoid errors (1). • Ensure the tape measure is pulled straight (1) when measuring width of channel to ensure length recorded is correct (1). • Ensure the same person uses the clinometer (1) at every site to reduce errors in angle recorded (1). • Ensure a group of students agree the shape of pebbles (1) as judgement is subjective (1). • Take more measurements (1) to reduce the influence of anomalies (1) Accept any other appropriate response.	**(4)**

Question number	Answer	Mark
4(d)	**AO3 (2 marks) / AO4 (1 mark)** Award 1 mark for the initial explanation and 2 marks for further explanation up to a maximum of 3 marks. • The river gradient decreased (1) as vertical erosion decreases (1) and lateral erosion increases in the middle/lower course (1). • The pebble shape became more rounded (1) as a result of attrition (1) as you travel downstream (1). • The velocity increased downstream (1) because more tributaries join the main channel (1) increasing the volume of water (1). • Channel width increases (1) as lateral erosion increases (1) at sites further downstream (1). Accept any other appropriate response.	**(3)**

Question number	Answer	Mark
4(e)	**AO3 (4 mark)/AO4 (4 mark)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the level-based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive, and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. This question is about evaluating the reliability of the students conclusions. Candidates will need to be able to identify the limitations in the methods and conclusion reached in the investigation and decide how this affects the validity of the conclusion reached. **AO3** • The Bradshaw model suggests that discharge and velocity in a river increase downstream. • Random sampling may not ensure that there is enough variation in sites chosen to fully represent changes along a rivers long profile. • The data was collected during spring which would mean unreliable results as discharge and velocity change during the year. • Students did not repeat measurements meaning averages could not be calculated which can increase the influence of anomalies on their results. • Students should have visited the river at different	

	times of year to get more accurate data about width and velocity. • The students should have collected data on depth of river. • The students conclusion does not fit the Bradshaw model suggesting there is an error making their conclusion less reliable. **AO4** • The three sites along the river are all located close together (likely all in the middle course). • Site 2 has the widest width and highest velocity. • Site 1 has the narrowest width and lowest velocity. • Site 3 is closest to the lower course (lowlands) but has a smaller width and lower velocity.	
		(8)

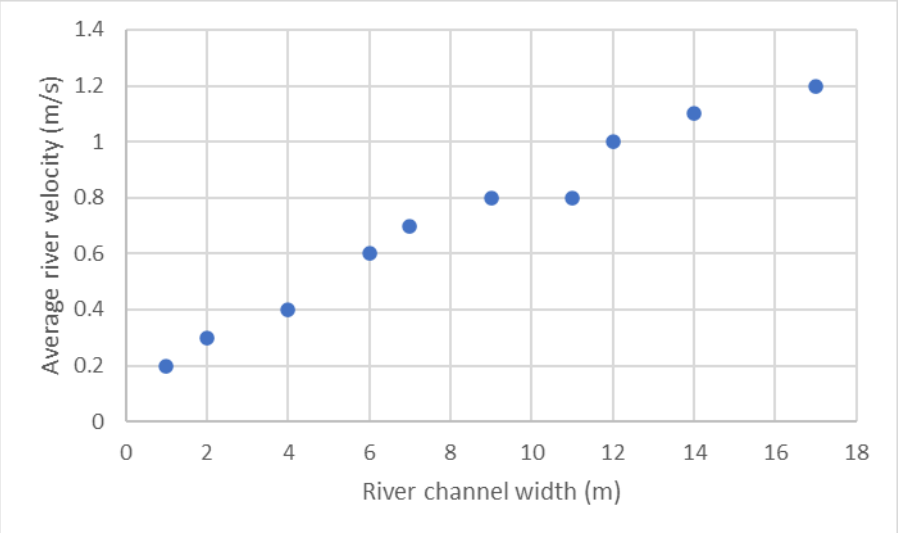
Question number	**Answer**	
Level	**Mark**	**Descriptor**
	0	No rewardable material.
Level 1	**1–3**	• Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements that are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (AO4)
Level 2	**4–6**	• Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)
Level 3	**7–8**	• Applies understanding to deconstruct information and provide logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

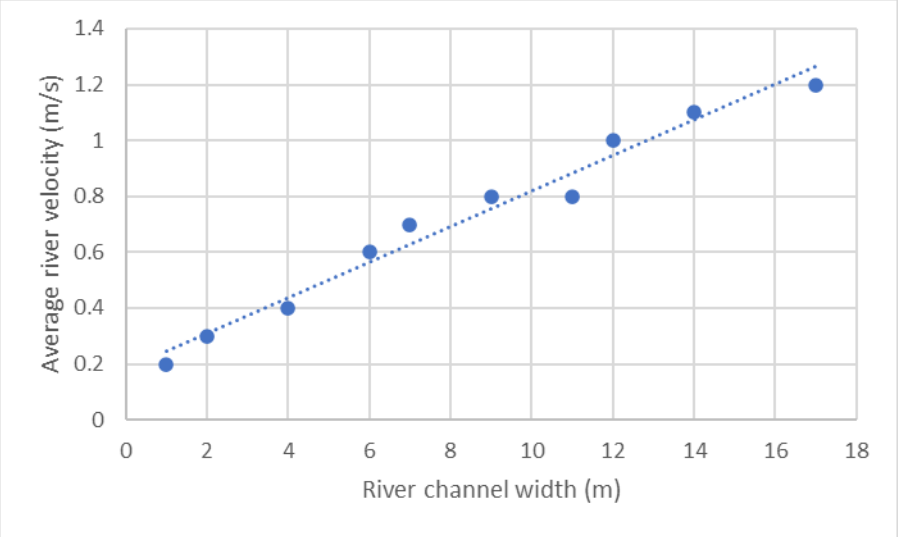
Question number	**Answer**	**Mark**

4(a)(i)	**AO3 (1 mark)** **B** (Clinometer) Cannot be A (sediment size), C (direction) or D (distribution).	**(1)**

Question number	Answer	Mark
4(a)(ii)	**AO3 (1 mark)** • Slipping (1) • Falling into water (1) • Coming into contact with dirty water (1) • Getting cold (1) • Getting lost (1) • Heavy rain / strong winds (1) • River too deep / fast moving (1) Accept any other acceptable response.	**(1)**

Question number	Answer	Mark
4(b)	**AO4 (2 marks)** Award 1 mark for correct method of working with correct figures and 1 mark for correct answer. 63-5 = 58cm	**(2)**

Question number	Answer	Mark
4(c)(i)	**AO4 (2 marks)** Award 1 mark for each correct plot. 	**(2)**

Question number	Answer	Mark
4(c)(ii)	**AO4 (1 mark)** Award 1 mark for correct line of best fit drawn. The line drawn needs to have at least 3 plots above the line of best fit and 3 plots below the line of best fit drawn for credit OR be drawn through at 3 data plots for credit.  **No credit for curved line of best fit.**	(1)

Question number	Answer	Mark
4(c)(iii)	**AO3 (1 mark)/AO4 (1 mark)** Award 1 mark (AO4) for initial point and a further mark for development (AO3) up to a maximum of two marks. • There is a positive correlation between width and velocity (1) because more lateral erosion occurs (1). • As velocity increases so does width (1) because there is less friction which increases erosion (1). • As one increases so does the other because there is more erosion (1) as the water has more energy (1). Accept any other acceptable response.	(2)

Question number	Answer	Mark
4(d)	**AO3 (3 marks)** Award 1 mark for initial point and a further mark for development up to a maximum of two marks. • Students may find it useful to collect data on sediment size (1) as a higher discharge is likely to increase erosion (1) to see if they get smaller downstream (1). • Students could collect data on sediment shape (1) as you would expect sediment to become more rounded (1) further downstream as it has been transported further (1). • Students could do a field sketch at each site (1) as it can be useful to have qualitative data collection (1) which will help them to remember the features of the river landscape (1). Accept any other acceptable response.	(3)

Question number	Answer	Mark
4(e)	**AO3 (4 marks)/AO4 (4 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the level-based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive, and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. This question is about evaluating the accuracy and reliability of the student's own data collection methods. The candidate needs to evaluate the strengths and weaknesses of several different data collection techniques they used in their enquiry and reach a judgement on how effective their data collection was overall. **AO3** • Accuracy is about how correct or incorrect the data written down is. • Reliability is about how dependable the data collected is and often relates to having a big enough sample size to make a judgement. • Data collection techniques are the methods adopted when collecting data. • There are different sampling strategies which have a range of advantages and disadvantages that need to be considered to increase reliability. • Consideration of different equipment errors and the	(8)

	impact these might have had on accuracy of data. • Consideration of the number of sites and samples taken and the impact these might have on reliability. • A judgement about which techniques were reliable and/or accurate. • A judgement about overall accuracy and reliability of data collection techniques. **AO4** • Detail about the specific sampling strategies used of their own data collection techniques. • Detail about the site selection for enquiry. • Detail about the sample size for each set of data collected. • Detail about the equipment used for each technique. • Detail about rationale for taking more than one reading for a data type.	

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	**1–3**	• Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements that are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (AO4)
Level 2	**4–6**	• Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)
Level 3	**7–8**	• Applies understanding to deconstruct information and provide logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

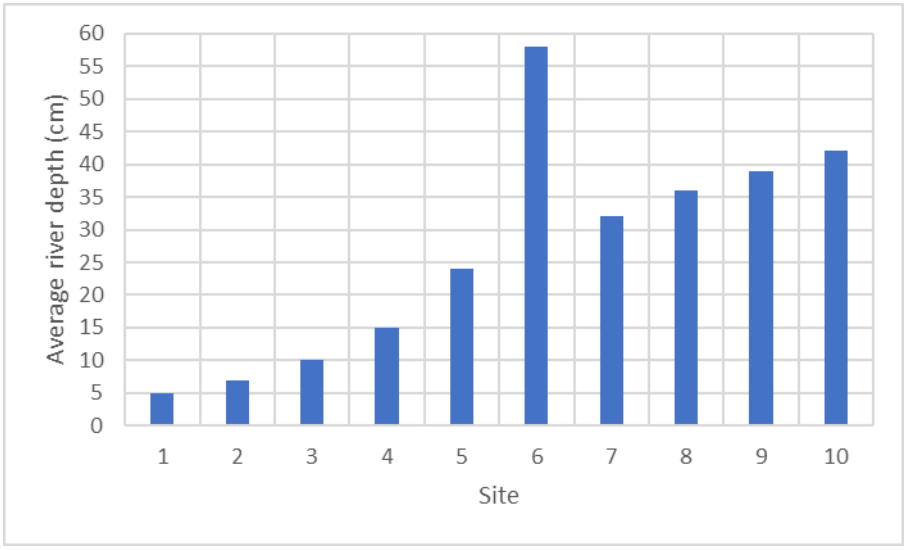
Question number	Answer	Mark

4(a)(i)	**AO1 (1 mark)** **B** (information collected by other people) Cannot be A, C or D (primary data)	**(1)**

Question number	Answer	Mark
4(a)(ii)	**AO1 (1 mark)** Award one mark for any of the following: • Field sketch (1) • Photograph (1) • Open question survey/questionnaire (1) • Interviews/focus groups (1) Accept any other acceptable response.	**(1)**

Question number	Answer	Mark
4(b)	**AO3 (1 mark)/AO4 (1 mark)** Award 1 mark (AO4) for initial point and a further mark for development (AO3) up to a maximum of two marks. • There is a risk of slipping (on rocks on the riverbed) (1) which can cause injury (1). • There is a risk of cutting hand (on rocks) (1) which can cause infection (1). • Standing in cold water (1) as it can lead to hypothermia (1). Accept any other acceptable response.	**(2)**

Question number	Answer	Mark
4(c)	**AO4 (2 marks)** Award 1 mark for correct method of working with correct figures and 1 mark for correct answer. 5 , 12 , 17 , 20 , 21 , 31 , 31 , 31 , 40 , 40 21+31 = 52 / 2 = 26 Answer = 26 cm	**(2)**

Question number	Answer	Mark
4(d)(i)	**AO4 (2 marks)** Award 1 mark for each correct plot. 	(2)

Question number	Answer	Mark
4(d) (ii)	**AO4 (1 mark)** Award one mark for any of the following: • (Site) 6 (1)	(1)

Question number	Answer	Mark
4(d)(iii)	**AO4 (3 marks)** Award 1 mark (AO4) for initial point and further marks for evidence (AO4) up to a maximum of three marks. • Human error (1) where the student has not held the meter ruler vertical (1) increasing the depth data (1). • The student may not have held the ruler perfectly vertical (1) this will have increased the number on the ruler (1) leading to the incorrect depth being recorded (1). • The student may have collected data from a river cliff (1) leading to higher erosion than normal (1) increasing the depth of data recorded (1). • The student may have collected data in an area of high littering forming a dam (1) this would have formed a pool of water behind the dam (1) increasing the depth of the water in the channel (1).	(3)

	• Uneven riverbed (due to rocks) (1) causes ruler to be placed in a hollow (1) which increases data recorded for depth (1). Accept any other acceptable response.	

Question number	Answer	Mark
4(e)	**AO3 (4 mark)/AO4 (4 mark)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the level-based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive, and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. This question is about evaluating the reliability of the students own conclusions. The candidate needs to evaluate the strengths and weaknesses of several sets of data in order to determine the reliability and accuracy of their conclusion. This should include judgement on influence of anomalies and the extent to which data fits known theories or trends. **AO3** • Accuracy is about how correct or incorrect the data written down is. • Reliability is about how dependable the data is and often relates to having a big enough sample size to reach a conclusion. • Conclusions can be determined by the extent to which the results fit a geographical theory. • Data collection techniques are very important in determining accuracy of conclusions. • There are different sampling strategies which have a range of advantages and disadvantages that need to be considered when reaching a conclusion. • Consideration of different equipment errors and the impact these might have had on accuracy of data. • Consideration of ways the accuracy of the conclusions could have been improved. • Conclusions should make a judgement about the presence of anomalies and whether they be included or excluded from the analysis. • A judgement about which techniques were reliable and/or accurate. • A judgement about overall accuracy of conclusion drawn. **AO4** • Detail about overall conclusions drawn from own enquiry. • Detail about the specific sampling strategies used of	**(8)**

	their own data collection techniques. • Detail about the site selection for enquiry. • Detail about the sample size for each set of data collected. • Detail about the equipment used for each technique. • Detail about rationale for taking more than one reading for a data type. • Detail about anomalies in own results.	

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	**1–3**	• Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements that are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (AO4)
Level 2	**4–6**	• Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)
Level 3	**7–8**	• Applies understanding to deconstruct information and provide logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

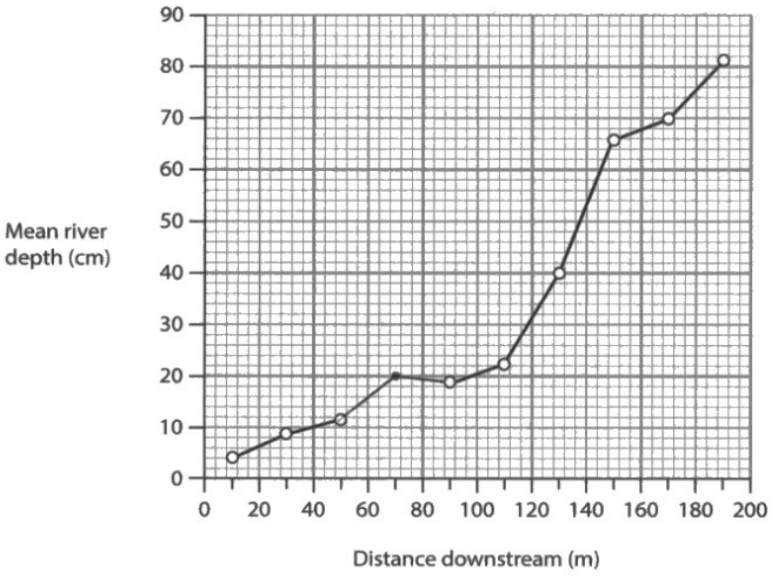
Question number	Answer	Mark

Question 4

Question number	Answer	Mark
4(a)	**AO3 (1 mark)** Award 1 mark for a suitable piece of equipment for investigating river environments. • Stopwatch (1) • Ruler / tape measure (1) • Hydro prop / flow meter / dog biscuit (1) • Ranging pole (1) • Clinometer / angle measurer (1) • Calliper / Power's Index Scale / roundness scale (1) • Compass (1) Accept any other acceptable response. **No credit for stationery e.g. pen/paper**	**(1)**

Question number	Answer	Mark
4(b)	**AO3 (2 marks)/AO4 (2 marks)** Award 1 mark (AO3) for initial point and a further mark for development (AO4) up to a maximum of two marks. Advantage: • Field sketches help us remember the place (1) which can help to interpret data (1). • Field sketches allow for key features to be highlighted (1) which helps to explain data (1). • Field sketches allow notes to be added at the time of drawing (1) which helps to understand the environment being sketched (1). • Field sketches can be used to visualise the landscape before visiting (1) to help plan where to collect the data (1). Disadvantage: • Field sketches take more time than photographs (1) which can be a challenge if in a rush (1). • Field sketches cannot show change over time (1) which can bias your findings if it is completed at a certain time of year (1). • Field sketches are not drawn to scale (1) making it less accurate (1). • Field sketches are subjective (1) so may miss key details compared to someone else drawing it (1). Accept any other acceptable response.	**(4)**

Question number	Answer	Mark
4(c)	**AO4 (2 marks)** Award 1 mark for correct method of working with correct figures and 1 mark for correct answer. • (0.8-0.1 = 0.7) 0.7/0.1 x 100 = • = 700% (1) **Note**: figures in brackets as first part of method are not required for first mark.	**(2)**

Question number	Answer	Mark
4(d) (i)	**AO4 (2 marks)** Award 1 mark for correct plot and second mark for joining points.  	**(2)**

Question number	Answer	Mark
4(d)(ii)	**AO3 (1 mark)/AO4 (1 mark)** Award 1 mark for initial point and a further mark for development up to a maximum of two marks. • Depth increases downstream (1) as there is higher velocity (1). • Depth increases downstream (1) at 10m depth was 4cm and at 130m depth is 40cm (1). Accept any two correct pairs of data to demonstrate the relationship. • Depth increases downstream (1) as more tributaries join upstream increasing discharge (1). • Rivers begin shallow and get deeper (1) as the discharge increases (1). Accept any other acceptable response.	**(2)**

Question number	Answer	Mark
4(d)(iii)	**AO3 (1 mark)** **B** (data that does not fit the pattern) Cannot be A (quantitative), C (distribution) or D (trend).	**(1)**

Question number	Answer	Mark
4(e)	**AO3 (4 marks)/AO4 (4 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the level-based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive, and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. This question is about evaluating the effectiveness of planning their sampling for data collection. The candidate needs to evaluate the strengths and weaknesses of their site selection and sampling strategies to reflect on the reliability of their conclusion. **AO3** • Consideration to location and number of sites chosen for data collection. • It may be important to ensure key features of the area are represented in data collected. • Sites need to be easily accessible. • There are three main sampling strategies – systematic, random, stratified. • Random sampling removes bias from data collected. • Random sampling can lead to poor representation in data. • Systematic sampling ensures good coverage of sample area. • Systematic sampling is more biased as not all areas have equal chance of being selected. • Stratified sampling can be more representative. • Stratified sampling is difficult if sub-sets are not accurate/known. • A judgement about how site selection and sampling strategies helped to answer their enquiry title. **AO4** • Detail about the specific way they chose their sites in relation to collecting accurate/reliable data. • Detail about how many sites were selected and why this number of sites was chosen. • Detail about the sampling strategies used for each type of data collected and why this strategy was chosen. • Detail about any limitations in their chosen site and sampling strategies. • Detail about whether they could answer their hypothesis/predictions/enquiry questions.	**(8)**

	• Detail about specific mitigation strategies used to ensure data collected was reliable and accurate. • Detail about what conclusion were reached.	

Question number	Answer	
Level	**Mark**	**Descriptor**
	0	No rewardable material.
Level 1	**1–3**	• Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements that are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (AO4)
Level 2	**4–6**	• Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)
Level 3	**7–8**	• Applies understanding to deconstruct information and provide logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

4(a)	**AO4 (2 marks)** Award 1 mark for identifying a relevant sampling technique and a further mark for development up to a maximum of two marks. • Random sampling (1) using a random number generator to select our sites (1). • Systematic sampling (1) to measure every 20 m (1). • To measure at equal intervals (1) by measuring the width and dividing by 10 (1) • Opportunistic sampling (1) to pick sites which can be accessed (1). • Stratified sampling (1) to choose sites at different courses of the river (1). Accept any other acceptable response.	**(2)**

Question number	Answer	Mark
4(b)	**AO3 (2 marks) / AO4 (1 mark)** Award 1 mark for the initial variable identified and 2 marks for further explanation up to a maximum of 3 marks. • I measured the river depth (1) at three intervals across the channel (1) to get an average depth from bank to bank (1). • I measured the gradient of the channel (1) at three sites along the river (1) to determine if the river became more gently sloping (1). • I completed sediment shape analysis (1) using the Power's index scale (1) to identify where the rounded pebbles were found (1). Accept any other acceptable response.	**(3)**

Question number	Answer	Mark
4(c)	**AO3 (2 marks) / AO4 (2 marks)** Award 1 mark for the identification of a variable used to present data and a further mark for explanation up to a maximum of two marks each. • Presented gradient data (as a line graph) (1) as this is continuous data (1).	

	• Presented pebble shape (as pie charts) (1) this made it easy to compare differences at different sites (1). • Presented pebble size (as stacked/compound/divided bar graph) (1) to present both total number of pebbles measured and number each size for each site (1). • Cross section graph to show both depth and width (1) which made it easy to visualise the changes at each site (1).	**(4)**

Question number	Answer	Mark
4(d)	**AO3 (2 marks) / AO4 (1 mark)** Award 1 mark for the initial explanation and 2 marks for further explanation up to a maximum of 3 marks. • The bigger your data sample the more representative it will be (1) this means you are more likely to get the same results (1) if you repeat the investigation (1). • More data means you reduce the influence of outliers (1) but working out interquartile range (1) giving a more reliable dispersion of data (1). • Having more data means you are less likely to miss a key characteristic of the environment (1) as your samples are collected close enough together (1) to ensure small changes are recorded (1). • Have more pebbles sampled will avoid anomalies (1) from pebbles thrown/moved by animals/people (1) affecting your central tendency values (1).	**(3)**

Question number	Answer	Mark
4(e)	**AO3 (4 marks)/AO4 (4 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the level-based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive, and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. This question is about evaluating the validity of the hypothesis proposed. The candidate needs to evaluate the strengths and weaknesses of the information shown in the secondary data source and make a judgement about feasibility of the hypothesis proposed. **AO3** • Topographical maps show relief of the landscape.	**(8)**

	• Secondary sources can be out of date making information less reliable. • Secondary sources will not show the exact sites the primary data is collected from. • Time of year can affect the environment making primary and secondary sources very different. • It is difficult to determine if secondary data was collected accurately. • Tributaries joining the river will increase the discharge and velocity. • Rivers flowing through urban areas may experience withdrawals affecting discharge. • Rivers flowing through urban areas may be managed using hard engineering which alters natural processes. • The hypothesis mentions velocity but this is not shown on the secondary source at all making it less valid. • Small changes in gradient would suggest very little change along the river in depth, width, velocity and discharge. • The secondary data does show a change in width and depth suggesting this part of the hypothesis is valid. • The hypothesis is less suitable as the river appears widest on the upper site on the map. **AO4** • Figure 4 shows that the river from source to mouth. • Figure 4 shows the depth increases by 0.4 m. • Figure 4 shows the width increases by 14.1 m. • Figure 4 shows a tributary joins the river before it reaches the mouth. • Figure 4 shows the relief decreases by 9 m from source to mouth. • Figure 4 shows the river flows through a built up area. • Figure 4 shows the river on the map appears wider at the source than the river downstream river.	

Question number	**Answer**	
Level	**Mark**	**Descriptor**
	0	No rewardable material.
Level 1	**1–3**	• Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements that are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (AO4)

Level 2	**4–6**	• Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)
Level 3	**7–8**	• Applies understanding to deconstruct information and provide logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

QUESTION 5

Question number	Answer	Mark

4(a)	**AO4 (2 marks)** Award 1 mark for identifying a relevant risk and a further mark for development up to a maximum of two marks. • Slipping on wet/uneven ground (1) causing injury (1). • Water entering cuts (1) causing infection (1). • Getting lost (1) leading to distress/anxiety (1). • Getting wet and cold (1) causing hyperthermia (1). • Getting lost (1) so stayed in groups (1). • Slipping on rocks (1) so wore appropriate footwear/trainers/shoes with good grip (1). Accept any other acceptable response.	**(2)**

Question number	Answer	Mark
4(b)	**AO3 (2 marks) / AO4 (1 mark)** Award 1 mark for the initial data collection method and 2 marks for further explanation up to a maximum of 3 marks. • I measured gradient from upper to lower course (1) using a clinometer to measure the angle of slope (1) to see the difference downstream (1). • I measured the channel depth with a meter ruler (1) at three points along the width (1) to measure cross sections for each site (1). • I selected 10 pebbles at each site randomly (1) and measured their longest axis (1) to see size changes downstream (1). • I selected 10 pebbles at each site (1) and recorded their shape (1) to see shape changes downstream (1). • I took photographs (1) to create a visual record of the channel changes downstream (1) remember the features of the landscape at each site (1). Accept any other acceptable response.	**(3)**

Question number	Answer	Mark
4(c)	**AO3 (2 marks) / AO4 (2 marks)** Award 1 mark for the identification of a factor that increases accuracy and a further mark for explanation up to a	

	maximum of two marks each. • Used a protractor to draw the proportions on pie charts (1) to ensure the degrees equaled 360 (1). • Used a ruler to draw bars (1) to ensure each bar was the same width (1). • Used a consistent scale on the y axis (1) to ensure height/size was not distorted (1). • Ensured axis begun at zero (1) to avoid distorting the pattern on the graph (1). • Used a computer / Excel to plot data (1) to ensure points on the line graph were placed accurately (1).	**(4)**

Question number	Answer	Mark
4(d)	**AO3 (2 marks) / AO4 (1 mark)** Award 1 mark for the initial explanation and 2 marks for further explanation up to a maximum of 3 marks. • Not ensuring the measuring tape is pulled tight (1) results in the incorrect distance being measured (1) making it longer or shorter (1). • Dropping the cork into the water at a different time (1) to when the stopwatch is started (1) will result in the time recorded being incorrect (1). • Placing the ruler on a raised area of riverbed (1) can result in a smaller depth being recorded (1) which is not representative (1). • Not calibrating equipment (1) could mean it produces incorrect readings (1) which are not noticed (1). • There were no anomalies in my data (1) because I used calibrated equipment (1) ensuring accuracy of my data (1). • Starting the stopwatch late (1) due to human error (1) meant the first seconds (of the orange moving) were missed (1). Accept any other acceptable response.	**(3)**

Question number	Answer	Mark
4(e)	**AO3 (4 marks)/AO4 (4 marks)** **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the level-based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive, and	**(8)**

	candidates are not required to include all of it. Other relevant material not suggested below must also be credited. This question is about evaluating the how well the secondary data supported the students' conclusion. The candidate needs to evaluate the strengths and weaknesses of the information shown in the secondary data source and make a judgement about the validity of the conclusion drawn. **AO3** • Topographical maps show relief of the landscape. • Secondary sources can be out of date making information less reliable. • Secondary sources will not show the exact sites the primary data is collected from. • Time of year can affect the environment making primary and secondary sources very different. • It is difficult to determine if secondary data was collected accurately. • Rivers flowing through urban areas may be managed using hard engineering which alters natural processes. • Erosion and deposition influence the features of meanders. • Climate can influence the rate of erosion and deposition. • The conclusion reached states very little change which is inaccurate making it less valid. **AO4** • Figure 4 shows that the three biggest meanders remain in a similar position. • Figure 4 shows that the land use along this stretch of river has not changed much. • Figure 4 shows an area of steep land to the north of the river. • Figure 4 shows an area of flat land to the south of the river. • Figure 4 shows an area of braided river (3 channels) which has disappeared. • Figure 4 shows the river channel route has changed most furthest west in the images.	

Question number	**Answer**	
Level	**Mark**	**Descriptor**
	0	No rewardable material.
Level 1	**1–3**	• Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements that are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited

		relevance and accuracy, which supports few aspects of the argument. (AO4)
Level 2	**4–6**	• Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)
Level 3	**7–8**	• Applies understanding to deconstruct information and provide logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

QUESTION 5

Question number	Answer	Mark