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EDEXCEL GCSE BIOLOGY: QUESTIONS BY TOPIC

Cells and Control (2)

GCSE Biology (Higher) Topic 2

18 questions · 178 marks · Mark schemes included

Pearson Edexcel GCSE (9-1) Biology 1BI0, Higher Tier, June 2018 - June 2025

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HOW TO USE THIS BOOKLET

Questions run from the lowest mark tariff to the highest, so similar questions sit together.

Click any row below to jump straight to that question.

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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QUESTIONS

18 questions · 178 marks · lowest tariff first



6-MARK QUESTIONS

2 questions in this booklet



1 Figure 1 shows an eye.

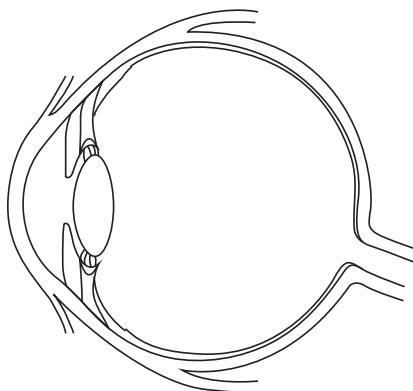


Figure 1

(a) (i) When the eye changes from focusing on a distant object to focusing on a near object (1)

- ☐ A the lens gets thinner to bend the light rays more
- ☐ B the lens gets thicker to bend the light rays more
- ☐ C the lens gets thinner to bend the light rays less
- ☐ D the lens gets thicker to bend the light rays less

(ii) Give a reason why people who are short-sighted cannot see distant objects clearly. (1)

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2



DO NOT WRITE IN THIS AREA

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(iii) State the type of lens that can be used to correct short-sightedness.

(1)

(b) A student was given the hypothesis 'People with brown eyes are more likely to be short-sighted than people with blue eyes.'

Devise a plan to test this hypothesis.

(3)

(Total for Question 1 = 6 marks)



1 (a) Figure 1 shows a diagram of the human eye.

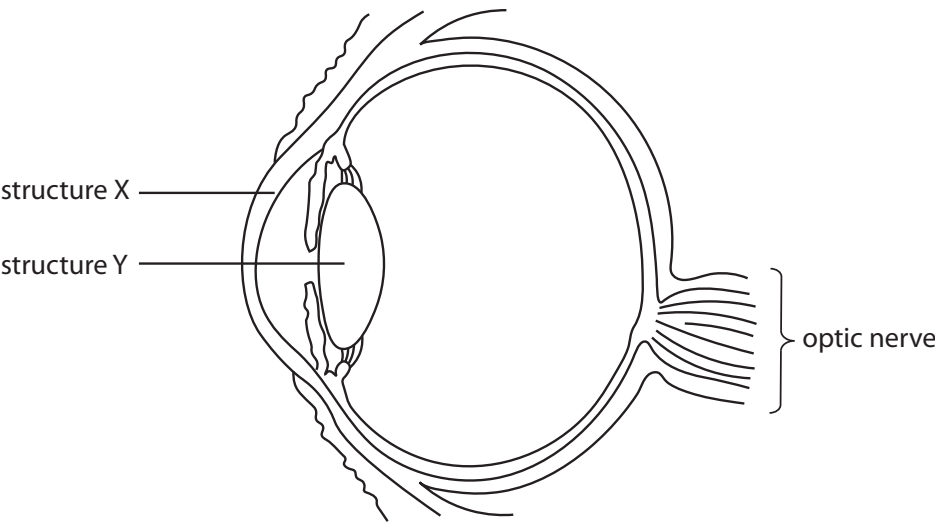


Figure 1

(i) Which row in the table gives the function of structure X and structure Y?

(1)

		function of structure X	function of structure Y
☒	A	refracts light	detects light
☒	B	detects light	refracts light
☒	C	reflects light	detects light
☒	D	refracts light	refracts light

(ii) Describe the changes that occur in the eye when a bright light is directed into the eye.

(2)

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(b) Eye tests can detect some brain tumours.

(i) State **one** other way that brain tumours can be detected.

(1)

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(ii) Describe why a brain tumour is difficult to treat.

(2)

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(Total for Question 1 = 6 marks)



7-MARK QUESTIONS

1 question in this booklet



- 1 (a) Figure 1 shows a percentile chart for the height of boys from age 2 to age 16.

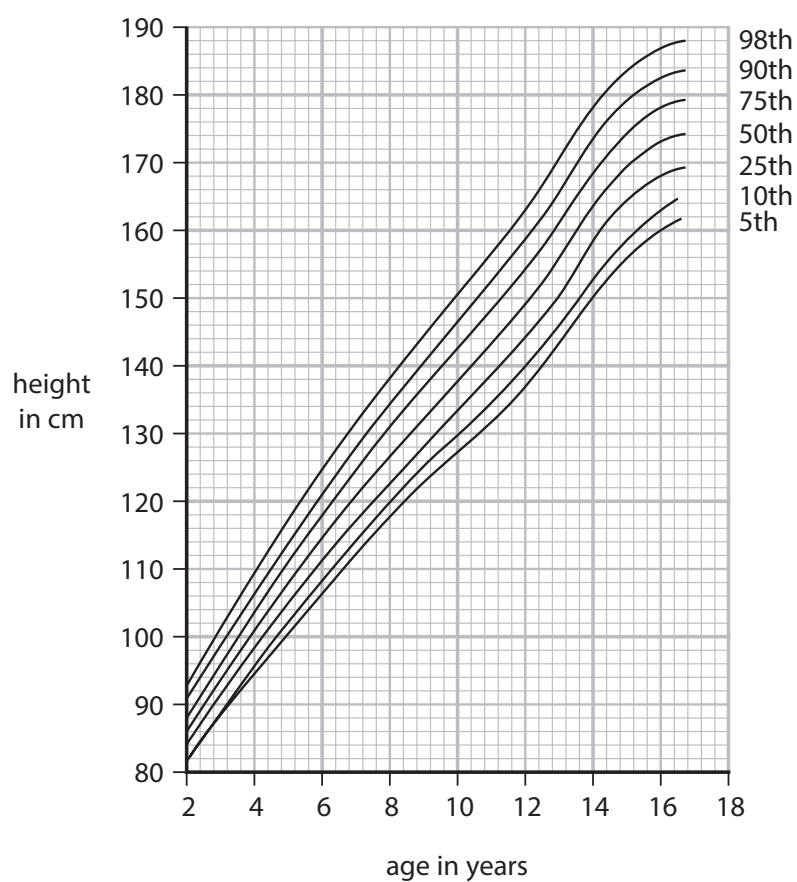


Figure 1

- (i) Which is the height of an 8-year-old boy on the 10th percentile?

(1)

- ☐ A 118 cm
☐ B 120 cm
☐ C 128 cm
☐ D 130 cm

(ii) The height of a 4-year-old boy was 94 cm.

Two years later, his height was 106 cm.

Using Figure 1, explain the conclusion that can be made about the growth of this child.

(2)

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(b) Fats are needed for energy.

(i) Describe how a sample of food can be tested to show that it contains fat.

(2)

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(ii) Which is produced when fats are digested?

(1)

- ☐ A amino acids
- ☐ B fatty acids
- ☐ C glucose
- ☐ D starch

(c) State what calorimetry is used to measure.

(1)

.....

(Total for Question 1 = 7 marks)



9-MARK QUESTIONS

4 questions in this booklet



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- 6 (a) In 2012, two scientists were awarded the Nobel prize for their research on stem cells.

They showed that adult cells could be reprogrammed to become cells with the properties of embryonic stem cells.

Describe the possible benefits of this research.

(3)



19



(b) Figure 11 shows four stages of mitosis, labelled P, Q, R and S.

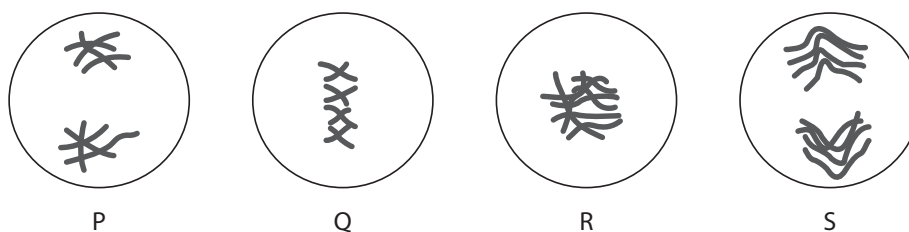


Figure 11

(i) Which is the correct order for these stages?

(1)

- ☒ A $Q \rightarrow R \rightarrow S \rightarrow P$
- ☒ B $R \rightarrow Q \rightarrow S \rightarrow P$
- ☒ C $R \rightarrow S \rightarrow Q \rightarrow P$
- ☒ D $Q \rightarrow S \rightarrow R \rightarrow P$

(ii) The stage of mitosis labelled S in figure 11 is

(1)

- ☒ A anaphase
- ☒ B prophase
- ☒ C telophase
- ☒ D metaphase

(iii) Interphase is part of the cell cycle.

Describe what happens during interphase.

(2)

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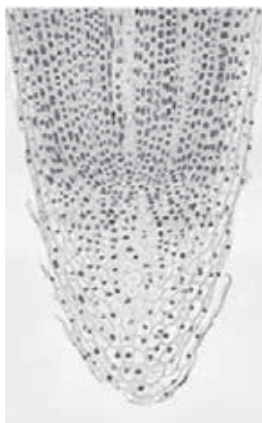


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(c) Figure 12 shows a root tip with cells in different stages of mitosis.

The image was magnified $400\times$.



© WIM VAN EGMOND/SCIENCE PHOTO LIBRARY

Figure 12

Explain how a magnification of $400\times$ can be obtained using the lenses on a light microscope.

(2)

(Total for Question 6 = 9 marks)

3 Figure 2 shows a banana plantation.



© warmer/Shutterstock

Figure 2

After the bananas have been harvested, the old plants are cut down.

The suckers then develop into mature plants producing the next crop of bananas.

The tip of each sucker contains a group of cells called a meristem.

(a) (i) Describe the function of a meristem in the growth of a plant.

(2)

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(ii) A student took a sample of cells from a meristem to view under a light microscope.

Describe how the student would prepare a microscope slide using these cells.

(3)

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(b) Figure 3 is a drawing of a eukaryotic cell.

Structure **Z** is found in plant leaf cells.

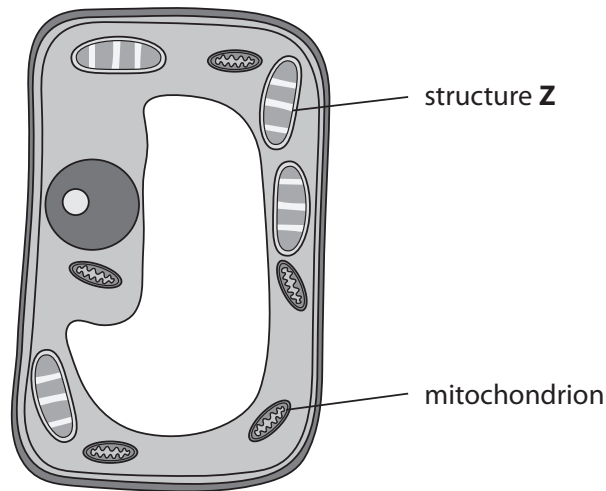


Figure 3

(i) Name structure **Z**.

(1)

(ii) Give **one** function of the mitochondrion.

(1)

(iii) Describe how a prokaryotic cell is different from the cell in Figure 3.

(2)

(Total for Question 3 = 9 marks)

- 2 (a) Figure 2 shows part of a reflex arc in the spinal cord.

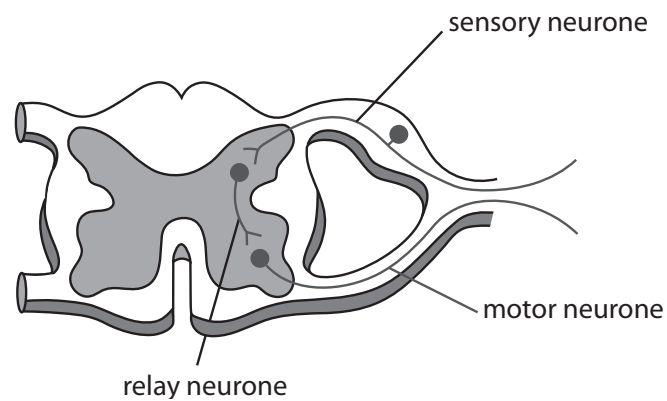


Figure 2

- (i) Describe how an impulse passes from the relay neurone to the motor neurone.

(3)

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- (ii) Explain the function of a reflex arc.

(2)

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- (b) A scientist investigated the reaction times of five students using a computer program.

The computer screen showed a blue square at the start.

As soon as the blue square turned yellow, each student had to press a key on the keyboard as fast as possible.

Figure 3 shows the results for the five students.

student	reaction time in milliseconds
1	245
2	200
3	210
4	215
5	225

Figure 3

- (i) Which is the median result for these students?

(1)

- ☐ **A** 200 milliseconds
- ☐ **B** 210 milliseconds
- ☐ **C** 215 milliseconds
- ☐ **D** 225 milliseconds

- (ii) The scientist wanted to investigate if the colours of the squares used on the computer program affected reaction time.

The computer program started with blue squares that turned into yellow squares.

Describe how the scientist could compare the reaction times of these students when they respond to red squares turning into yellow squares.

(3)

(Total for Question 2 = 9 marks)



- 6 (a) Figure 8 shows how alcohol consumption increases the risk of developing liver cancer.

Someone who does not drink alcohol has a 1.0 risk of developing liver cancer.

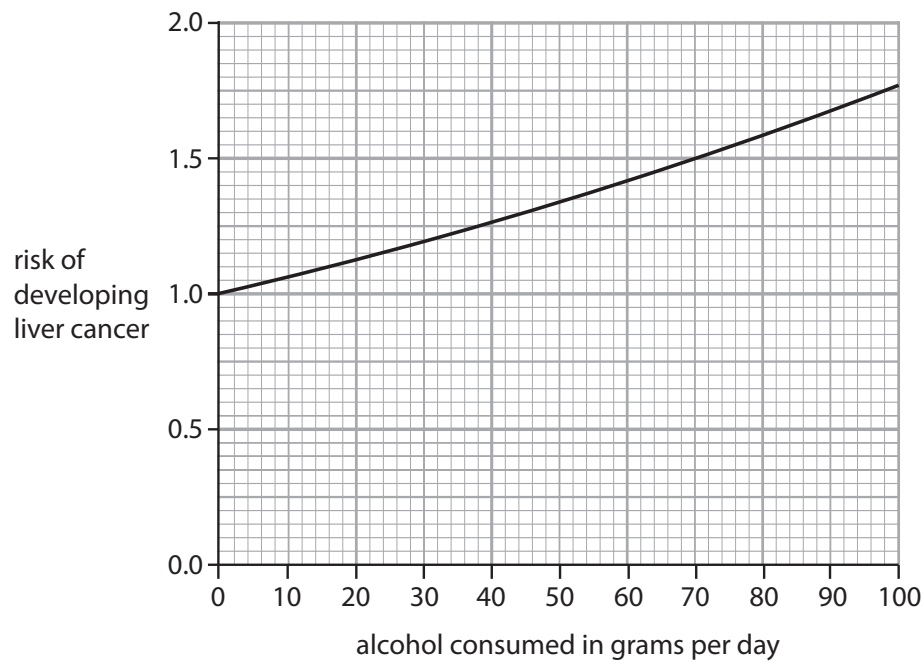


Figure 8

- (i) One unit of alcohol contains 8 grams of alcohol.

Calculate the risk of developing liver cancer for someone who consumes 4 units of alcohol a day.

(2)

..... risk of developing liver cancer

(ii) Describe how cancer develops in the liver.

(2)

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(b) Haemochromatosis is a disease that occurs when iron accumulates in the liver.

A person with haemochromatosis is treated by having 0.5 dm^3 of their blood removed each week.

This lowers the level of iron in their blood.

(i) Give **two** safety precautions needed when blood is removed from this person.

(2)

1

.....

2

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(ii) Haemochromatosis can be inherited.

Haemochromatosis occurs when a person inherits two copies of a recessive allele.

Figure 9 shows the inheritance of haemochromatosis in a family.



Figure 9

State and explain the genotype of female Z.

(3)

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(Total for Question 6 = 9 marks)

10-MARK QUESTIONS

1 question in this booklet



5 (a) Figure 8 shows a diagram of a mouse sperm cell.

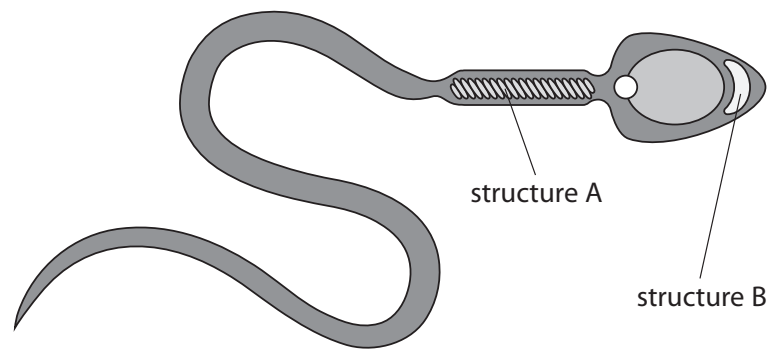


Figure 8

(i) Which row of the table shows the functions of structure A and structure B? (1)

	function of structure A	function of structure B
☐ A	releases energy	contains the genetic material
☐ B	produces glucose	contains digestive enzymes
☐ C	releases energy	contains digestive enzymes
☐ D	produces glucose	contains the genetic material

(ii) The diploid chromosome number for a mouse is 40.
State the number of chromosomes in a mouse sperm cell. (1)

.....

(b) After a mouse egg cell is fertilised, cell division produces a ball of genetically identical stem cells.

(i) Which is the correct order for the stages of one cell division?

(1)

- ☐ **A** metaphase → prophase → anaphase → telophase
- ☐ **B** prophase → metaphase → anaphase → telophase
- ☐ **C** anaphase → prophase → metaphase → telophase
- ☐ **D** prophase → anaphase → metaphase → telophase

(ii) The genetically identical stem cells produce the cells that develop into an embryo.

Describe how stem cells produce the cells of an embryo.

(2)

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- (c) Scientific research has made many discoveries and developments allowing stem cells to be used in medical treatments.

Figure 9 shows a timeline for some of these discoveries and developments.

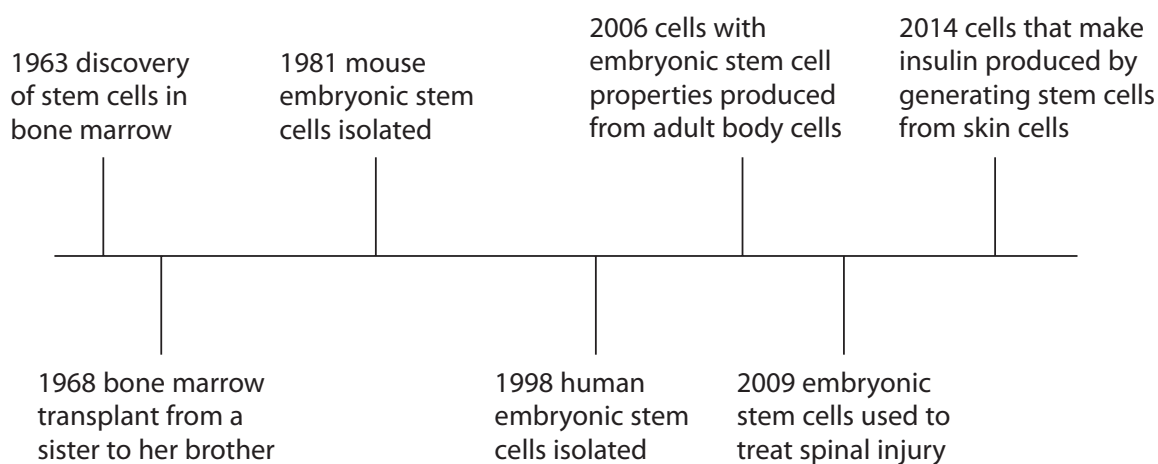


Figure 9

- (i) Give **one** scientific reason why the bone marrow transplant in 1968 was from a sister to her brother.

(1)

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.....

- (ii) Give **one** scientific reason why some people are opposed to the isolation of human embryonic stem cells.

(1)

.....

.....

- (iii) Stem cells, with the properties of embryonic stem cells, can be produced from a patient's own skin cells.

Discuss the benefits of using these stem cells to treat the patient.

(3)

(Total for Question 5 = 10 marks)

11-MARK QUESTIONS

7 questions in this booklet



- 9 Cancer Research UK found that many people do not realise that obesity is linked to an increased risk of developing cancer.

In the body, fat tissue sends signals that cause other cells to divide.

- (a) (i) Describe how this could cause cancer to develop.

(3)

- (ii) Cell division occurs during the cell cycle.

During which stage of the cell cycle is DNA replicated?

(1)

- ☐ A anaphase
- ☐ B prophase
- ☐ C interphase
- ☐ D telophase

- (iii) Obesity is linked to 1 in 20 cases of **all** types of cancer.

Approximately 13% of cases of bowel cancer are caused by obesity.

Determine how the impact of obesity on bowel cancer compares to the impact of obesity on all types of cancer.

(2)

(b) Two men have the same mass of 80 kg.

One man's BMI is categorised as normal weight, the other man's BMI is categorised as obese.

Explain why the men have different BMI values.

(2)

(c) Obesity can also cause cardiovascular disease to develop.

Describe the different treatments available for cardiovascular disease.

(3)

(Total for Question 9 = 11 marks)



- 10** (a) The UK driving test requires a person to be able to read a number plate at a distance of 20.5 metres.

Some people are short-sighted so cannot read the number plate at this distance.

Explain how a diverging lens corrects short-sightedness.

You may draw a diagram to help with your answer.

(2)

- (b) Colour blindness affects approximately 1 in 12 men.

In a city of 2 million people, 51% are men.

- (i) What is the number of men who are colour blind in the city?

(1)

- ☐ **A** 42 500
- ☐ **B** 85 000
- ☐ **C** 166 666
- ☐ **D** 1 020 000

(ii) Colour blindness is a sex-linked genetic disorder caused by a recessive allele.

Colour blindness only affects 1 in 200 women.

Explain why more men than women are colour blind.

(2)

(iii) A female without the allele for colour blindness has a baby boy.

The father is colour blind.

Explain the probability of the baby boy being colour blind.

(2)

(c) One cause of colour blindness is a change in the DNA sequence of a gene.

This results in the production of a different protein in cone cells in the retina of the eye.

Explain how a change in the DNA sequence of a gene can result in the production of a different protein.

(4)

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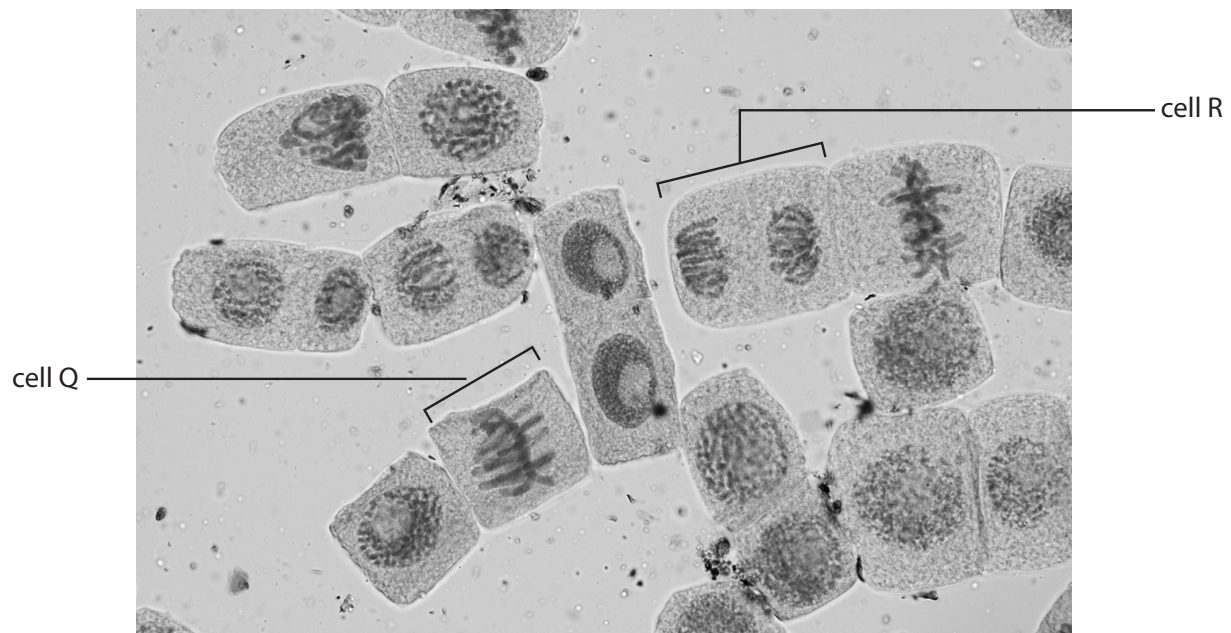
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(Total for Question 10 = 11 marks)



5 (a) Figure 7 shows cells from an onion root tip as seen using a light microscope.



(Source: © Rattiya Thongdumhyu/Shutterstock)

Figure 7

(i) Identify the stages of mitosis shown in cell Q and cell R.

(1)

	cell Q	cell R
☐ A	metaphase	anaphase
☐ B	telophase	anaphase
☐ C	metaphase	interphase
☐ D	telophase	interphase

(ii) Describe **two** processes that occur in cells during prophase.

(2)

- 1
- 2

(iii) State the term used to describe the process which occurs after mitosis, when the cell divides into two.

(1)

(iv) The diameter of one cell in Figure 7 is 0.075 mm.

Which is this diameter in μm ?

(1)

- ☐ **A** 0.75 μm
- ☐ **B** 75 μm
- ☐ **C** 750 μm
- ☐ **D** 75 000 μm

(b) A student placed a prepared slide on the stage of a light microscope.

Describe how to adjust the microscope to view the slide at a magnification of $\times 400$.

(2)

(c) Arthritis is a condition that occurs when cells in joints get damaged or destroyed.

Stem cell therapy can be used to treat arthritis.

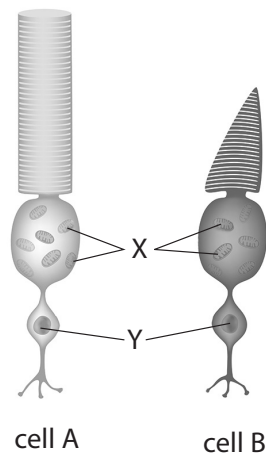
Discuss the benefits and risks of using stem cell therapy to treat arthritis.

(4)

(Total for Question 5 = 11 marks)



4 (a) Figure 3 shows two light receptor cells from the human eye.



(Source: © Kokhanchikov/Shutterstock)

Figure 3

(i) Which part of the eye contains light receptor cells?

(1)

- ☒ **A** cornea
- ☒ **B** iris
- ☒ **C** lens
- ☒ **D** retina

(ii) These cells require energy.

The cell organelles labelled X release energy during respiration.

Name the organelles labelled X.

(1)

(iii) The cell organelle labelled Y contains chromosomes.

Name the organelle labelled Y.

(1)

(iv) Cell A responds to dim light and is responsible for night vision.

Name cell A.

(1)

- (v) Describe how the role of light receptor cell B is different from the role of light receptor cell A.

(2)

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- (b) The optic nerve carries information from the back of the eye to the brain.

The optic nerve is 47 mm in length.

Nerve impulses travel at 75 metres per second.

- (i) Calculate the time an impulse takes to travel the length of the optic nerve.

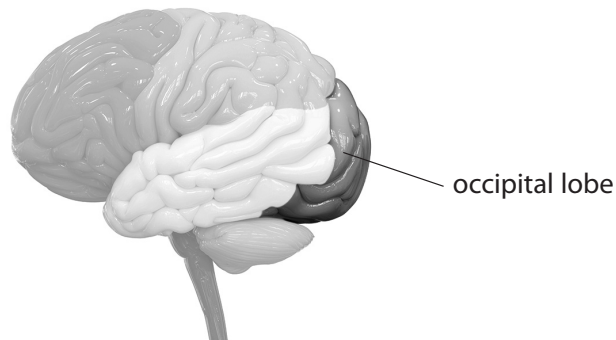
Use the equation: $\text{speed} = \frac{\text{distance}}{\text{time}}$

(3)

..... seconds



- (ii) The impulse travels to the occipital lobe of the brain.
The occipital lobe is labelled in Figure 4.



(Source: © Magic mine/Shutterstock)

Figure 4

Which part of the brain contains the occipital lobe?

(1)

- ☐ **A** cerebral hemispheres
- ☐ **B** medulla oblongata
- ☐ **C** cerebellum
- ☐ **D** hypothalamus

- (iii) State the sense most likely to be affected if the occipital lobe is damaged.

(1)

(Total for Question 4 = 11 marks)

7 (a) A student was investigating mitosis in the roots of a garlic plant.

Describe how the student could prepare a microscope slide to show mitosis in the growing roots of a garlic plant.

(4)

(b) Describe what is produced when a single cell divides by mitosis.

(3)

[illegible]

(c) The student observed 89 cells on the microscope slide.

Figure 6 shows the number of cells at each stage of the cell cycle.

stage of cell cycle	number of cells
Interphase	44
Prophase	12
Metaphase	6
Anaphase	18
Telophase	9

Figure 6

Use this equation to calculate the mitotic index for this slide.

$$\text{mitotic index} = \frac{\text{number of cells in mitosis}}{\text{total number of cells}} \times 100$$

Give your answer to three significant figures.

(3)

Mitotic index

(d) The mitotic index is often used in the diagnosis of cancer.

State the effect of cancer on cell division.

(1)

(Total for Question 7 = 11 marks)



- 4 Figure 5 shows a chart used by opticians to test a person's vision.

The person's vision is judged by the lowest row of letters they can read.

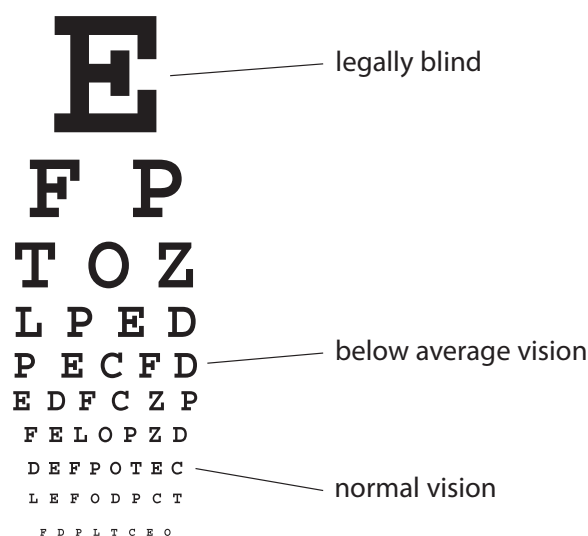


Figure 5

- (a) (i) An optician tested the eyesight of 240 people.

35% of these people could read the normal vision row without wearing glasses.

The rest of the people need glasses to correct their vision.

Calculate the number of people who need glasses to correct their vision.

(3)

..... people

- (ii) An optician can use the chart to diagnose short-sightedness.

Give **one** reason why people are short-sighted.

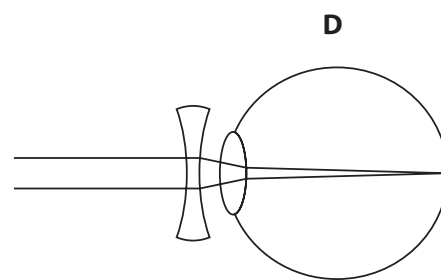
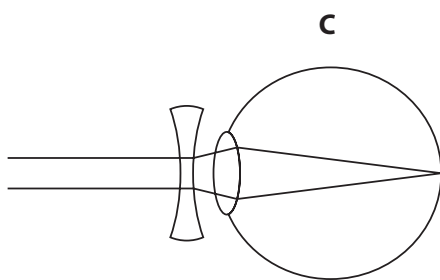
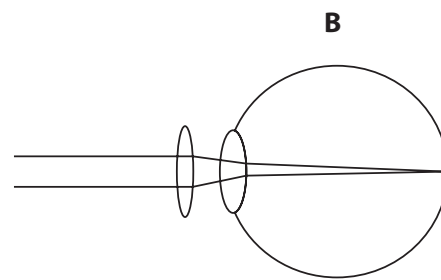
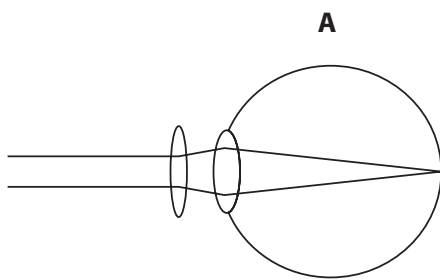
(1)

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(iii) Which diagram shows how short-sightedness can be corrected?

(1)



- ☒ **A**
- ☒ **B**
- ☒ **C**
- ☒ **D**

- (b) Cataracts can affect a person's vision.

Figure 6 shows what a person with normal vision and a person with cataracts can see for the top letter on the optician's chart.



person with normal vision



person with cataracts

Figure 6

- (i) Describe why a person with cataracts would see the image shown in Figure 6.

(2)

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- (ii) State the treatment for cataracts.

(1)

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(c) Figure 7 shows the structure of the brain.

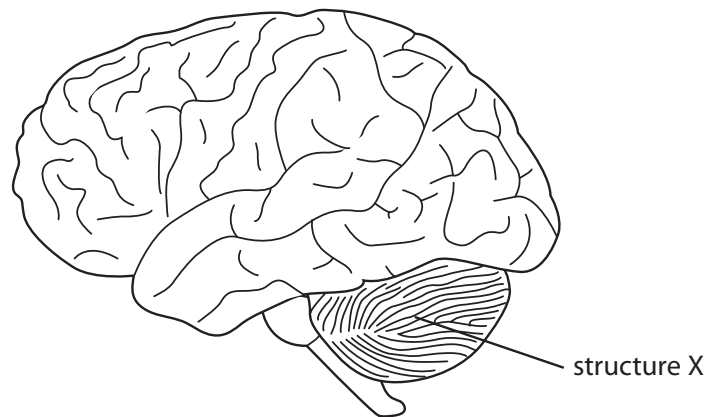


Figure 7

(i) Which region of the brain is labelled structure X?

(1)

- ☐ **A** cerebellum
- ☐ **B** cerebral hemisphere
- ☐ **C** medulla oblongata
- ☐ **D** spinal cord

(ii) When a person reacts to a stimulus, messages from the brain are sent to their muscles.

Describe how messages are sent from the brain to muscles.

(2)

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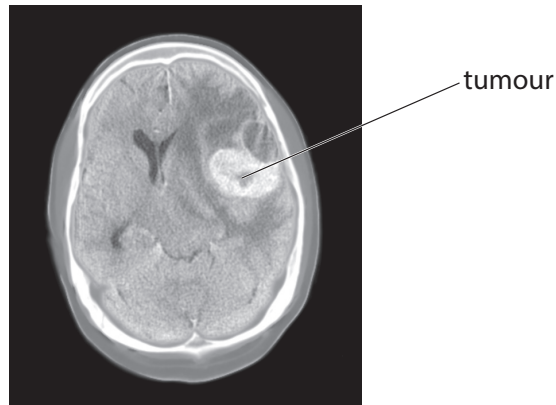
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(Total for Question 4 = 11 marks)

- 7 (a) Figure 8 shows a CT scan image of a person with a brain tumour.



(Source: © DUCANE MEDICAL IMAGING LTD/SCIENCE PHOTO LIBRARY)

Figure 8

- (i) Explain why tumours can be detected using CT scans.

(2)

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- (ii) This person has reduced vision.

Name the part of the brain responsible for vision.

(1)

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- (b) Tumours can also be detected by PET scanning.

Before a PET scan, a radioactive form of glucose is injected into the bloodstream of a person.

Explain why this glucose is injected before a PET scan.

(2)

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*(c) Some monoclonal antibodies have been approved for use in the diagnosis of blood clots.

Explain how monoclonal antibodies are produced and how they can be used in the diagnosis of blood clots.

(6)

(Total for Question 7 = 11 marks)



12-MARK QUESTIONS

3 questions in this booklet



- 8 (a) The reaction time of five people was tested using a computer.

These people were then given 100 cm³ of a liquid to drink.

Their reaction times were recorded 10 minutes after drinking the liquid.

Figure 9 shows the results.

person	reaction time in seconds		
	before drinking the liquid	after drinking the liquid	difference
1	0.256	0.245	−0.011
2	0.234	0.232	−0.002
3	0.268	0.259	−0.009
4	0.254	0.248	−0.006
5	0.215	0.208	−0.007

Figure 9

- (i) Calculate the mean difference in reaction time.

Give your answer in milliseconds.

(2)

..... ms

- (ii) The drinks manufacturer wants to advertise the effect of the drink on reaction time.

The manufacture needs to confirm the effect on reaction time by improving the investigation.

Give **two** improvements the manufacturer would need to make to this investigation.

(2)

1

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2

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(b) Figure 10 shows a neurone.

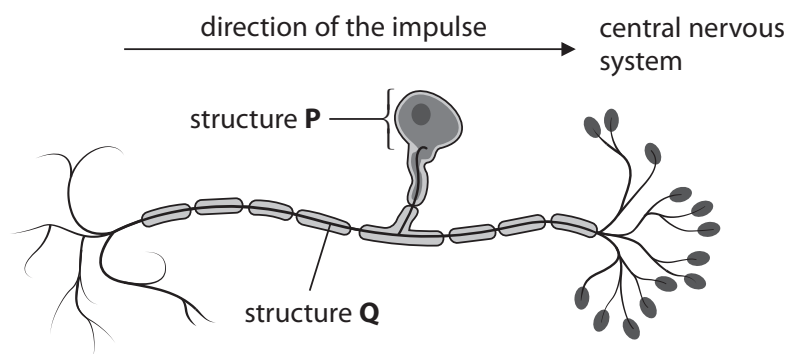


Figure 10

(i) Name the type of neurone shown in Figure 10.

(1)

(ii) Which row identifies structure **P** and structure **Q**?

(1)

	structure P	structure Q
☐ A	myelin sheath	axon
☐ B	cell body	dendron
☐ C	myelin sheath	dendron
☐ D	cell body	axon

*(c) Some painkillers prevent neurotransmitters binding to receptors in a synapse.

Explain how a signal is transmitted at a synapse and how the painkillers reduce the pain felt by the person.

(6)

(Total for Question 8 = 12 marks)



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(ii) State what happens to the cell cycle in cancerous cells.

(1)

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(b) The production of more cells contributes to the growth of an animal.

(i) Which other process is needed for the growth of an animal?

(1)

- ☐ A cell elongation
- ☐ B differentiation
- ☐ C cell wall synthesis
- ☐ D transpiration

(ii) A parent is concerned that their child is not growing as much as other children.

Describe how a doctor might determine if the child is growing as expected.

(4)

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(Total for Question 9 = 12 marks)



- 8 (a) Reaction time can be tested by dropping a ruler and measuring the distance it travels before it is caught.

Figure 9 shows how the test works.

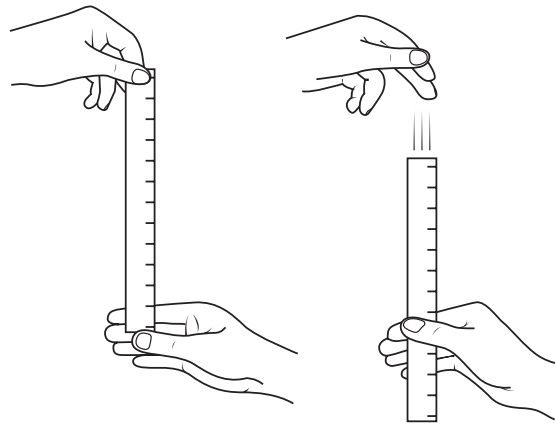


Figure 9

This method was used to test the reaction times of three students.

Each student completed the test five times and the distances were recorded.

- (i) State how the median distance for each student could be determined from the results.

(1)

- (ii) State and explain **one** variable that needs to be controlled in this investigation.

(2)

(iii) Figure 10 shows the results recorded for the three students.

student	distance in mm				
A	70	69	67	64	62
B	71	70	69	67	65
C	72	70	69	66	62

Figure 10

Explain **one** conclusion that can be made from the results in Figure 10.

(2)

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(iv) A student wanted to investigate the effect of two different drinks containing caffeine on reaction time using this method.

Devise a plan the student could use.

(3)

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(b) Figure 11 shows a myelinated sensory neurone.

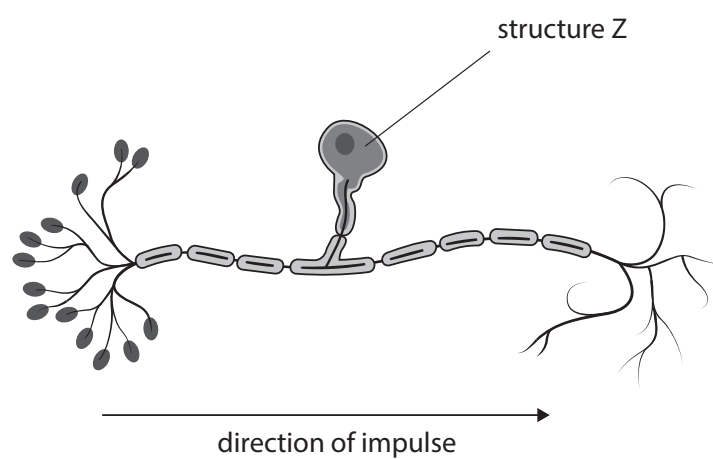


Figure 11

(i) Identify structure Z.

(1)

- (ii) Figure 12 shows how the diameter of neurones affects the speed of electrical impulses.

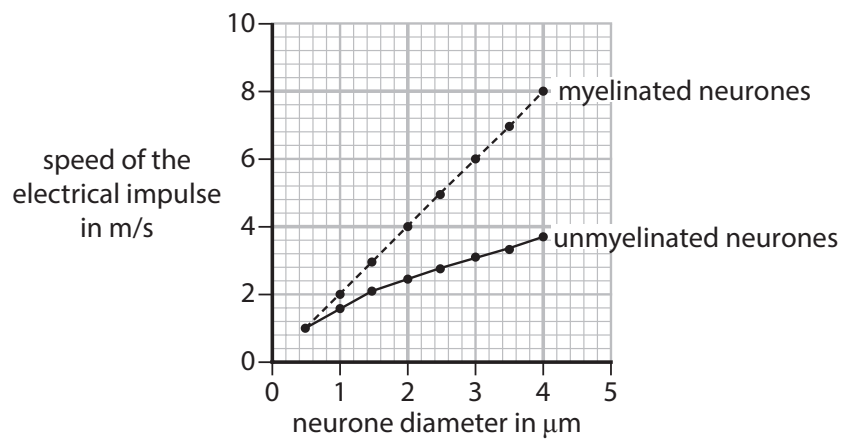


Figure 12

Comment on how the diameter of a neurone affects the speed of the electrical impulses.

(3)

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(Total for Question 8 = 12 marks)

MARK SCHEMES

official Pearson Edexcel mark schemes



Question Number	Answer	Mark
1(a)(i)	B the lens gets thicker to bend the light rays more 1. The only correct answer is B <i>A is not correct because it would not bend the light rays more.</i> <i>C is not correct because the light rays need to be bent more.</i> <i>D is not correct because the light rays need to be bent more.</i>	(1) AO 2 1

Question Number	Answer	Additional guidance	Mark
1(a)(ii)	light rays meet in front of the retina (1)	accept eye is too long/too big accept light is refracted too much	(1) AO 1 1

Question Number	Answer	Additional guidance	Mark
1(a)(iii)	concave /diverging / minus (lens)	ignore contact lens	(1) AO 1 1

Question Number	Answer	Additional guidance	Mark
1(b)	An answer that combines the following points to provide a plan: - choose equal numbers of people with brown and blue eyes (1) - test their vision /details of a method to test vision (1) - count the number of people in each group who are short-sighted/if more people with brown eyes are short-sighted the hypothesis is correct / ORA (1)	accept compare the results for the two groups	(3) AO 3 3a

Total for Question 1 = 6 marks



Question Number	Answer	Mark
1 (a)(i)	D refracts light refracts light The only correct answer is D <i>A is not correct because structure Y does not detect light</i> <i>B is not correct because structure X does not detect light</i> <i>C is not correct because structure X does not reflect light</i>	(1) AO1 1

Question Number	Answer	Additional Guidance	Mark
1 (a)(ii)	A description including two from: - pupil becomes smaller (1) - the iris changes shape (1) - correct light intensity is detected by {retina / rods / cones} (1)	accept the iris get larger accept reduces the amount of light entering the eye / protects the retina	(2) AO2 1

Question Number	Answer	Additional Guidance	Mark
1 (b)(i)	{CT / PET} scanning	accept MRI / X-ray	(1) AO1 1

Question Number	Answer	Additional Guidance	Mark
1 (b)(ii)	A description including two from: • brain is protected by skull (1) • it is difficult to access (1) • nerves do not {repair / regenerate} (1) • the risk of damage to the brain (1)	accept bone for skull accept must not damage healthy cells/can cause side effects	(2) AO1 1

(Total for question 1 = 6 marks)

Question number	Answer	Mark
1(a)(i)	B 120 cm The only correct answer is B A, C and D are not correct because they are not on the 10th percentile for an 8-year-old boy	(1) AO2 2

Question number	Answer	Additional guidance	Mark
1(a)(ii)	An answer linking: • he is growing as expected (1) • because the boy is still on the 5th percentile (1)	accept healthy growth accept he is on the 5th percentile (at age 6) / the same percentile	(2) AO3 2a+2b

Question number	Answer	Additional guidance	Mark
1(b)(i)	An answer including: • add ethanol and water (1) • a white emulsion is present (1) OR • rub food on paper (1) • leaves grease spot (1)	accept cloudy accept emulsion test	(2) AO1 2

Question number	Answer	Mark
1(b)(ii)	B fatty acids The only correct answer is B A, C and D are not correct because they are not produced when fats are digested	(1) AO1 1

Question number	Answer	Additional Guidance	Mark
1 (c)	the energy (content of food)	accept calories / joules ignore temperature (change)	(1) AO1 1

Total for question 1 = 7 marks



Question Number	Answer	Additional guidance	Mark
6(a)	Any three from: - have the potential to produce any cell type (1) - no need to use embryonic stem cells (1) - less chance of patient rejecting their own cells (1) - used to treat conditions which are currently incurable / used for cell transplants / used to replace faulty cells (1)	accept can turn into many cell types / pluripotent / totipotent accept embryos do not need to be killed accept named conditions e.g Parkinson's / diabetes ignore references to cloning body parts / replace organs / treat cancer unless qualified	(3) AO 2 1

Question Number	Answer	Mark
6(b)(i)	B $R \rightarrow Q \rightarrow S \rightarrow P$ 1. The only correct answer is B <i>A is not correct because Q is after R</i> <i>C is not correct because S is after Q</i> <i>D is not correct because R is before Q and S</i>	(1) AO 3 1b

Question Number	Answer	Mark
6(b)(ii)	A anaphase 1. The only correct answer is A <i>B is not correct because R is prophase</i> <i>C is not correct because P is telophase</i> <i>D is not correct because Q is metaphase</i>	(1) AO 3 1a

Question Number	Answer	Additional guidance	Mark
6(b)(iii)	Any two from: - DNA is replicated (1) - production of cell {components / proteins / organelles} (1) {metabolic activities / cell reactions} occur / cell growth (1)	accept DNA duplicates / chromosomes duplicate accept sub-cellular structures / named structures chromosomes coil up / condense (1)	(2) AO 1 1

Question Number	Answer	Additional guidance	Mark
6(c)	- selection of 40 x objective lens (1) - combines with 10 x eye piece lens (1)	accept other combinations that multiply together to make 400 x with the eye piece as equal or the lower power accept use two lenses with correct magnification to make 400x for 1 mark	(2) AO 1 2

Total for Question 6 = 9 marks



Question number	Answer	Additional guidance	Mark
3(a)(i)	Two from: (meristem cells) are undifferentiated (meristem cells) divide / produce more cells (1) - by mitosis (1)	accept are stem cells accept (the cells produced) can differentiate / become specialised/elongate (1)	(2)

Question number	Answer	Additional guidance	Mark
3(a)(ii)	An answer including: - use a thin section of {cells/meristem} (1) - add a stain / named stain (1) - place a cover slip on top of the sample (1)	accept add a sample of the cells to the microscope slide accept a description of a coverslip	(3)

Question number	Answer	Mark
3(b)(i)	chloroplast / chloroplasts accept phonetically correct misspellings	(1)

Question number	Answer	Additional guidance	Mark
3(b)(ii)	(aerobic) respiration / release energy	ignore make / produce energy accept word equation for respiration accept to produce ATP	(1)

Question number	Answer	Additional guidance	Mark
3(b)(iii)	Any two from: • no nucleus/ chromosomal DNA (in the cytoplasm) (1) • no membrane-bound organelles (1) • circular/plasmid DNA (1) • no mitochondria (1) • no chloroplasts (1) • no vacuole (1)	accept: presence of flagellum (1) presence of a slime coat (1) presence of pili (1) accept cell wall not made of cellulose (1)	(2)

(Total for question 3 = 9 marks)

Question Number	Answer	Additional guidance	Mark
2(a)(i)	A description including three from: - the impulse (in the relay neurone) triggers the release of a chemical (1) - neurotransmitter (1) (neurotransmitter) diffuses (1) - across the synapse (1) - new impulse triggered in {motor neurone / next neurone} (1)	accept chemical messenger accept across the gap	(3) AO1 1

Question Number	Answer	Additional Guidance	Mark
2(a)(ii)	An explanation linking two from: - a process that occurs in response to danger (1) - which bypasses the {brain / parts of the brain} / is an {involuntary process / subconscious process} (1) - so there is a faster transmission (of electrical impulses) / faster response / allows a quick reaction (1) - to protect the body from harm (1)	accept goes to the spinal cord accept react without thinking accept examples of actions to protect the body e.g. pulling hand away	(2) AO1 1

Question Number	Answer	Mark
2(b)(i)	C 215 milliseconds The only correct answer is C <i>A is not correct because the median is not 200 milliseconds</i> <i>B is not correct because the median is not 210 milliseconds</i> <i>D is not correct because the median is not 225 milliseconds</i>	(1) AO2 1

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	A description including three from: • measure their reaction time using red squares (1) • keep everything else the same (as using blue squares) (1) • repeat measurements (for each student) (1) • calculate a mean reaction time (1) • control other variables (1)	accept see how fast they react with red squares accept examples of other variables e.g. tiredness / environment / health	(3) AO3 3a

(Total for question 2 = 9 marks)

Question Number	Answer	Additional Guidance	Mark
6(a)(i)	$(8 \times 4) = 32$ (grams of alcohol) (1) 1.2 / 1.20 (x risk)	award full marks for the correct answer with no workings	(2) AO3

Question Number	Answer	Additional Guidance	Mark
6(a)(ii)	An answer including two from: • mutations in DNA (1) • cell division is uncontrolled (1) • leading to the formation of a tumour / growth / mass of cells (1)	accept change in the gene/cell mutates accept {rapid / continuous} cell division	(2) AO2 1

Question Number	Answer	Additional Guidance	Mark
6(b)(i)	Any two from: - wear gloves (1) - clean the area of skin where blood being removed (1) - cover the wound after (1) - use a sterile needle (1)	accept wash hands / wear a mask accept disinfect / clean the wound ignore clean accept sit the person down (1) ignore references to removing the correct volume of blood	(2) AO2 2

Question Number	Answer	Additional Guidance	Mark
6(b)(ii)	- heterozygous An explanation linking: - affected offspring must have inherited the recessive allele (1) - unaffected offspring must have inherited dominant allele (1)	accept carrier / dominant and recessive allele / Hh accept one offspring is homozygous recessive accept one / two offspring are homozygous dominant accept a labelled Punnett square for any mark point	(3) AO3

(Total for question 6 = 9 marks)



Question number	Answer	Mark
5(a)(i)	C releases energy contains digestive enzymes The only correct answer is C <i>A is not correct because structure B does not contain the genetic material</i> <i>B is not correct because structure A does not produce glucose</i> <i>D is not correct because structure A does not produce glucose and structure B does not contain the genetic material</i>	(1)

Question number	Answer	Mark
5(a)(ii)	20 / twenty	(1)

Question number	Answer	Mark
5(b)(i)	B prophase → metaphase → anaphase → telophase The only correct answer is B <i>A is not correct because metaphase is not the first stage</i> <i>C is not correct because anaphase is not the first stage</i> <i>D is not correct because metaphase is before anaphase</i>	(1)

Question number	Answer	Additional guidance	Mark
5(b)(ii)	An answer including: (stem cells divide) by <u>mitosis</u> (1) - cells differentiate / to become specialised cells (1)	reject meiosis accept produce cells with a specific function	(2)

Question number	Answer	Additional guidance	Mark
5(c)(i)	so the tissues matched / to reduce the chance of rejection	accept because they are genetically similar / have similar DNA	(1)

Question number	Answer	Additional guidance	Mark
5(c)(ii)	they have the potential to develop into a {foetus / baby / person / life} so embryos are not {harmed / destroyed}	accept people have ethical concerns / think it is unethical / the {embryo / foetus} is alive	(1)

Question number	Answer	Additional guidance	Mark
5(c)(iii)	An answer including three from: - means that embryos do not need to be used / a donor is not needed (1) - they can {develop / differentiate / specialise} into any cell (1) - replace damaged {cells / tissue} (1) - they will match the tissue type of the patient / less chance of rejection (1)	accept they are easier to obtain / unlimited supply accept can develop into a named cell (type) accept specific examples of use e.g. Parkinson's ignore repair cells accept repair tissues accept no need to take immune-suppression medication (1)	(3)

(Total for question 5 = 10 marks)



Question number	Answer		Mark
9(a)(i)	An answer including three from: • (cells are triggered to divide) by mitosis (1) • this division is uncontrolled (1) • creates a mass/large number of cells /tumour (1)	accept cells won't stop dividing/faster cell division/increased cell division	(3)

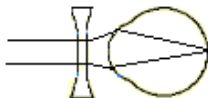
Question number	Answer	Mark
9(a)(ii)	C interphase The only correct answer is C <i>A is not correct because the DNA is not replicated in anaphase</i> <i>B is not correct because the DNA is not replicated in prophase</i> <i>D is not correct because the DNA is not replicated in telophase</i>	(1)

Question number	Answer	Additional guidance	Mark
9(a)(iii)	An answer combining: • 1 in 20 is a rate of 5% (1) • obesity increases the risk of bowel cancer more (than other types of cancer) (1)	accept 13% is 1 in 8/1 in 7.7 accept other correct manipulation of figures accept obesity is less of a contributing factor to other types of cancer	(2)

Question number	Answer	Additional guidance	Mark
9(b)	An explanation linking: - BMI calculation takes into account height / divides mass by height² (1) - the obese man must be shorter / the normal man is taller (1)	ignore references to muscle mass accept BMI relies on measurements of height and weight/mass accept equation for BMI accept the men are different heights	(2)

Question number	Answer	Additional guidance	Mark
9(c)	An answer including: - surgery to treat narrow or blocked arteries (1) - lifestyle changes including {healthy diet/more exercise} (1) (life-long) medication to {prevent blood clots/reduce blood pressure/thin the blood} (1)	accept by-pass surgery / stents / heart surgery / other relevant surgeries such as gastric bands accept examples of lifestyle changes e.g. stop smoking accept named medications used for cardiovascular disease	(3)

(Total for question 9 = 11 marks)

Question number	Answer	Additional guidance	Mark
10(a)	An explanation linking: (a diverging lens) {bends/refracts} light rays outwards (1) - so the light rays {meet/converge/focus} on the retina (1)	ignore refract light rays less accept refract light onto the retina. accept the back of the eye accept a diagram for either or both marking points 	(2)

Question number	Answer	Mark
10(b)(i)	B 85 000 The only correct answer is B <i>A is not correct because the number of affected males is not 42 500</i> <i>C is not correct because the number of affected males is not 166 666</i> <i>D is not correct because the number of affected males is not 1 020 000</i>	(1)

Question number	Answer	Additional guidance	Mark
10(b)(ii)	An explanation linking two of the following: • allele is located on the X chromosome (1) • men are XY/have one X chromosome (1) • if they have one {recessive/affected} allele they are colour blind (1)	ignore sex-linked ignore X/Y genes. accept the idea that if woman have one affected allele, they have a second allele/women would need two recessive alleles	(2)

Question number	Answer	Additional guidance	Mark
10(b)(iii)	An explanation linking: • 0% / he will not be colour blind (1) • he will inherit the Y chromosome from his father that does not have the allele / inherits an X chromosome from his mother with the {dominant / normal / unaffected} allele (1)		(2)

Question number	Answer	Additional guidance	Mark
10(c)	An explanation linking four of the following: - changes the sequence of the mRNA (1) - produced in transcription (1) - leads to a different amino acid (in the polypeptide sequence) (1) - which is added {by tRNA/during translation/at the ribosome} (1) - changes the shape/function of the protein / a cone cell does not detect the coloured light correctly (1)	accept mRNA produced from the DNA sequence accept the (mRNA) determines the amino acid sequence ignore a different protein is produced	(4)

(Total for question 10 = 11 marks)

Question Number	Answer	Mark
5(a)(i)	A metaphase anaphase The only correct answer is A <i>B is not correct because cell Q is not telophase</i> <i>C is not correct because cell R is not interphase</i> <i>D is not correct because cell R is not interphase</i>	(1) AO2 1

Question Number	Answer	Additional Guidance	Mark
5(a)(ii)	A description including two from: • chromatids condense (1) • identical chromatids are joined (1) • nuclear membrane breaks down (1)	accept chromosomes condense / coil up / become visible accept chromosomes join accept nucleus breaks down accept spindle fibres form (1)	(2) AO1 1

Question Number	Answer	Mark
5(a)(iii)	cytokinesis	(1) AO1 1

Question Number	Answer	Mark
5(a)(iv)	B 75 μm The only correct answer is B <i>A is not correct because 0.75 μm is 0.00075 mm</i> <i>C is not correct because 750 μm is 0.75mm</i> <i>D is not correct because 75 000 μm is 75 mm</i>	(1) AO1 1

Question Number	Answer	Additional Guidance	Mark
5(b)	An answer including: • use the x40 objective lens (1) and one from: • use the x10 eye piece lens (1) • use the focusing wheel (1)	accept other combinations of x 400 lenses for two marks accept move the {stage / lens}	(2) AO1 1

Question Number	Answer	Additional Guidance	Mark
5(c)	An answer including four from: Benefits (maximum 2 marks): • stem cells can differentiate / become specialised (1) • replace (damage) cells (1) • reduce symptoms of arthritis (1) Risks (maximum 2 marks): • new cells do not function correctly (1) • stem cells continue to divide (1) • risk of side effects / symptoms worsen / rejecting cells (1)	accept can become {joint cells / any type of cell} accept repair damaged joints accept cell division could develop into cancer accept may have to take medication to prevent rejection / suppress immune system	(4) AO2 1

(Total marks for question 5 = 11 marks)



Question number	Answer	Mark
4(a)(i)	D retina The only correct answer is D A is incorrect because the cornea does not contain light receptor cells B is incorrect because the iris does not contain light receptor cells C is incorrect because the lens does not contain light receptor cells	(1) AO1 1

Question number	Answer	Mark
4(a)(ii)	mitochondria / mitochondrion accept phonetic spellings	(1) AO1 1

Question number	Answer	Mark
4(a)(iii)	nucleus / nuclei accept phonetic spellings	(1) AO1 1

Question number	Answer	Additional guidance	Mark
4(a)(iv)	rods / rod cells	reject cones	(1) AO1 1

Question number	Answer	Additional guidance	Mark
4(a)(v)	A description including two of the following: - cell B is a cone cell (1) - involved in colour vision (1)	accept respond to bright light / high light intensities accept responds to different {wavelengths / frequencies} of light (1)	(2) AO1 1

Question number	Answer	Additional guidance	Mark
4(b)(i)	Change the subject of the equation: time = distance ÷ speed (1) Conversion of mm to m: $47 \div 1000 = 0.047(\text{m})$ (1) Substitution: $0.047 \div 75 = 0.0006267$ (seconds) OR Change the subject of the equation: time = distance ÷ speed (1) Conversion of m to mm: $75 \times 1000 = 75000$ (mm) (1) Substitution: $47 \div 75000 = 0.0006267$ (seconds)	award full marks for correct answer no working accept answers in standard form accept any correct rounding - 0.00063 / 0.000626(recurring) / 0.0006 accept any correct rounding - 0.00063 / 0.000626(recurring) / 0.0006 accept answers in standard form	(3) AO2 1

Question number	Answer	Mark
4(b)(ii)	A cerebral hemispheres The only correct answer is A <i>B is incorrect because the occipital lobe is not located in the medulla oblongata</i> <i>C is incorrect because the occipital lobe is not located in the cerebellum</i> <i>D is incorrect because the occipital lobe is not located in the hypothalamus</i>	(1) AO1 1

Question number	Answer	Mark
4(b)(iii)	(eye)sight / vision / seeing / being able to see	(1) AO2 1

Total for question 4 = 11 marks



Question number	Answer	Additional guidance	Mark
7(a)	A description including four of the following: • use the {root tip / meristem} (1) • Soften the root (with alcohol/heat/acid) (1) • crush the root onto the slide/take a thin section (1) • Stain the root / named stain (1) • Add a drop of water to the slide (1) • Add a cover slip (1)	accept the end of the root for root tip accept description of a root squash accept use a layer of cells accept dye ignore ink accept another slide / description of a cover slip	(4) A03 3a

Question number	Answer	Additional guidance	Mark
7(b)	A description including three from: • two cells (1) • diploid cells / same number of chromosomes as parent cell (1) • genetically identical cells (1) • body cells (1)	accept 23 pairs of chromosomes / 46 chromosomes accept cells for growth / repair	(3) A01 1

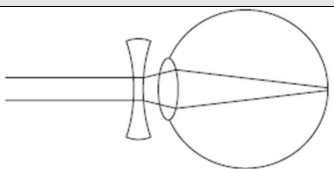
Question number	Answer	Additional guidance	Mark
7(c)	Select 45 cells in mitosis (1) $(45) \div 89 \times 100 = 50.561$ (1) 50.6	Award full marks for correct answer with no working ecf for workings that show the use of an incorrect number of cells up to and including 89 cells ecf if the workings show their answer to 3 s.f.	(3) A03 2ab

Question number	Answer	Additional Guidance	Mark
7(d)	(makes cell division) uncontrolled	accept idea of cell division being rapid / increased ignore references to mutation / tumour	(1) A01 1

Total for question 7 = 11 marks

Question number	Answer	Additional guidance	Mark
4(a)(i)	$240 \times 0.35 / 84$ (1) $240 - 84$ (1) 156 (people) OR $100 - 35 / 65 / 0.65$ (1) $0.65 \times 240 / 65 \div 100 \times 240$ (1) 156 (people) OR $240 \div 100 / 2.4$ (1) 2.4×65 (1) 156 (people)	award full marks for the correct answer with no workings ecf for an incorrect value subtracted from 240 shown in working ecf for an incorrect value multiplied by 240 shown in working ecf for an incorrect value multiplied by 65 shown in working	(3)

Question number	Answer	Additional guidance	Mark
4(a)(ii)	Any one from: - the eye(ball) is too long (1) - the cornea is too curved (1) - lens is too thick / too curved (1) - the {cornea / lens} refracts the light too much (1) {light rays focus / focal point is} in front of the retina (1)	ignore the eye(ball) is too big ignore image forms in front of the retina accept it is inherited / caused by genetics (1)	(1)

Question number	Answer	Mark
4(a)(iii)	C  The only correct answer is C A is not correct because a convex lens is not used B is not correct because a convex lens is not used D is not correct because a concave lens doesn't refract light in this way	(1)

Question number	Answer	Additional guidance	Mark
4(b)(i)	An answer including two from: • protein (has built up) (1) • (in the) <u>lens</u> (1) • light is dispersed (1)	accept cloudy lens accept not all the light rays pass through ignore blurry vision	(2)

Question number	Answer	Additional guidance	Mark
4(b)(ii)	• (surgery to) replace the lens / use an {artificial / plastic lens}	ignore surgery / laser surgery	(1)

Question number	Answer	Mark
4(c)(i)	A cerebellum The only correct answer is A <i>B is not correct because structure X is not the cerebral hemisphere</i> <i>C is not correct because structure X is not the medulla oblongata</i> <i>D is not correct because structure X is not the spinal cord</i>	(1)

Question number	Answer	Additional guidance	Mark
4(c)(ii)	An answer including: • by electrical impulses (1) • along a motor neurone (to the effector) (1)	accept electrical message / signal accept motor neurone in the correct place in a description of a reflex arc	(2)

(Total for question 4 = 11 marks)

Question number	Answer	Additional guidance	Mark
7(a) (i)	An explanation linking: • X-rays (1) • absorbed by the tumour (1) • because tumours are {a mass of cells / dense} (1)	accept tumours absorb the radiation award two marks for tumours absorb X-rays	(2) AO2 1

Question number	Answer	Additional guidance	Mark
7(a) (ii)	cerebrum / cerebral hemispheres / cerebral cortex	accept hippocampus accept occipital lobe accept cerebellum / frontal lobe	(1) AO2 1

Question number	Answer	Additional guidance	Mark
7(b)	An explanation linking: • the glucose goes to the tumour (1) • because they are (rapidly) dividing / (glucose is used) for respiration (1)	accept cancer cells for tumour accept tumours {have a higher metabolism / require energy / have rapid growth}	(2) AO2 1

Question number	Indicative content	Mark
7 *(c)	A01 6 marks Production • uses antigen present in a blood clot • antigen is injected into a small mammal • mammal has an immune response • lymphocyte producing the complementary antibody is isolated • fused with a myeloma / cancer cell / tumour cell • to form a hybridoma • which divides and produces the monoclonal antibody • Diagnosis • monoclonal antibody is attached to a radioisotope • injected into the blood stream of a person • monoclonal antibody attaches to the antigen in the blood clot • the location of the blood clot is identified	(6) A01 1

Level	Mark	Descriptor
	0	• No rewardable material.
Level 1	1-2	• Demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. • Presents an explanation with some structure and coherence.
Level 2	3-4	• Demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and /or developed. • Presents an explanation that has a structure which is mostly clear, coherent and logical.
Level 3	5-6	• Demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas is detailed and fully developed. • Presents an explanation that has a well-developed structure which is clear, coherent and logical.

Additional Guidance

Level 1	1–2	• A brief description of the production OR the use in diagnosis • The response includes more than one stage of production or diagnosis
Level 2	3–4	• A brief description of the production AND the use in diagnosis OR a detailed explanation of the production OR a detailed explanation of the use in diagnosis • The response makes a links between stages using key scientific terms correctly
Level 3	5–6	• A detailed explanation of the production AND the use in diagnosis • Response makes links between stages of production and diagnosis using key scientific terms correctly

Total for Question 7 = 11 marks

Question number	Answer	Additional guidance	Mark
8(a)(i)	$0.035 \div 5 = 0.007$ (1) $7 / -7$ (ms)	award two marks for correct answer with no working accept $0.033 \div 4 = 0.008$ for 1 mark if working shown accept $8 / -8$ (ms) for 2 marks if working shown. allow ecf for incorrect mean converted into ms for 1 mark	(2)

Question number	Answer	Additional guidance	Mark
8(a)(ii)	Any two from: - test the drink on more people / different people (1) - more repeats on the same people (1) - repeat using different volumes of the drink (1) - repeat using different times between drinking and the test (1) - repeat the experiment with just water (1) - control other environmental factors/named factors (1)	accept different amounts accept use a control/use a placebo accept tiredness/health/drug intake/food intake	(2)

Question number	Answer	Additional guidance	Mark
8(b)(i)	sensory (neurone)	accept phonetically correct misspellings	(1)

Question number	Answer	Mark
8(b)(ii)	B cell body dendron The only correct answer is B <i>A is not correct because P is the cell body</i> <i>C is not correct because P is the cell body</i> <i>D is not correct because Q is the dendron</i>	(1)

Question number	Indicative content	Mark
* 8(c)	Synapse transmission • neurones transmit electrical impulses • the synapse is a gap between 2 neurones • triggering the release of neurotransmitters • which diffuse across the synapse • as a chemical signal • neurotransmitters bind to receptors on the next neurone • triggering an electrical impulse in the next neurone Painkillers • prevent neurotransmitters binding to receptors in the next neurone • electrical impulse is not triggered • signal is not received by the central nervous system • person does not feel pain	(6)

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	- The explanation attempts to link and apply knowledge and understanding of scientific ideas, flawed or simplistic connections made between elements in the context of the question. - Lines of reasoning are unsupported or unclear
Level 2	3–4	- The explanation is mostly supported through linkage and application of knowledge and understanding of scientific ideas, some logical connections made between elements in the context of the question - Line of reasoning mostly supported through the application of relevant evidence
Level 3	5–6	- The explanation is supported throughout by linkage and application of knowledge and understanding of scientific ideas, some logical connections made between elements in the context of the question - Line of reasoning are supported by sustained application of relevant evidence

Level	Mark	Descriptor
Level 1	1-2	A simple explanation of how messages are transmitted either over the synapse or along the neurone Linked to the effect of painkillers
Level 2	3-4	At least one link between how messages are transmitted between the neurone and the synapse or across the synapse Linked to the effect of painkillers
Level 3	5-6	A detailed description of how messages are passed across the synapse Linked to the effect of painkillers binding to receptors

Level	Mark	Examples of possible responses
	0	No rewardable material.
Level 1	1	Messages are passed along neurones as electrical impulses
	2	A synapse is a gap between neurones and the painkillers prevent the pain message getting through to the brain
Level 2	3	Synapses are gaps between neurones. Neurotransmitters diffuse across the gap to the next neurone.
	4	Synapses are gaps between neurones. Neurotransmitters diffuse across the gap to the next neurone. The painkillers bind to receptors stopping the message being passed on to the CNS so the person does not feel pain.
Level 3	5	Synapses are gaps between neurones. The electrical impulse reaches the synapse and causes neurotransmitters to diffuse

	6	across the gap to the next neurone. A new impulse is initiated in the next neurone. • Synapses are gaps between neurones. The electrical impulse reaches the synapse and causes neurotransmitters to diffuse across the gap to the next neurone. A new impulse is initiated in the next neurone. The painkillers prevent the neurotransmitters binding to the next neurone, so a new impulse is not generated and the message is not passed to the CNS.
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(Total for question 8 = 12 marks)



* 9(a)(i)	AO1 (6 marks) Stage 1 Interphase • longest stage of the cell cycle • DNA is replicated • more organelles are synthesised • cell grows • chemical reactions / named reactions occur Stage 2 Mitosis • nucleus divides • prophase - nuclear membrane dissolves and the chromosomes condense • spindle fibres form • metaphase - the chromosomes line up on the equator • anaphase - the chromosomes are separated and pulled to the poles • telophase - the nuclear membrane reforms Stage 3 Cytokinesis • the cell divides • into two genetically identical cells which have a diploid nucleus • the cells are body cells needed for growth and repair	(6)
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Level	Mark	Descriptor
0		• No rewardable material.
Level 1	1-2	• Demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific, enquiry, techniques and procedures lacks detail. (AO1) • Presents a description which is not logically ordered and with significant gaps. (AO1)

Question number	Answer	additional guidance	Mark
9(a)(ii)	(cell cycle / cell division) is quick(er) / is uncontrolled / doesn't stop	accept cells split / reproduce for divide	(1) AO1 1

Question number	Answer	Mark
9(b)(i)	B differentiation The only correct answer is B <i>A is not correct because cell elongation is not part of growth in animals</i>	(1) AO1 1

Question number	Answer	additional guidance	Mark
9(b)(ii)	An answer including: • (measure the) {height / mass / head circumference} (1) • find the percentile (1) • for their age (1) • measurements should increase along a percentile / repeated measurements over time (1)	accept weight ignore BMI accept (use a) percentile chart accept compare (measurement) with children of their age accept the idea that growth should stay on or around the same percentile	(4) AO2 2

(Total for question 9 = 12 marks)

Question number	Answer	Mark
8 (a)(i)	(put the results in order) determine the middle value / place the results in order and find the 3 rd value	(1) AO2 1

Question number	Answer	Additional Guidance	Mark
8 (a)(ii)	An explanation linking one from: • {height / start point} of the ruler (1) • where catching hand starts / catching hand starts at 0 • distances the thumb and fingers are apart (1) • catching it with the same hand (1) • {food / drink / drug} intake / amount of sleep (1) AND • valid / comparable (1)	accept tiredness	(2) AO2 1

Question number	Answer	Additional guidance	Mark
8(a)(iv)	An answering including three from: - two students each given a different caffeine drink (1) - test before and after drinking / use a control (1) - a variable that needs controlling (1) - repeat with multiple students (for each drink) / calculate the mean (1)	accept use of the same student with a time interval in between accept same volume of caffeine drink / same time interval between drinking and testing	(3) AO3 2ab

Question number	Answer	Mark
8 (b)(i)	cell body	(1) AO1 1

Question number	Answer	Additional guidance	Mark
8(b)(ii)	An answering including three from: - increasing diameter increases the speed (1) (after 0.5 μm) there is a greater increase in the speed of impulses in myelinated neurones (1) - correct comparison of data from the graph for the effect of diameter on speed (1)	accept the speed is greater in myelinated neurones / impulses travel faster in myelinated neurones accept the increase in speed in myelinated neurones is linear / ORA ignore speeds quoted for one diameter	(3) AO3 2ab

Total for question 8 = 12 marks

