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EDEXCEL INTERNATIONAL GCSE COMPUTER SCIENCE: QUESTIONS BY TOPIC

Communication and the Internet (Topic 5)

International GCSE Computer Science Topic 5

8 questions · 114 marks · Mark schemes included

Pearson Edexcel International GCSE (9–1) Computer Science 4CP0, Papers 1 & 2, June 2019 - June 2022

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HOW TO USE THIS BOOKLET

Grouped by sub-topic, lowest mark tariff first. Paper 2 answers use the Python mark scheme (2A).

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.

QUESTION	SOURCE	MARKS	PAGE
5(a) NETWORKS		5 questions · 74 marks	3
1. Q5 <i>also Topic 6</i>	Paper 1 June 2022	12	4
2. Q3	Paper 1 November 2021	13	6
3. Q6	Paper 1 June 2022	15	8
4. Q3	Paper 1 June 2019	16	11
5. Q2	Paper 1 June 2021	18	14
5(b) NETWORK SECURITY		2 questions · 23 marks	17
6. Q2	Paper 1 November 2021	11	18
7. Q2 <i>also Topic 6</i>	Paper 1 June 2019	12	20
5(c) THE INTERNET AND THE WORLD WIDE WEB		1 questions · 17 marks	23
8. Q1	Paper 1 November 2020	17	24



QUESTIONS

8 questions · 114 marks · grouped by sub-topic



SUB-TOPIC 5(a)

5(a) NETWORKS

5 questions in this booklet



5 Viza Health Centre is located in the North East of England.

- (a) The health centre uses artificial intelligence to provide a symptom-checking service for its patients.

Patients log on to the website and input their symptoms.

- (i) Describe how artificial intelligence could identify what is wrong with them.

(2)

- (ii) Give **one** reason why a patient may not want to use this online service.

(1)

- (b) The health centre has clinics in two buildings: Cleveland and Stockton.

The network server is in the Cleveland building.

- (i) Name the type of network used to access the server from within the Cleveland building.

(1)

- (ii) Name the type of network used to access the server from the Stockton building.

(1)

(c) The network is at risk of an eavesdropping attack.

Identify the description of eavesdropping.

(1)

- ☐ **A** Tricking people into giving information by sending emails pretending to be from someone in authority
- ☐ **B** Spying on someone using a computer
- ☐ **C** Intercepting information as it is transmitted over a network
- ☐ **D** Redirecting a user from a genuine website to a fake one

(d) Doctors use laptops when they visit patients in their homes.

(i) The laptops have solid state drives.

Explain **one** reason why a solid state drive is better than a magnetic hard drive for the laptops.

(2)

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.....

.....

.....

(ii) Describe how data is stored on a solid state drive.

(2)

.....

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.....

.....

(iii) The laptops have two types of memory.

Complete the table by adding **one** tick (✓) to match **each** description to the type of memory used.

(2)

Description	RAM	ROM
Stores the boot up sequence		
The contents are lost when the laptop is shut down		

(Total for Question 5 = 12 marks)



3 Carlo uses his smartphone to make hands-free calls from the car.

(a) The smartphone connects to the car wirelessly forming a network.

Complete the table by adding a tick (✓) to indicate the network type and a tick (✓) to indicate the usage model the network uses.

(2)

Network type	Tick (✓)	Usage model	Tick (✓)
Local Area Network (LAN)		Client-Server	
Wide Area Network (WAN)		Peer-to-peer	
Personal Area Network (PAN)			

(b) Data on a network is transmitted between devices using packets and the TCP/IP layered protocol stack.

Complete the table by naming **two** layers of the stack and giving **one** function for each of the layers that you have named.

(4)

	Layer name	Function
1		
2		



(c) The smartphone can communicate using Wi-Fi.

Identify which **one** of these is a radio frequency used by smartphones to connect to Wi-Fi.

(1)

- ☐ A 2.4 GHz
- ☐ B 3 KHz
- ☐ C 4.1 GHz
- ☐ D 5 KHz

(d) Carlo's smartphone can use 3G, 4G and 5G mobile communication standards.

(i) Give **one** advantage of using a higher frequency band for mobile communications.

(1)

(ii) Explain **one** benefit to Carlo of using 5G rather than 3G.

(2)

(e) Carlo wants to reduce the environmental impact of his smartphone.

(i) Give **one** way Carlo could reduce energy consumption.

(1)

(ii) Explain **one** way, other than reducing energy consumption, that Carlo could reduce the environmental impact of his smartphone.

(2)

(Total for Question 3 = 13 marks)

6 Santiago manages a computer network for a small business.

(a) Networks are based on a topology.

Figure 3 shows a network topology.

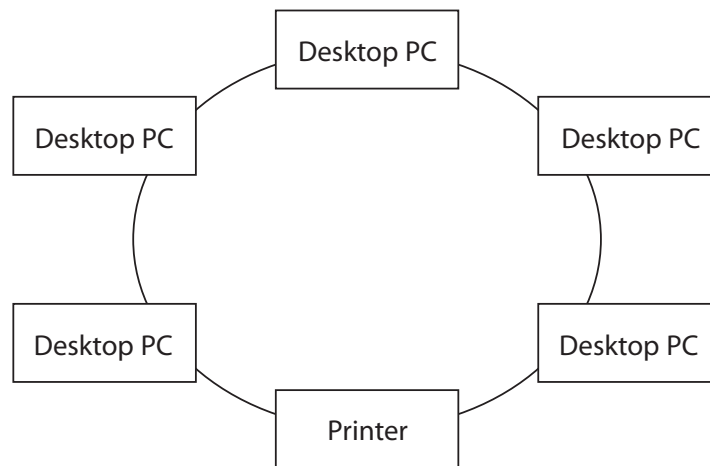


Figure 3

(i) Explain **one** benefit of this network topology.

(2)

.....

.....

.....

.....

(ii) The internet is the world's largest mesh network.

Explain **one** reason why a mesh topology is essential for the internet.

(2)

.....

.....

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.....

(b) Santiago works on his laptop whilst travelling by train.

There is a free Wi-Fi connection on the train, but Santiago doesn't use it.

He prefers to set up a network between his smartphone and his laptop to connect to the internet.

(i) Name this type of network.

(1)

(ii) Explain **one** advantage for Santiago of using the network he has set up to connect to the internet, rather than the free Wi-Fi connection.

(2)

(c) Santiago uses audit trails to help protect the network.

(i) State what is meant by an **audit trail**.

(1)

(ii) Give **one** way the data from audit trails can be used to help keep the network secure.

(1)

(d) Santiago wants to find and fix network vulnerabilities before the reputation of the company suffers.

Discuss the methods he can use.

You should consider:

- ethical hacking
- commercial analysis tools
- review of network and user policies.

(6)

3 Isra works in an office building where she has access to different types of network.

(a) Isra uses different types of networks for different tasks.

(i) Name the type of network she uses to print a document on the printer in the office next door.

(1)

(ii) Name the type of network she uses to order stationery from an online supplier.

(1)

(b) Identify the measurement used for network data speeds.

(1)

- ☐ **A** Megabits per second
- ☐ **B** Megapixels per second
- ☐ **C** Mebibytes per second
- ☐ **D** Megahertz per second

(c) Isra uses her tablet computer and smartphone to access email.

She wants to set up a new email account.

State the email protocol she should use.

Justify your choice.

(3)

Email protocol

Justification

(d) The table describes characteristics of different network topologies.

Complete the table to match each characteristic to **one** network topology.

(4)

Characteristic	Bus	Ring	Star	Mesh
Network performance degrades as more devices are added.	☐	☐	☐	☐
All devices are directly connected to all others.	☐	☐	☐	☐
Each node has a physical attachment to a routing device.	☐	☐	☐	☐
There are no data collisions, because packets travel in the same direction.	☐	☐	☐	☐

(e) Information sent across networks is represented in bit patterns.

(i) The bit pattern 1101 0001 uses sign and magnitude representation.

Convert this bit pattern to a denary number.

(2)

.....

.....

.....

.....

(ii) Convert the denary number 75 to 8-bit binary.

(2)

.....

.....

.....

.....

(iii) The addition of these two 8-bit binary patterns generates an error condition.

0	1	1	0	1	1	0	1	
1	1	0	0	0	0	0	0	+
0	0	1	0	1	1	0	1	

Explain this error condition.

(2)

.....

.....

.....

.....

(Total for Question 3 = 16 marks)

2 Many organisations use networks.

(a) One reason for networking computers is to share access to the internet.

Give **one other** reason for connecting computers in a local area network.

(1)

(b) State the purpose of network protocols.

(1)

(c) Data is transmitted in packets.

(i) Identify the layer of the TCP/IP model that would add the File Transfer Protocol (FTP).

(1)

☐ **A** Application

☐ **B** Data

☐ **C** Network

☐ **D** Transport

(ii) Give **one** task carried out by the network layer.

(1)

(d) Complete the table by adding a tick (✓) to match each item to its name.

(3)

Item	Domain Name	IP Address	URL
https://www.pearson.com			
216.33.251.195			
pearson.com			

(e) **Figure 2** shows a network topology.

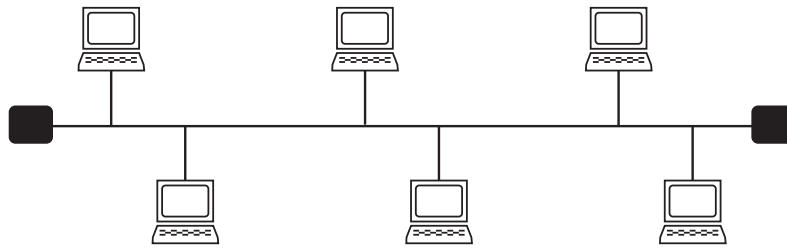


Figure 2

(i) State the name of this network topology.

(1)

(ii) State **one** benefit of using this network topology.

(1)

(iii) State **one** drawback of using this network topology.

(1)

(f) Files may be compressed using lossless or lossy algorithms.

(i) Music files are distributed over the internet.

Give **two** reasons why lossy compression is used when distributing music files over the internet.

(2)

- 1
- 2

(ii) Identify which **one** of these file formats uses lossy compression.

(1)

- ☐ **A** BMP
- ☐ **B** DOC
- ☐ **C** JPEG
- ☐ **D** PNG

(iii) Here is a string of data.

CCCWWWCCWWWWWCCC

Give the result of compressing the string using a run-length encoding algorithm.

(1)

(g) A video file is to be transmitted over the internet.

- The network transmission speed is 54 Mbps.
- The file size is 6 gigabytes (GB).

Construct an expression to show how the transmission time, in seconds, is calculated.

You do **not** have to do the calculation.

(4)



SUB-TOPIC 5(b)

5(b) NETWORK SECURITY

2 questions in this booklet



2 Danielle manages network security for a small business.

(a) Identify **one** action Danielle could take to protect the **network** from unauthorised access.

(1)

- ☐ A Give each user a separate account
- ☐ B Enforce a strong password policy
- ☐ C Make a backup plan
- ☐ D Encrypt sensitive files

(b) Danielle has received this email.

She is a customer of SafePayment.com but thinks this is a phishing attempt.

From: SafePayment.accounts@5safepayment.com
To: Danielle616
Subject: Account restricted (case SP-0011312-2021-06)

Dear Customer,

We have noticed some unusual activity on your account, so have stopped all payments.

Please use this link to log in and check your account.

Log in

Your normal log in will stoop working until you have done this.

Regards
SafePayment fraud prevention team.

(i) Danielle has circled the words **Dear Customer**.

Give **one** reason why the use of these words might make Danielle suspect that the email is a phishing attempt.

(1)

(ii) Draw circles around **two other** aspects of the email that might make Danielle suspect it is a phishing attempt.

(2)



(c) Some employees use company laptops in public places.

Danielle is concerned that shoulder surfing could pose a risk to security.

(i) Describe what is meant by **shoulder surfing**.

(2)

(ii) Explain **one** way to prevent shoulder surfing.

(2)

(d) Danielle wants to protect the network from cyberattacks.

(i) Identify the purpose of penetration testing.

(1)

- ☐ **A** To decompile executable code
- ☐ **B** To identify security vulnerabilities
- ☐ **C** To test the strength of an encryption algorithm
- ☐ **D** To enforce a network user policy

(ii) Danielle is sent a software patch for the network operating system but is too busy to install it straight away.

Explain why this delay could pose a threat to the security of the network.

(2)

(Total for Question 2 = 11 marks)



2 Zafer and Robert work for a company that makes washing machines.

(a) Zafer writes user manuals for the washing machines.

He stores these documents in the cloud.

Zafer and the cloud storage provider share responsibility for data security.

State **one** area of responsibility for each of them.

(2)

Zafer

Cloud storage provider

(b) Robert programs the robots that make the parts for the washing machines.

Zafer writes the user manuals.

Robert and Zafer have different levels of access to folders and files on the company network.

The different levels of access are Read, Write, Execute and None.

Complete the table to show the levels of access that each has.

(2)

	Robert	Zafer
Washing machine design drawings		
A folder of manuals for new machines		

- (c) Zafer uses a browser to view pages on Pearson's website by typing a uniform resource locator into a browser. This is shown in **Figure 1**.



Figure 1

Pearson's machine	Zafer's machine
MAC address: 03-57-00-EC-4B-30	MAC address: 00-15-00-BC-9A-90
IPv4 address: 2.20.38.113	IPv4 address: 192.168.1.78
IPv4 Subnet Mask: 255.255.0.0	IPv4 Subnet Mask: 255.255.255.0
Website domain: www.pearson.com	Web browser
Main web page: https://www.pearson.com/uk/	Uniform resource locator: www.pearson.com

A domain name server is used in this process.

Identify the input to and the output from the domain name server.

(2)

Input

Output

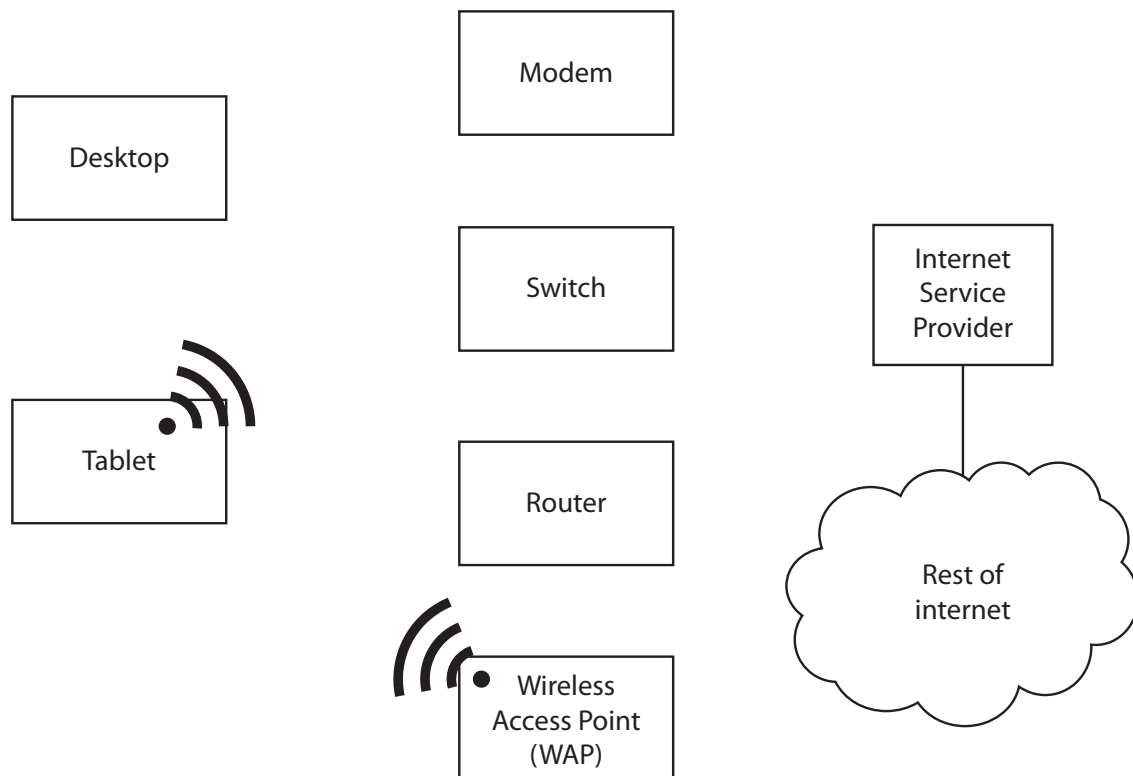
(d) Zafer can use a desktop or a tablet computer to connect to the internet.

Only the tablet has wireless capabilities.

The diagram shows the components used to connect to the internet.

Complete the diagram to show how the desktop and the tablet are connected to the internet.

(6)



(Total for Question 2 = 12 marks)

SUB-TOPIC 5(c)

5(c) THE INTERNET AND THE WORLD WIDE WEB

1 question in this booklet



1 Upeka manages the network in her office building.

(a) Upeka uses the network to install software updates on all the office computers.

Give **two other** reasons why computers are connected in a network.

(2)

1

.....

2

.....

(b) The network uses wired and wireless connectivity.

(i) State **two** advantages of using wired rather than wireless connectivity.

(2)

1

.....

2

.....

(ii) State **two** disadvantages of using wired rather than wireless connectivity.

(2)

1

.....

2

.....



(c) Some people confuse the terms 'internet' and 'world wide web'.

Describe the difference between the internet and the world wide web.

(2)

(d) Networks use both IPv4 and IPv6 addresses to identify connected devices.

Explain why IPv6 addressing was introduced.

(2)

(e) Network layouts can be based upon a number of different network topologies.

Figure 1 shows a network topology.

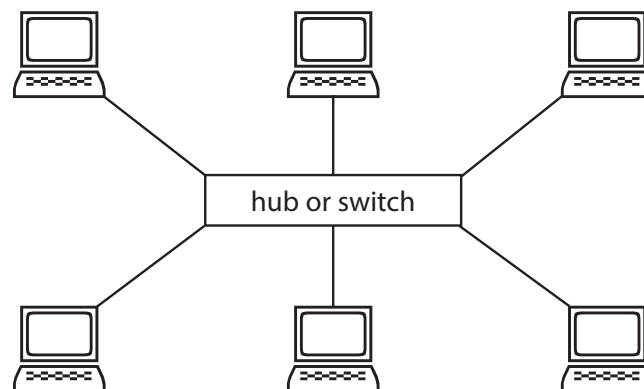


Figure 1

(i) State the name of this network topology.

(1)

(ii) State **one** benefit of using this network topology.

(1)

(iii) State **one** drawback of using this network topology.

(1)

(f) The network uses TCP/IP.

Figure 2 shows the TCP/IP protocol stack.

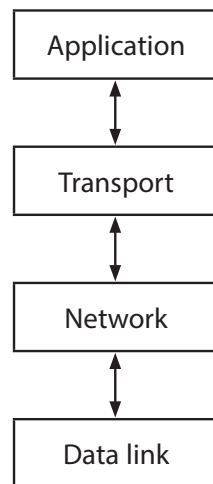


Figure 2

(i) One use of the application layer is to send and receive emails.

State **two** email protocols.

(2)

- 1
- 2

(ii) Upeka sends an email to Peter. The transport layer in Upeka's computer splits the email into data packets.

State **two** tasks performed by the transport layer in Peter's computer when the packets arrive from the network layer.

(2)

- 1
.....
- 2
.....
.....

(Total for Question 1 = 17 marks)

MARK SCHEMES

official Pearson Edexcel mark schemes



Question Number	Answer	Additional Guidance	Mark
5(a)(i)	Any two from: - It will interpret/analyse patient input to identify symptoms (1) and match the symptoms to (possible) illnesses (1) - It will match symptoms to possible illnesses (1) and give the most likely/probable illness (1) - It will match symptoms to possible illnesses (1) and ask further questions to narrow it down (1) - It will match symptoms to possible illnesses (1) by searching/using a database/other data store (1)		2
5(a)(ii)	Award one mark from: - May not have access to the internet (1) - May not have access to a device (1) - May not want to use it (1) - May not have the technical knowledge to use it (1) - May have a physical disability that stops them from using the service (1) - May not want to disclose personal information (1) - hacking or security or data issue (1) - May not trust the AI/system (1) - Can't take physical measurements eg. blood pressure (1) - may want a real person (1)		1

Question Number	Answer	Additional Guidance	Mark
5(b)(i)	Award one mark for: Local area network / LAN / VLAN		1
5(b)(ii)	Award one mark for: Wide area network / WAN		1

Question Number	Answer	Additional Guidance	Mark
5(c)	The only correct answer is C <i>A is not correct because this is phishing</i> <i>B is not correct because this is shoulder surfing</i> <i>D is not correct because this is pharming</i>		1

Question Number	Answer	Additional Guidance	Mark									
5(d)(i)	Award up to two marks for a linked explanation such as: • Robust/less likely to break it if dropped / quieter than a mechanical hard drive (1) because it doesn't have any moving/mechanical parts (1) • Smaller/thinner/lighter than a device with HDD (1) so easier to carry/more portable / laptops have less room in them for drives/components(1) • SSD uses less power (1) so battery will last longer (1) • SSD is faster (1) so can access data/records more quickly (1)		2									
5(d)(ii)	Any two from: • Flash memory chips are used (1) • Chips have (floating gate) transistors/electron pools/charge traps (1) • Gates/electron pools/charge traps hold an electrical charge (1) • Charge remains even when no power (1) • No charge/empty pool/trap represents data/1 (1) • A charge/full pool/trap represents no data/0 (1) • Data is stored in blocks and pages (1)		2									
5(d)(iii)	Award one mark for each of: <table><tr><th>Description</th><th>RAM</th><th>ROM</th></tr><tr><td>Stores the boot up sequence</td><td></td><td>☐</td></tr><tr><td>The contents are lost when the laptop is shut down</td><td>☐</td><td></td></tr></table>	Description	RAM	ROM	Stores the boot up sequence		☐	The contents are lost when the laptop is shut down	☐			2
Description	RAM	ROM										
Stores the boot up sequence		☐										
The contents are lost when the laptop is shut down	☐											
Total for question 5			12									

Question Number	Answer	Additional Guidance	Mark																
3(a)	Award one mark for correct network type Award one mark for correct usage model One mark for each column <table border="1"> <thead> <tr> <th>Network type</th><th>Tick (□)</th><th>Usage model</th><th>Tick (□)</th></tr> </thead> <tbody> <tr> <td>Local Area Network (LAN)</td><td></td><td>Client-Server</td><td></td></tr> <tr> <td>Wide Area Network (WAN)</td><td></td><td>Peer-to-peer</td><td>□</td></tr> <tr> <td>Personal Area Network (PAN)</td><td>□</td><td></td><td></td></tr> </tbody> </table>	Network type	Tick (□)	Usage model	Tick (□)	Local Area Network (LAN)		Client-Server		Wide Area Network (WAN)		Peer-to-peer	□	Personal Area Network (PAN)	□				2
Network type	Tick (□)	Usage model	Tick (□)																
Local Area Network (LAN)		Client-Server																	
Wide Area Network (WAN)		Peer-to-peer	□																
Personal Area Network (PAN)	□																		

Question Number	Answer	Additional Guidance	Mark										
3(b)	Award one mark for each correct layer name up to a maximum of two Award one mark per layer for a correct function associated with the correct layer up to a maximum of two <table><tr><th>Layer</th><th>Function</th></tr><tr><td>Application</td><td> • Selects and uses the correct protocol to transmit data • Interacts with the user </td></tr><tr><td>Transport</td><td> • Identifies the server port to use • Identifies the client port to use • Divides the data into packets • Numbers the packets • Adds the total number of packets • Sets up communication between hosts / Establishes end to end communication • Passes the packets to the network layer • Checks the packets arrive at the destination • Resends any packets that have not arrived </td></tr><tr><td>Network</td><td> • Adds the source/sender's IP address • Adds the destination IP address • Routes the packets </td></tr><tr><td>Data link</td><td> • Controls physical connections between pieces of hardware • Adds MAC addresses to the packets • Sends the packets on their way • Adds headers and trailers </td></tr></table>	Layer	Function	Application	• Selects and uses the correct protocol to transmit data • Interacts with the user	Transport	• Identifies the server port to use • Identifies the client port to use • Divides the data into packets • Numbers the packets • Adds the total number of packets • Sets up communication between hosts / Establishes end to end communication • Passes the packets to the network layer • Checks the packets arrive at the destination • Resends any packets that have not arrived	Network	• Adds the source/sender's IP address • Adds the destination IP address • Routes the packets	Data link	• Controls physical connections between pieces of hardware • Adds MAC addresses to the packets • Sends the packets on their way • Adds headers and trailers	Accept functions at the receiving end too	
Layer	Function												
Application	• Selects and uses the correct protocol to transmit data • Interacts with the user												
Transport	• Identifies the server port to use • Identifies the client port to use • Divides the data into packets • Numbers the packets • Adds the total number of packets • Sets up communication between hosts / Establishes end to end communication • Passes the packets to the network layer • Checks the packets arrive at the destination • Resends any packets that have not arrived												
Network	• Adds the source/sender's IP address • Adds the destination IP address • Routes the packets												
Data link	• Controls physical connections between pieces of hardware • Adds MAC addresses to the packets • Sends the packets on their way • Adds headers and trailers												

4



Question Number	Answer	Additional Guidance	Mark
3(c)	The only correct answer is A <i>B is not correct because it is not a smartphone frequency band</i> <i>C is not correct because it is not a smartphone frequency band</i> <i>D is not correct because it is not a smartphone frequency band</i>		1

Question Number	Answer	Additional Guidance	Mark
3(d)(i)	Award one mark from: - higher frequency has more waves per second/carries more data in the same time (1) - higher frequency gives greater bandwidth (1) - higher frequency is more stable/less prone to interference (1)		1
3(d)(ii)	Award up to two marks for a linked explanation such as: - gives Carlo faster responses to his communications/connections (1) allowing Carlo to move/download/share data in a shorter time (1) - gives Carlo more reliable communications/can access communications more widely/in more places (1) giving Carlo a better user experience (1) - gives Carlo more secure communications (1) improving his privacy/reducing other people's ability to intercept/spy on his communications (1)		2

Question Number	Answer	Additional Guidance	Mark
3(e)(i)	Award one mark from: - do not leave the smartphone on standby/turn off when not being used (1) - use (portable) solar cells/other renewable generation method (1) - unplug charger when not in use (1) - reduce screen brightness (1) - turn off WiFi/GPS/Bluetooth/location (when not in use) (1) - close apps that are not being used (1)		1

Question Number	Answer	Additional Guidance	Mark
3(e)(ii)	Award up to two marks for a linked explanation. Award one mark for the action - keep smartphone for longer (1) - repair/recycle smartphone if not working (1) - upgrade the operating system (1) Award one mark for the impact - less e-waste is generated (1) - manufacturing could be reduced (1)		2
Total			13

Question Number	Answer	Additional Guidance	Mark
6(a)(i)	Award up to two marks for a linked explanation such as: • Can transfer data quickly / reduced chance of packet collisions (1) as data only flows in one direction (1) • No need for a server/switch/hub (1) because the packets do not have to be directly routed to a specific device / each workstation controls connectivity / packets are passed from workstation to workstation until the destination is reached (1) • Every workstation gets equal access to resources (1) because each station has to wait until it gets a token / devices do not have to compete to get a token (1) • Additional workstations can be easily added/easy to set up (1) because each workstation only connects to two other workstations (1) • Easy to find faults (1) all of the tokens will end up on one workstation (1) • Cheap to set up (1) uses minimum cabling (1)	Not a Comparison without expansion that fits mark scheme	2
6(a)(ii)	Award up to two marks for a linked explanation such as: • It needs to be easily scalable (1) mesh topology allows this as it is decentralised / nodes connect with other nodes around them (1) • Can handle high volumes of data traffic (1), because data can travel via multiple routes (1) • Is self-healing/resilient/allows alternative paths (1), which means data will still reach its destination even if a node or connection fails(1) Not system/computer/switch etc • Enables it to span a huge geographic area (1), because additional nodes can be added to expand coverage (1)		2

Question Number	Answer	Additional Guidance	Mark
6(b)(i)	Award one mark for: • Personal area network / PAN/WPAN		1



6(b)(ii)	Award up to two marks for a linked explanation such as: • A faster connection speed (1) because fewer users/devices sharing the bandwidth/connection (1) • Improved security /stated security issue(1) because it uses secure cellular data connection / not on public network /Santiago has to approve users(1)		2
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Question Number	Answer	Additional Guidance	Mark
6(c)(i)	Award one mark from: • A record of activities/specified activity that have taken place on a computer system (1) • Automatic record of what has happened and who did it (1)		1
6(c)(ii)	Award one mark from: • To identify suspicious/malicious activity/changes (1) • To increase accountability (1) • To trace a problem back to its source/perpetrator (1) • To find out if any users are using unauthorised applications (capable of putting the network at risk) (1)		1

Question Number	Answer	Additional Guidance	Mark
6(d)	Ethical hacking • Ethical hackers are white hat hackers • Attempt to access the network as a hacker does • Don't attempt to change or steal data • Looking for weaknesses in the network • Weakness pointed out • Weaknesses fixed • Could be employed by the business • Could work for another specialist company • Can include penetration testing Commercial analysis tools • Software used to find weaknesses • Can be configured to check for a range of weaknesses • Results/reports generated identifying faults • Weaknesses fixed Review of network and user policies • Collection of rules and guidelines that govern the behaviours of network devices/users • Need reviewing because may not comply with new laws and regulations • Reviews should be scheduled		6
Total for question 6			15
Level	Mark	Descriptor	
	0	No rewardable content.	
Level 1	1–2	Basic, independent points are made showing elements of knowledge and understanding of key concepts/principles of computer science. The discussion will contain basic information with little linkage between points made.	
Level 2	3–4	Demonstrates adequate knowledge and understanding of key concepts/principles of computer science. The discussion shows some linkages and lines of reasoning with some structure.	
Level 3	5–6	Demonstrates comprehensive knowledge and understanding by selecting relevant knowledge and understanding of key concepts/principles of computer science to support the discussion being presented. The discussion shows a well-developed, sustained line of reasoning which is clear, coherent, and logically structured.	



Question Number	Answer	Additional Guidance	Mark
3(a)(i)	• LAN / Local area network (1) Allow PAN/Personal Area Network		1

Question Number	Answer	Additional Guidance	Mark
3(a)(ii)	• WAN / Wide area network (1)		1

Question Number	Answer	Additional Guidance	Mark
3(b)	A: Megabits per second The only correct answer is A B is not correct because megapixels are associated with images rather than network data speeds C is not correct because mebibytes are not associated with network data speeds D is not correct because mebihertz are not associated with network data speeds		1

Question Number	Answer	Additional Guidance	Mark
3(c)	- IMAP (1) AND one from: - because changes are synced (1) with the mail server in real-time (1) - because the messages always reside on the email server (1) as she has limited storage (1) on her tablet and phone - it gets sent to both smartphone and tablet (1) Alternative answer: - POP3 (not awarded a mark) AND one from: - because storage limitations on server (1) and privacy issues (1) - because more CPU time (1) may be used when syncing (1) (a large number of messages).		3

Question Number	Answer	Additional Guidance	Mark																									
3(d)	<table><tr><th>Characteristic</th><th>Bus</th><th>Ring</th><th>Star</th><th>Mesh</th></tr><tr><td>Network performance degrades as more devices are added.</td><td>✓</td><td></td><td></td><td></td></tr><tr><td>All devices are directly or indirectly connected to all others.</td><td></td><td></td><td></td><td>✓</td></tr><tr><td>Each node has a physical attachment to a routing device.</td><td></td><td></td><td>✓</td><td></td></tr><tr><td>There are no data collisions, because packets travel in the same direction.</td><td></td><td>✓</td><td></td><td></td></tr></table>	Characteristic	Bus	Ring	Star	Mesh	Network performance degrades as more devices are added.	✓				All devices are directly or indirectly connected to all others.				✓	Each node has a physical attachment to a routing device.			✓		There are no data collisions, because packets travel in the same direction.		✓				4
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Question Number	Answer	Additional Guidance	Mark
3(e)(i)	-81 One mark for negative sign One mark for 81.		2

Question Number	Answer	Additional Guidance	Mark
3(e)(ii)	One mark for each nibble in correct order 0100 1011		2

Question Number	Answer	Additional Guidance	Mark
3(e)(iii)	Any two from: 1. This is an overflow (1) error 2. It is caused by adding two 1s in the most significant bit (1) 3. The resulting number is too large to fit in the number of bits available / requires 9 bits / the number is larger than 2^8 / there is 1 that needs to be carried over (in MSB) / MSB gets discarded (1) 4. It can cause the program to crash or produce unreliable/incorrect results (1)		2

Question Number	Answer	Additional Guidance	Mark
2(a)	Award one mark from: • share peripherals/devices (e.g. printers, scanners) (1) • communicate (e.g. email, instant messaging, play games) (1) • share data (e.g. files/music/videos/backups on servers) (1) • deploy/update applications/software(1) • administrative purposes (e.g. remote access/desktop)		1

Question Number	Answer	Additional Guidance	Mark
2(b)	Award one mark from: • to allow (connected) machines to communicate (1) • to provide the rules of communication between (networked) devices (1)	Accept any other response indicating protocols enable communication between devices	1

Question Number	Answer	Additional Guidance	Mark
2(c)(i)	The only correct answer is A B is not correct because FTP is an application protocol, which is added in the application layer C is not correct because FTP is an application protocol, which is added in the application layer D is not correct because FTP is an application protocol, which is added in the application layer		1
2(c)(ii)	Award one mark from: - Adds the source/destination IP address (1) - Establishes sockets (an IP address followed by a port number) (1) - Moves packets onto the next network node (1) - Strips the source/destination IP addresses (when it arrives at its destination) (1) - Passes the packet to the transport/next layer (when it arrives at its destination) (1) - Adds/removes packet headers (1)		1

Question Number	Answer	Additional Guidance	Mark												
2(d)	Award one mark for each of: <table><tr><th>Domain Name</th><th>IP Address</th><th>URL</th></tr><tr><td></td><td></td><td>✓</td></tr><tr><td></td><td>✓</td><td></td></tr><tr><td>✓</td><td></td><td></td></tr></table>	Domain Name	IP Address	URL			✓		✓		✓				3
Domain Name	IP Address	URL													
		✓													
	✓														
✓															

Question Number	Answer	Additional Guidance	Mark
2(e)(i)	Bus		1
2(e)(ii)	Award one mark from: • Easy to connect/remove devices/computers (in a network) (1) • Cable cost less / fewer cables needed (compared to mesh/star topology) (1) • Easier to plan/setup/maintain (1)		1
2(e)(iii)	Award one mark from: • If the main cable/a terminator fails or gets damaged the whole network will fail (1) • The more workstations the slower it gets (1) • The more workstations the more collisions (1) • Every device 'sees' all of the data on the network (1)		1

Question Number	Answer	Additional Guidance	Mark
2(f)(i)	Award two marks from: • Reduces time taken to upload/download (1) • Reduces the bandwidth required/cost of data to upload/download (1) • (Usually) produces smaller file/reduces storage (on the web server/device) (1) • People have a limited hearing range / can't tell the difference (1) • People's brains will 'fill in the blanks' (1)		2
2(f)(ii)	The only correct answer is C <i>A is not correct because it is not compressed</i> <i>B is not correct because it uses lossless compression</i> <i>D is not correct because it uses lossless compression</i>		1
2(f)(iii)	Award one mark from: • 3c3w2c6w3c (1) • c3w3c2w6c3 (1)		1

Question Number	Answer	Additional Guidance	Mark
2(g)	Award four marks for a correct expression or correct answer Examples of correct expressions: $6 \times 1000 \times 1000 \times 1000 \times 8$ (4) $54 \times 1000 \times 1000$ $\frac{1000 \times 8}{9}$ (4) 888.9 (4) For an incorrect or partial expression award one mark for each of: • Bits to transfer ○ 6×1000^3 (1) ○ $\times 8$ (or equivalent) (1) • Speed in bits per second ○ 54×1000^2 (1) • Their bits divided by their speed (1)	• Units are not required • Equivalent expressions are accepted • Allow follow through for incorrect or partial expressions	4

Question Number	Answer	Additional Guidance	Mark
2(a)	The only correct answer is B <i>A is not correct because a password is needed to prevent unauthorised access to the network</i> <i>C is not correct because it only provides security after access to the network</i> <i>D is not correct because it only provides security after access to the network</i>		1

Question Number	Answer	Additional Guidance	Mark
2(b)(i)	Award one mark from: - the email should be addressed to Danielle by her (full) name (1) - the email should be personalised (1)		1

2(b)(ii)	Award up to two marks for identifications from: From: SafePayment.accounts@SafePayment.com To: Danielle616 Subject: Account restricted (case SP-0011312-2021-06) Dear Customer, We have noticed some unusual activity on your account, so have stopped all payments. Please use this link to log in and check your account.  Your normal log in will stop working until you have done this. Regards SafePayment fraud prevention team.	Allow link to log in OR circle around button	2
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Question Number	Answer	Additional Guidance	Mark
2(c)(i)	Award up to two marks for a linked description such as: A hacker/third party spies on/watches the user (of an electronic device) (1) In order to obtain their personal identification number/password/login information/sensitive information (1)		2

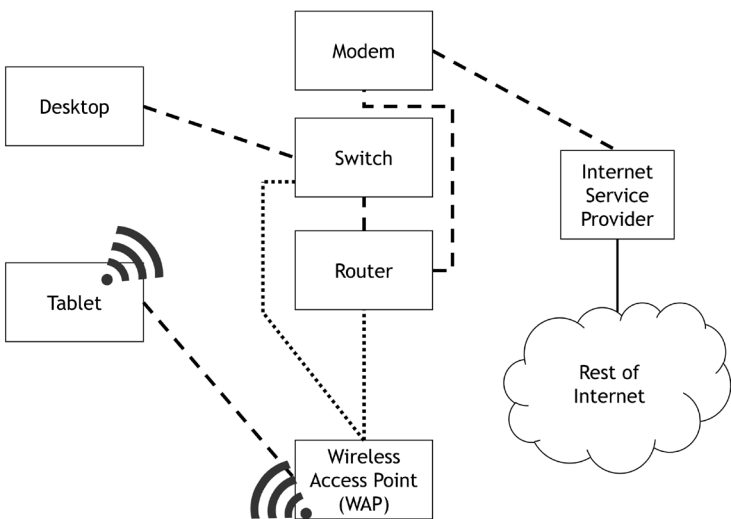
2(c)(ii)	Award up to two marks for a linked explanation such as: • tilt the screen away from possible viewers/position yourself with your back to a wall (1) to ensure no one can see the screen (1) • shield your screen/keypad/keyboard when entering (sensitive/personal) information (1) to stop people seeing/memorising passwords/named sensitive item/sensitive/personal information (1) • use long/strong passwords (1) to prevent onlookers memorising them as you type (1) • use a screen/privacy filter (1) because it will prevent anyone not sitting directly in front of the screen from reading what is displayed (1) • sit where the information displayed on the screen (1) can't be captured on CCTV/by a drone-mounted camera or viewed by someone using binoculars (1)	Allow 1 mark for don't enter private information in a public place	2
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Question Number	Answer	Additional Guidance	Mark
2(d)(i)	The only correct answer is B <i>A is not correct because this is not the purpose of penetration testing</i> <i>C is not correct because this is not the purpose of penetration testing</i> <i>D is not correct because this is not the purpose of penetration testing</i>		1
2(d)(ii)	Award up to two marks for a linked description such as: • compromised/unpatched software is more vulnerable to attack (1) and may allow an attacker control of the whole network (1) • unpatched software has known weaknesses (1) which can be exploited by a hacker (1)		2
Total			11

Question Number	Answer	Additional Guidance	Mark
2(a)	Award one from each: Zafer: 1. Choose strong (1) authentication credentials (username/password) 2. Not sharing his credentials (1) 3. Not having automatic login to cloud / leaving his machine unattended (1) 4. Changing password regularly (1) 5. Password protect documents (1) Provider: 1. Infrastructure (e.g. firewall/servers) must be secure from unauthorised access (1) 2. Keeping their security software up to date (1) 3. Policy and procedures effective in preventing an insider attack / a data breach (1) 4. Data protection laws in the resident country must be obeyed (1) 5. Backup and restore procedures (1) 6. Encryption (1)		2

Question Number	Answer	Additional Guidance	Mark									
2(b)	Two marks if completely correct. One mark for any two correct cells. <table><tr><th></th><th>Robert</th><th>Zafer</th></tr><tr><td>Washing machine design drawings</td><td>Read</td><td>Read</td></tr><tr><td>A folder of manuals for new machines</td><td>None</td><td>Read, Write Or Write, Read</td></tr></table>		Robert	Zafer	Washing machine design drawings	Read	Read	A folder of manuals for new machines	None	Read, Write Or Write, Read	Ignore spelling mistakes	2
	Robert	Zafer										
Washing machine design drawings	Read	Read										
A folder of manuals for new machines	None	Read, Write Or Write, Read										

Question Number	Answer	Additional Guidance	Mark
2(c)	Award one mark from each category (maximum of 2) Input: • www.pearson.com / website domain (1) • Uniform Resource Locator / URL (of Pearson website) (1) Output: • 2.20.38.113 (1) • Pearson's machine IP(v4) address (1)	Don't penalise spelling or typos, especially in addresses	2

Question Number	Answer	Additional Guidance	Mark
2(d)	One mark for each dotted connection, correctly located. Maximum of 6 marks. Note: WAP can be connected to either the Switch or the Router, but not both  The diagram shows a network topology. A Desktop is connected to a Switch by a dotted line. A Tablet is connected to a Wireless Access Point (WAP) by a dotted line. The WAP is connected to a Router by a dotted line. The Router is connected to a Switch by a dotted line. The Switch is connected to a Modem by a dotted line. The Modem is connected to an Internet Service Provider (ISP) by a dotted line. The ISP is connected to the Rest of Internet cloud by a solid line.		6

Question Number	Answer	Additional Guidance	Mark
1(a)	Any two from: • (Share) access to the Internet/WWW/broadband connection (1) • (Internal) communication (using email/instant messaging/calendars) (1) • Share files/data (1) • Share peripherals/printers / hardware (1) • Increases the amount of storage (since network storage devices can be attached) (1) • Saves money on licences (since network site licences for software are usually cheaper than buying a stand-alone licence for every machine) (1) • Centralised backup (1) • Centralised security (1)	• Award examples if mapped to a bullet point • Do not award the same bullet more than once • Do not award for install updates (in the stem)	2

Question Number	Answer	Additional Guidance	Mark
1(b) (i)	Any two from: • ~~Faster (data transfer) (1)~~ Not really true, its Greater bandwidth / more bits per second (1) • The connection does not get worse the further you are from the router / more reliable (1) • Connection does not get obstructed by walls, ceilings, and furniture (1) • More secure (1)	Accept reverse arguments for disadvantages of wireless.	2

Question Number	Answer	Additional Guidance	Mark
1(b) (ii)	Any two from: • Installation/maintenance is more complex (1) • Devices need to be physically connected (1) • Less portable / limited by length of cable (1) • Limited number of devices can be connected (1) • Some digital devices cannot use a wired connection (1) • Trip hazard (1)	Accept reverse arguments for advantages of wireless.	2

Question Number	Answer	Additional Guidance	Mark
1(c)	Award two marks for a linked description that addresses the individual mark points: The internet is a (global) network of networks/ connected devices (1) whereas the www is the collection of web pages/service accessed using the internet (1) / the www is resources located via URLs/domain names (1) The internet is the infrastructure (1) and the www is a service that runs on that infrastructure (1)		2

Question Number	Answer	Additional Guidance	Mark
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1(d)	Award two marks for a linked explanation such as: Running out of IPv4 addresses/the number of (internet) connected devices has grown (1) IPv6 addresses are long/longer than IPv4 / the number of possible addresses is large/will last much longer (1)		2
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Question Number	Answer	Additional Guidance	Mark
1(e)(i)	Star		1

Question Number	Answer	Additional Guidance	Mark
1(e) (ii)	Any one from: • easy to connect/remove new nodes (1) • failure of one node/link does not affect the rest of the network (1) • easy to detect the failure of one node/link (1)		1

Question Number	Answer	Additional Guidance	Mark
1(e) (iii)	Any one from: • if central switch/hub fails then the whole network fails (1) • performance and number of nodes that can be added depends on capacity of central switch/hub (1) • can require more cable than some of the other topologies (1)		1

Question Number	Answer	Additional Guidance	Mark
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1(f)(i)	Any two from: - SMTP (1) - IMAP (1) - POP/POP3 (1)		2
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Question Number	Answer	Additional Guidance	Mark
1(f)(ii)	Any two from: - passes the (reassembled) packets to the application layer (1) - check if all packets have arrived (1) - determine whether the contents are correct (1) - requests resending of lost or damaged packets (1) - reassembles packets in correct order/ into an email (1)	Do not accept receives from network layer (stem)	2