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EDEXCEL INTERNATIONAL GCSE COMPUTER SCIENCE: QUESTIONS BY TOPIC

The Bigger Picture (Topic 6)

International GCSE Computer Science Topic 6

4 questions · 50 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
6(a) EMERGING TECHNOLOGIES		2 questions · 23 marks	3
1. Q6	Paper 1 June 2021	11	4
2. Q5 <i>also Topic 5</i>	Paper 1 June 2022	12	5
6(b) ETHICAL, LEGAL AND ENVIRONMENTAL ISSUES		2 questions · 27 marks	7
3. Q2 <i>also Topic 5</i>	Paper 1 June 2019	12	8
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QUESTIONS

4 questions · 50 marks · grouped by sub-topic



SUB-TOPIC 6(a)

6(a) EMERGING TECHNOLOGIES

2 questions in this booklet



6 (a) Two emerging technologies are DNA computing and quantum computing.

(i) Explain **one** difference between DNA computing and traditional computing.

(2)

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(ii) Give a definition of the term **superposition** in quantum computing.

(1)

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(b) Ethically, everyone should be able to access the benefits of technology.

Give **two** reasons why this may not be possible.

(2)

1

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2

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(c) Widespread use of computer technology has a negative environmental impact.

Discuss the negative environmental impact of using computers and actions that could be taken to reduce it.

(6)

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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)



SUB-TOPIC 6(b)

6(b) ETHICAL, LEGAL AND ENVIRONMENTAL ISSUES

2 questions in this booklet



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

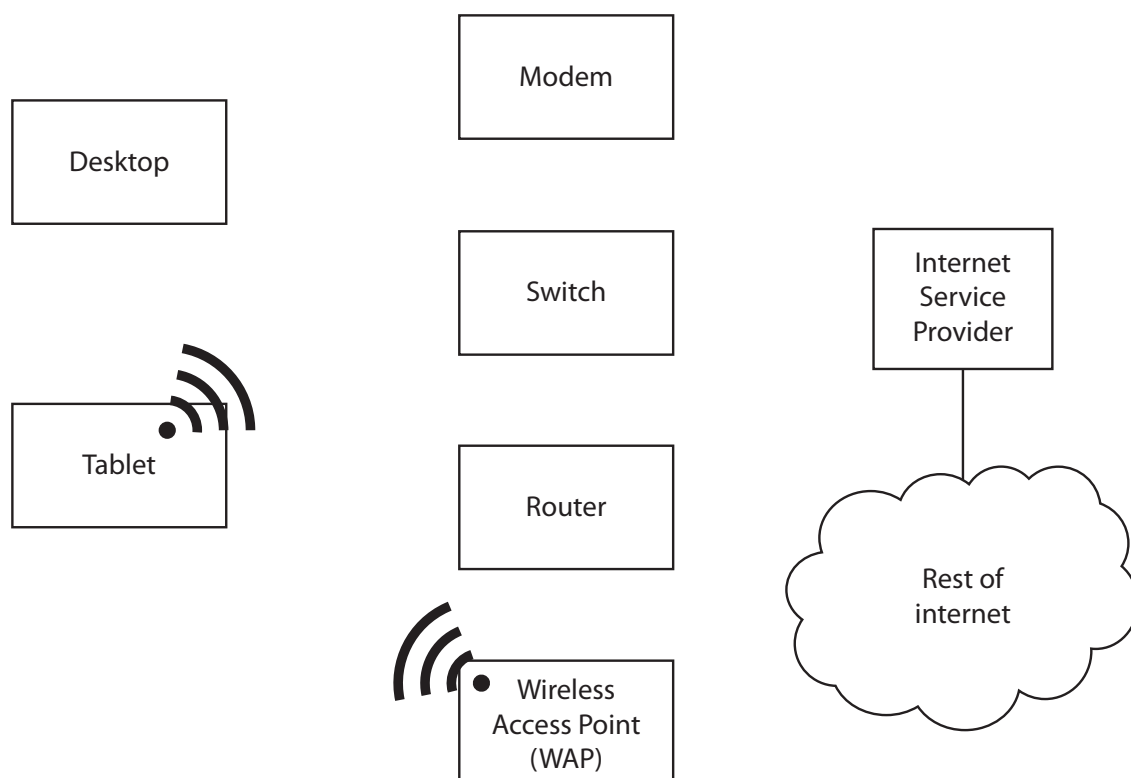
(d) Zafer can use a desktop or a tablet computer to connect to the internet.

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)

6 A train company uses ticket vending machines at each station.

(a) The machines use embedded systems.

(i) Explain **one** benefit of using an embedded system in these machines.

(2)

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(ii) Customers use a touch screen to select their destination. They can pay by cash or bank card. Their tickets and a receipt are printed.

The touch screen is controlled by an embedded system.

Give **two** other hardware components in the ticket machine that are controlled by embedded systems.

(2)

1

.....

2

.....

(iii) The ticket machine uses data encryption when a customer pays using a bank card.

State why data encryption is used in this case.

(1)

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(b) Compare **four** features of high-level and low-level programming languages.

(4)

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(c) Artificial intelligence (AI), in many forms, has an increasing impact on our lives.

Discuss this statement considering characteristics, uses and ethical issues.

(6)



MARK SCHEMES

official Pearson Edexcel mark schemes



Question Number	Answer	Additional Guidance	Mark
6(a)(i)	Award two marks for a linked explanation such as: • Uses DNA/biomolecular components (1) rather than standard hardware/silicon chips (1) • DNA uses four-character genetic alphabet (1) rather than binary digits (1) • DNA uses chemical reactions (1) rather than electrical states/properties (1) • DNA computing uses massive parallel processing/strands (1) to solve problems that otherwise would take impossible amounts of time (1)		2
6(a)(ii)	Award one mark from: • The ability of a system to be in multiple states at the same time (1) • Multiple probabilities at the same time (1) • One state combines all possibilities (1) • The state is not known until it is measured (1)		1

Question Number	Answer	Additional Guidance	Mark
6(b)	Award two marks from: - Some people may not want to use technology (1) - Some people may not be able to afford to use technology (1) - Some people may not have access to the technology/infrastructure (1) - Some people may not be allowed access to technology (1) - Some people may not be able to use it (disabilities etc.) (1)		2

Question Number	Answer	Additional Guidance	Mark
6(c)	Indicative content Impacts - Pollution (water, air, noise) resulting from the manufacturing process - High energy and water volumes needed for the manufacturing process - Mineral mining contaminates ground water - Mineral (copper, gold, silver, lithium) resource depletion - High energy use to keep machines cool with air conditioning or fans - Contain toxic components which means computing devices are hazardous waste - Batteries (laptop, lithium cells) disposal is hazardous and needs specialised disposal facilities - Computing devices sent to landfills contaminate ground and water resources Actions - Check national and local legislation - Some countries/states/regions require sellers to recycle own waste - Research recycling facilities to see if e-waste is acceptable - Find if local/national/regional government agencies charge for collection and disposal of e-waste - Find sellers offering exchange old for new + cost purchase options - Find charities (local, regional) which take donations of old devices - Turn off machines when not in use to save energy		6



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
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

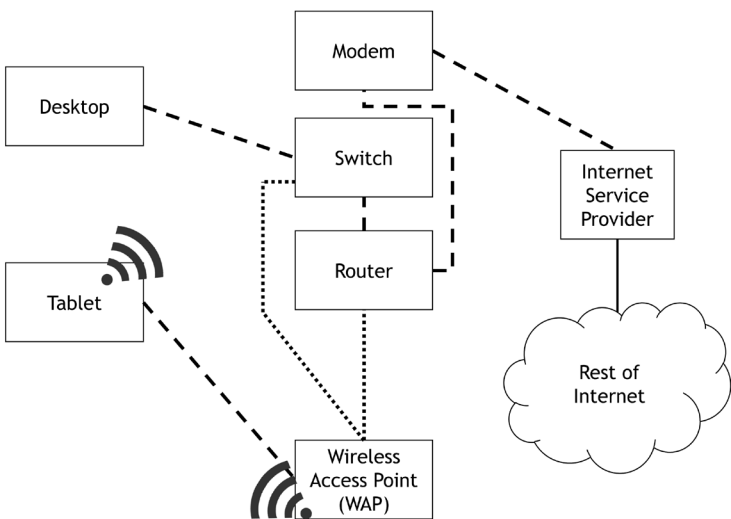
Question Number	Answer	Additional Guidance	Mark									
5(d)(i)	Award up to two marks for a linked explanation such as: • Robust/less likely to break it if dropped / quieter than a mechanical hard drive (1) because it doesn't have any moving/mechanical parts (1) • Smaller/thinner/lighter than a device 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
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 (represented by a cloud) by a solid line. The Router is also connected to the Rest of Internet by a solid line.		6

Question Number	Answer	Additional Guidance	Mark
6(a)(i)	Features such as power consumption / processor / memory / number and type of components / physical size (1) can be optimised / chosen to fit just one specific task. (1)		2

Question Number	Answer	Additional Guidance	Mark
6(a)(ii)	Any two from: • Printer (1) • Bank card (magnetic strip) reader/scanner (1) • Bank card contactless/NFC reader/scanner (1) • Cash input and giving change device (1)	Allow any hardware that relates to paying by cash for MP4	2

Question Number	Answer	Additional Guidance	Mark
6(a)(iii)	To prevent unauthorised people from reading / understanding the bank card information (1)	Do not award 'to keep it from being hacked / accessed'.	1

Question Number	Answer	Additional Guidance	Mark
6(b)	Award one mark for each of (maximum of 4): 1. Readability: high-level language is easily readable by a human because it is designed to look like English whereas a low-level language is binary patterns / mnemonics / abbreviations. (1) 2. Portability: code written in a high-level language is easily transportable across machines whereas a low-level language is designed for a specific microprocessor / piece of hardware. (1) 3. Uses: low-level languages are commonly used to write programs for hardware or devices, like printers, whereas high-level languages are commonly used for to write higher-level applications, such as word processors. (1) 4. Optimisation: low-level languages are used to improve performance, especially of hardware, whereas high-level languages have to go through multiple layers of software to get to the hardware, e.g. the need for HLL to be compiled/interpreted makes programmes run slower than LLL, HLL has a higher level of abstraction removing unnecessary detail (one to many), LLL keeps more of a detail (one to one) (1) 5. Ease of use: high-level languages usually have tools, functions, libraries and development environments which are accessible, even by those with little knowledge, whereas, low-level languages are often challenging to work with and require expertise and depth of knowledge. (1)	For each mark point: • the general feature is followed by exemplification • needs to be a comparison, which may be implicit	4

Question Number	Answer	Mark
6(c)	Indicative content: Characteristics – Any of the following: • Implemented in software. • Could involve the use of neural networks / clustering / modelling • Algorithms are trained by exposure to data that has been validated / checked • Algorithms learn by identifying commonalities between the validated / checked data • Algorithms make predictions for new data based on prior learning • Algorithms may incorporate recursive self-improvement Uses – Any of the following: • Game playing (opponents) • Analytics (analyse buying patterns, predicting behaviours, predictive text, targeted advertising, personalised news feeds, friend suggestions) • Image / Audio processing (recognising objects/patterns, face recognition) • Logistics (scheduling, order fulfilment) • Control systems (cars, manufacturing, weapons, navigation) • Diagnostic systems (medical, mechanical, electrical) • Natural languages processing (chatterbots, chatbots, speech recognition, personal assistants) • Robotics (dangerous situations, help aged or disabled) Ethical issues – Any of the following: • Training sets could include data that should not be used to make decisions (race, religion, gender, etc.) that could cause biased outcomes • Is a computer to be trusted to make decisions (life-death)? • If a computer discovers something that humans can't prove, should it be accepted as truth? • How do we know that the answer produced is correct? • Will people be comfortable interacting with machines that are considered intelligent? • Some jobs may be at risk, especially those requiring human skills such as empathy or creativity.	6

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