



Cambridge O Level

COMPUTER SCIENCE

2210/12

Paper 1 Theory

October/November 2022

MARK SCHEME

Maximum Mark: 75

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2022 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **13** printed pages.

PUBLISHED**Generic Marking Principles**

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Please note the following further points:

The words in **bold** in the mark scheme are important text that needs to be present, or some notion of it needs to be present. It does not have to be the exact word, but something close to the meaning.

If a word is underlined, this **exact** word must be present.

A single forward slash means this is an alternative word. A double forward slash means that this is an alternative mark point.

Ellipsis (...) on the end of one-mark point and the start of the next means that the candidate **cannot** get the second mark point without being awarded the first one. If a mark point has an ellipsis at the beginning, but there is no ellipsis on the mark point before it, then this is just a follow-on sentence and **can** be awarded **without** the previous mark point.

Question	Answer	Marks
1(a)	Any two from: <ul style="list-style-type: none"> • Keyboard • Trackpad • Trackball • Microphone • Keypad • Sensor • Button • Barcode/QR scanner/reader • Webcam/digital camera 	2
1(b)	Any one from: <ul style="list-style-type: none"> • Speaker • Headphones 	1
1(c)(i)	Any four from: <ul style="list-style-type: none"> • The screen is made up of (two) layers/multiple layers • The user pushes the top layer into the bottom layer // The user pushes the layers together • The layers create a circuit (when pushed together) • causing electricity to flow • allowing the co-ordinates/location of the users touch to be calculated 	4
1(c)(ii)	Any two from: <ul style="list-style-type: none"> • Cheap to manufacture/buy • Can still be used whilst wearing gloves • Waterproof // Can be used in bad weather • Does not easily shatter • Low power consumption • (Can) support multitouch 	2

Question	Answer	Marks
1(c)(iii)	Any two from: <ul style="list-style-type: none"> • Does not (normally) support multitouch • Screen visibility can be poor in sunlight • Longevity issues • (Normally) lower resolution • Not very sensitive to touch // Lower response time (than capacitive) • Prone to scratches 	2
1(c)(iv)	Any one from: <ul style="list-style-type: none"> • Capacitive • Infrared 	1
1(d)	Any two from: <ul style="list-style-type: none"> • Data and instructions are stored in the same memory • and can only be fetched one at a time 	2
1(e)	Any three from: <ul style="list-style-type: none"> • Multitasking • Multiprogramming • Input and output control • Running software • Memory management • Processor management • File management • Handling interrupts • Providing security • Managing user accounts • Batch / real-time processing 	3

Question	Answer	Marks
1(f)(i)	<ul style="list-style-type: none">• 000001100100• 000011101011• 000100101101	3
1(f)(ii)	<ul style="list-style-type: none">• 22• 119• 857	3
1(f)(iii)	One mark for two correct characters in the correct place, two marks for three <ul style="list-style-type: none">• 095• AD1	4

Question	Answer	Marks								
2(a)	<p>Six from:</p> <ul style="list-style-type: none"> • Motion/proximity/infra-red sensor is used • Sensor sends data to microprocessor • Data is converted from analogue to digital (using ADC) • Data is compared to stored/set value(s) • If data is inside range/outside range/greater than/less than, signal is sent to turn water tap on • If data is outside range /inside range/less than/greater than, tap remains off / signal is sent to turn water tap off • Actuator is used to turn the tap off/on • Whole process is continuous 	6								
2(b)	<p>One mark for each correct sensor</p> <table border="1" data-bbox="584 671 1693 1034" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th data-bbox="584 671 1429 735">Description of system</th> <th data-bbox="1429 671 1693 735">Sensor</th> </tr> </thead> <tbody> <tr> <td data-bbox="584 735 1429 836">it checks the air is dry enough in a garage that spray paints cars</td> <td data-bbox="1429 735 1693 836">Moisture/humidity</td> </tr> <tr> <td data-bbox="584 836 1429 936">it automatically switches on the headlights on a car when it is dark</td> <td data-bbox="1429 836 1693 936">Light</td> </tr> <tr> <td data-bbox="584 936 1429 1034">it checks that the soil in a greenhouse has the correct level of acidity</td> <td data-bbox="1429 936 1693 1034">pH</td> </tr> </tbody> </table>	Description of system	Sensor	it checks the air is dry enough in a garage that spray paints cars	Moisture/humidity	it automatically switches on the headlights on a car when it is dark	Light	it checks that the soil in a greenhouse has the correct level of acidity	pH	3
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3	<p data-bbox="338 213 741 245">One mark for each correct row</p> <table border="1" data-bbox="562 248 1711 810"> <thead> <tr> <th data-bbox="562 316 1151 448" rowspan="2">Statement</th> <th colspan="3" data-bbox="1151 248 1711 316">Component</th> </tr> <tr> <th data-bbox="1151 316 1317 448">RAM (✓)</th> <th data-bbox="1317 316 1482 448">Internal SSD (✓)</th> <th data-bbox="1482 316 1711 448">USB flash memory drive (✓)</th> </tr> </thead> <tbody> <tr> <td data-bbox="562 448 1151 515">it is a type of primary storage</td> <td data-bbox="1151 448 1317 515">✓</td> <td data-bbox="1317 448 1482 515"></td> <td data-bbox="1482 448 1711 515"></td> </tr> <tr> <td data-bbox="562 515 1151 582">it is volatile</td> <td data-bbox="1151 515 1317 582">✓</td> <td data-bbox="1317 515 1482 582"></td> <td data-bbox="1482 515 1711 582"></td> </tr> <tr> <td data-bbox="562 582 1151 649">it uses NAND and NOR technology</td> <td data-bbox="1151 582 1317 649"></td> <td data-bbox="1317 582 1482 649">✓</td> <td data-bbox="1482 582 1711 649">✓</td> </tr> <tr> <td data-bbox="562 649 1151 716">it does not have any moving parts</td> <td data-bbox="1151 649 1317 716">✓</td> <td data-bbox="1317 649 1482 716">✓</td> <td data-bbox="1482 649 1711 716">✓</td> </tr> <tr> <td data-bbox="562 716 1151 810">it is not directly connected to the Central Processing Unit (CPU)</td> <td data-bbox="1151 716 1317 810"></td> <td data-bbox="1317 716 1482 810">✓</td> <td data-bbox="1482 716 1711 810">✓</td> </tr> </tbody> </table>	Statement	Component			RAM (✓)	Internal SSD (✓)	USB flash memory drive (✓)	it is a type of primary storage	✓			it is volatile	✓			it uses NAND and NOR technology		✓	✓	it does not have any moving parts	✓	✓	✓	it is not directly connected to the Central Processing Unit (CPU)		✓	✓	5
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4	<p>One mark for the method, one mark for a corresponding description</p> <ul style="list-style-type: none">• Create a back-up• this means the data can be restored/recovered• Add verification• to get the user to confirm they want to delete the data• Set access rights• so that she cannot delete any files	4

Question	Answer	Marks
5	<p>One mark each for the correct byte and bit</p> <ul style="list-style-type: none">• Byte 4• Bit 5 <p>Any two from:</p> <ul style="list-style-type: none">• Counted all the 1s• An even parity has been used• Odd number of ones in that row (byte 4) and column (bit 5)	4

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Question	Answer	Marks
6(a)	Any two from: <ul style="list-style-type: none"> • Check if web address starts with HTTPS • Check if there is a locked padlock • Check the digital certificate for the website 	2
6(b)	<ul style="list-style-type: none"> • Transport layer security // TLS 	1
6(c)	Any four from: <ul style="list-style-type: none"> • To act as intermediary between browser and web server • to filter/examine/monitor traffic to the web server • to help stop malicious traffic to the web server • To cache frequently viewed web pages • to allow faster response time for requests • to reduce the number of requests the server needs to process • To help prevent DoS • stopping the webserver being overloaded with requests • by redirecting away from server // by stopping DoS attack reaching server • To act as a firewall 	4
6(d)(i)	<ul style="list-style-type: none"> • Spyware 	1

Question	Answer	Marks
6(d)(ii)	<p>One mark for a correct method, one mark for a corresponding description</p> <ul style="list-style-type: none"> • Drop down boxes • this means that the keypresses cannot be recorded • Onscreen/virtual keyboard • this means that the keypresses cannot be recorded • Biometrics // by example • this means that the keypresses cannot be recorded • no password entered to be gathered • Anti-malware // anti-spyware • this will scan for/remove any malware that could be recording keypresses • Random/select values requested from password • this means that full password cannot be obtained (in a single login) • Firewall • to prevent the download of any malware that could gather keypresses 	6
6(e)	<p>One mark for each correct term in the correct order</p> <ul style="list-style-type: none"> • URL • IP address • Web server • Web pages • HTML • Browser 	6

Question	Answer	Marks																				
7(a)	<p>One mark for each correct row</p> <table border="1" data-bbox="508 284 1767 644"> <thead> <tr> <th data-bbox="508 284 1379 381">Statement</th> <th data-bbox="1379 284 1509 381">NAND (✓)</th> <th data-bbox="1509 284 1639 381">OR (✓)</th> <th data-bbox="1639 284 1767 381">XOR (✓)</th> </tr> </thead> <tbody> <tr> <td data-bbox="508 381 1379 448">if both inputs are 1, the output is 1</td> <td data-bbox="1379 381 1509 448"></td> <td data-bbox="1509 381 1639 448">✓</td> <td data-bbox="1639 381 1767 448"></td> </tr> <tr> <td data-bbox="508 448 1379 515">if both inputs are different from each other, the output is 1</td> <td data-bbox="1379 448 1509 515">✓</td> <td data-bbox="1509 448 1639 515">✓</td> <td data-bbox="1639 448 1767 515">✓</td> </tr> <tr> <td data-bbox="508 515 1379 582">if both inputs are 0, the output is 0</td> <td data-bbox="1379 515 1509 582"></td> <td data-bbox="1509 515 1639 582">✓</td> <td data-bbox="1639 515 1767 582">✓</td> </tr> <tr> <td data-bbox="508 582 1379 644">if both inputs are the same as each other, the output is always 0</td> <td data-bbox="1379 582 1509 644"></td> <td data-bbox="1509 582 1639 644"></td> <td data-bbox="1639 582 1767 644">✓</td> </tr> </tbody> </table>	Statement	NAND (✓)	OR (✓)	XOR (✓)	if both inputs are 1, the output is 1		✓		if both inputs are different from each other, the output is 1	✓	✓	✓	if both inputs are 0, the output is 0		✓	✓	if both inputs are the same as each other, the output is always 0			✓	4
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7(b)	<p>One mark for a correct logic gate, one mark for a corresponding truth table</p> <ul style="list-style-type: none"> • AND <table border="1" data-bbox="591 762 911 1091"> <thead> <tr> <th data-bbox="591 762 685 828">A</th> <th data-bbox="685 762 779 828">B</th> <th data-bbox="779 762 911 828">Output</th> </tr> </thead> <tbody> <tr> <td data-bbox="591 828 685 895">0</td> <td data-bbox="685 828 779 895">0</td> <td data-bbox="779 828 911 895">0</td> </tr> <tr> <td data-bbox="591 895 685 962">0</td> <td data-bbox="685 895 779 962">1</td> <td data-bbox="779 895 911 962">0</td> </tr> <tr> <td data-bbox="591 962 685 1029">1</td> <td data-bbox="685 962 779 1029">0</td> <td data-bbox="779 962 911 1029">0</td> </tr> <tr> <td data-bbox="591 1029 685 1091">1</td> <td data-bbox="685 1029 779 1091">1</td> <td data-bbox="779 1029 911 1091">1</td> </tr> </tbody> </table>	A	B	Output	0	0	0	0	1	0	1	0	0	1	1	1	2					
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