



# Cambridge IGCSE™

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**COMPUTER SCIENCE****0478/12**

Paper 1 Theory

**October/November 2022**

MARK SCHEME

Maximum Mark: 75

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**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.

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

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

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

Question	Answer	Marks								
2(a)	<p><b>Six</b> from:</p> <ul style="list-style-type: none"> <li>• Motion/proximity/infra-red sensor is used</li> <li>• Sensor sends data to microprocessor</li> <li>• Data is converted from analogue to digital (using ADC)</li> <li>• Data is compared to <b>stored/set</b> value(s)</li> <li>• If data is <b>inside range/outside range/greater than/less than</b>, <b>signal</b> is sent to turn water tap on</li> <li>• If data is <b>outside range /inside range/less than/greater than</b>, tap remains off / <b>signal</b> is sent to turn water tap off</li> <li>• Actuator is used to turn the tap off/on</li> <li>• Whole process is continuous</li> </ul>	<b>6</b>								
2(b)	<p><b>One</b> mark for each correct sensor</p> <table border="1" data-bbox="584 668 1693 1034" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th data-bbox="584 668 1429 735">Description of system</th> <th data-bbox="1429 668 1693 735">Sensor</th> </tr> </thead> <tbody> <tr> <td data-bbox="584 735 1429 834">it checks the air is dry enough in a garage that spray paints cars</td> <td data-bbox="1429 735 1693 834">Moisture/humidity</td> </tr> <tr> <td data-bbox="584 834 1429 933">it automatically switches on the headlights on a car when it is dark</td> <td data-bbox="1429 834 1693 933">Light</td> </tr> <tr> <td data-bbox="584 933 1429 1034">it checks that the soil in a greenhouse has the correct level of acidity</td> <td data-bbox="1429 933 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	<b>3</b>
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Question	Answer				Marks																											
3	<p><b>One</b> mark for each correct row</p> <table border="1" data-bbox="562 245 1711 807" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th data-bbox="562 316 1151 448" rowspan="2">Statement</th> <th colspan="3" data-bbox="1151 245 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" style="text-align: center;">✓</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" style="text-align: center;">✓</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" style="text-align: center;">✓</td> <td data-bbox="1482 582 1711 649" style="text-align: center;">✓</td> </tr> <tr> <td data-bbox="562 649 1151 716">it does <b>not</b> have any moving parts</td> <td data-bbox="1151 649 1317 716" style="text-align: center;">✓</td> <td data-bbox="1317 649 1482 716" style="text-align: center;">✓</td> <td data-bbox="1482 649 1711 716" style="text-align: center;">✓</td> </tr> <tr> <td data-bbox="562 716 1151 807">it is <b>not</b> directly connected to the Central Processing Unit (CPU)</td> <td data-bbox="1151 716 1317 807"></td> <td data-bbox="1317 716 1482 807" style="text-align: center;">✓</td> <td data-bbox="1482 716 1711 807" style="text-align: center;">✓</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 <b>not</b> have any moving parts	✓	✓	✓	it is <b>not</b> directly connected to the Central Processing Unit (CPU)		✓	✓	<b>5</b>
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Question	Answer	Marks
4	<p><b>One</b> mark for the method, <b>one</b> mark for a corresponding description</p> <ul style="list-style-type: none"><li>• Create a back-up</li><li>• this means the data can be <b>restored/recovered</b></li><li>• Add verification</li><li>• to get the user to confirm they want to delete the data</li><li>• Set access rights</li><li>• so that she cannot delete any files</li></ul>	<b>4</b>

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

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

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

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7(a)	<p><b>One</b> mark for each correct row</p> <table border="1" data-bbox="506 284 1771 643"> <thead> <tr> <th data-bbox="506 284 1379 379">Statement</th> <th data-bbox="1379 284 1509 379">NAND (✓)</th> <th data-bbox="1509 284 1639 379">OR (✓)</th> <th data-bbox="1639 284 1771 379">XOR (✓)</th> </tr> </thead> <tbody> <tr> <td data-bbox="506 379 1379 445">if both inputs are 1, the output is 1</td> <td data-bbox="1379 379 1509 445"></td> <td data-bbox="1509 379 1639 445">✓</td> <td data-bbox="1639 379 1771 445"></td> </tr> <tr> <td data-bbox="506 445 1379 510">if both inputs are different from each other, the output is 1</td> <td data-bbox="1379 445 1509 510">✓</td> <td data-bbox="1509 445 1639 510">✓</td> <td data-bbox="1639 445 1771 510">✓</td> </tr> <tr> <td data-bbox="506 510 1379 576">if both inputs are 0, the output is 0</td> <td data-bbox="1379 510 1509 576"></td> <td data-bbox="1509 510 1639 576">✓</td> <td data-bbox="1639 510 1771 576">✓</td> </tr> <tr> <td data-bbox="506 576 1379 643">if both inputs are the same as each other, the output is always 0</td> <td data-bbox="1379 576 1509 643"></td> <td data-bbox="1509 576 1639 643"></td> <td data-bbox="1639 576 1771 643">✓</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			✓	<b>4</b>
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7(b)	<p><b>One</b> mark for a correct logic gate, <b>one</b> mark for a corresponding truth table</p> <ul style="list-style-type: none"> <li>AND</li> </ul> <table border="1" data-bbox="591 762 911 1090"> <thead> <tr> <th data-bbox="591 762 683 828">A</th> <th data-bbox="683 762 775 828">B</th> <th data-bbox="775 762 911 828">Output</th> </tr> </thead> <tbody> <tr> <td data-bbox="591 828 683 893">0</td> <td data-bbox="683 828 775 893">0</td> <td data-bbox="775 828 911 893">0</td> </tr> <tr> <td data-bbox="591 893 683 959">0</td> <td data-bbox="683 893 775 959">1</td> <td data-bbox="775 893 911 959">0</td> </tr> <tr> <td data-bbox="591 959 683 1024">1</td> <td data-bbox="683 959 775 1024">0</td> <td data-bbox="775 959 911 1024">0</td> </tr> <tr> <td data-bbox="591 1024 683 1090">1</td> <td data-bbox="683 1024 775 1090">1</td> <td data-bbox="775 1024 911 1090">1</td> </tr> </tbody> </table>	A	B	Output	0	0	0	0	1	0	1	0	0	1	1	1	<b>2</b>					
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