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**PHYSICAL SCIENCE**

**0652/31**

Paper 3 Core Theory

**October/November 2019**

MARK SCHEME

Maximum Mark: 80

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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 2019 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 **10** printed pages.

**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.

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
1(a)(i)	car C ;	<b>1</b>
1(a)(ii)	car C ;	<b>1</b>
1(a)(iii)	car A ;	<b>1</b>
1(b)	average speed ;	<b>1</b>
1(c)	same area (under curve) ;	<b>1</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
2(a)	one ; one ; three ; seven ;	<b>4</b>
2(b)	2 and 2 ;	<b>1</b>

Question	Answer	Marks
3(a)(i)	any renewable NOT nuclear ;	<b>1</b>
3(a)(ii)	any non-renewable ;	<b>1</b>
3(b)(i)	solar ;	<b>1</b>
3(b)(ii)	hydro ;	<b>1</b>
3(b)(iii)	geothermal ;	<b>1</b>
3(c)(i)	<i>any two from</i> building ; decommissioning ; fuel ; safety ; waste ;	<b>2</b>
3(c)(ii)	kinetic (energy) ; thermal / heat (energy) ;	<b>2</b>
3(d)	larger surface area ;	<b>1</b>

Question	Answer	Marks
4(a)	orange / pink / copper ;	1
4(b)	copper oxide ; oxygen is removed / lost ;	2
4(c)(i)	condensation ;	1
4(c)(ii)	(anhydrous) copper sulfate ; (turns from white to) blue ; <b>OR</b> cobalt chloride (solution / paper) ; (turns from blue to) pink ;	2

Question	Answer	Marks
5(a)(i)	M1 ammeter symbol ; M2 connected in series <b>and</b> complete circuit <b>and</b> no additional components ;	2
5(a)(ii)	voltmeter symbol in parallel ;	1
5(b)(i)	resistor ;	1
5(b)(ii)	use of $V = IR$ ; 150 (ohms) ;	2

Question	Answer	Marks
6(a)(i)	cathode negative <b>and</b> anode positive ;	1
6(a)(ii)	(good) conductor ; inert ;	2
6(b)	<i>anode</i> : bromine ; <i>cathode</i> : lead ;	2
6(c)	no more products / electrolysis stops / stops conducting ;	1

Question	Answer	Marks															
7(a)	<table border="1"> <thead> <tr> <th>name</th> <th>formula</th> <th>structure</th> </tr> </thead> <tbody> <tr> <td><del>methane</del></td> <td><del><math>\text{CH}_4</math></del></td> <td><del> <pre>       H             H-C-H               H           </pre> </del></td> </tr> <tr> <td><del>ethane</del></td> <td><del><math>\text{C}_2\text{H}_6</math></del></td> <td><del> <pre>       H   H                 H-C-C-H                   H   H           </pre> </del></td> </tr> <tr> <td><del>ethene</del></td> <td><del><math>\text{C}_2\text{H}_4</math></del></td> <td><del> <pre>       H   H        \ /         C=C        / \       H   H           </pre> </del></td> </tr> <tr> <td><del>ethanol</del></td> <td><del><math>\text{C}_2\text{H}_5\text{OH}</math></del></td> <td><del> <pre>       H   H                 H-C-C-O-H                   H   H           </pre> </del></td> </tr> </tbody> </table>	name	formula	structure	<del>methane</del>	<del><math>\text{CH}_4</math></del>	<del> <pre>       H             H-C-H               H           </pre> </del>	<del>ethane</del>	<del><math>\text{C}_2\text{H}_6</math></del>	<del> <pre>       H   H                 H-C-C-H                   H   H           </pre> </del>	<del>ethene</del>	<del><math>\text{C}_2\text{H}_4</math></del>	<del> <pre>       H   H        \ /         C=C        / \       H   H           </pre> </del>	<del>ethanol</del>	<del><math>\text{C}_2\text{H}_5\text{OH}</math></del>	<del> <pre>       H   H                 H-C-C-O-H                   H   H           </pre> </del>	8
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7(b)(i)	fuel ;	1															
7(b)(ii)	<u>natural</u> gas ;	1															

Question	Answer	Marks
8(a)	A = (a permanent) magnet ; B = (soft) iron ; C = aluminium ; D = (a permanent) ;	<b>3</b>
8(b)	M1 overall shape of four lines correctly shown ; M2 all drawn arrow heads N to S and at least one arrow head shown ; M3 six lines which do not overlap or touch ;	<b>3</b>
8(c)	<u>magnetic</u> field due to current (in wire) ;	<b>1</b>
8(d)	M1 larger current ; M2 core made from magnetic material owtte ;	<b>2</b>



Question	Answer	Marks
9(a)	radon / rocks / building materials ;	<b>1</b>
9(b)	reduce ; <b>to</b> $\frac{1}{4}$ / 0.25 / 25% ;	<b>2</b>
9(c)(i)	reduces ;	<b>1</b>
9(c)(ii)	increases ;	<b>1</b>
9(d)	<i>any two from</i> M1 electron ; M2 negatively charged ; M3 high energy ;	<b>2</b>
9(e)(i)	causes DNA damage / causes mutation / kills cells / causes cancer ; (radiation is) ionising ;	<b>2</b>
9(e)(ii)	dosimeter / shielding / maintaining a set distance from source / tongs / personal protection equipment / ppe ;	<b>1</b>

Question	Answer	Marks
10(a)	<i>any two from</i> M1 high temperature ; M2 high pressure ; M1 add a catalyst ;	<b>2</b>
10(b)	air ; 78% ;	<b>2</b>
10(c)(i)	M1 3 hydrogens surrounding 1 nitrogen with 3 shared electron pairs ; M2 rest of molecule correct ;	<b>2</b>
10(c)(ii)	water / ethanol ;	<b>1</b>
10(c)(iii)	ionic ;	<b>1</b>

Question	Answer	Marks
11(a)	M1 red ; M2 <u>strong acid</u> ; M3 blue ; M4 8 to 12 ;	<b>4</b>
11(b)	sodium sulfate <b>and</b> water ;	<b>1</b>