



**Cambridge International Examinations**  
Cambridge International General Certificate of Secondary Education

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**PHYSICAL SCIENCE**

**0652/21**

Paper 2 Core Theory

**October/November 2016**

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.

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>
1(a)	BC ; CD ;	<b>2</b>
1(b)	D ;	<b>1</b>
1(c)	evidence that $s = \text{area under the graph}$ (accept use of $vt$ for this mark) ; attempt to measure triangle ; $= 40 \pm 2.5 \text{ (m/s)}$ ;	<b>3</b>
1(d)(i)	change (per unit time) in the speed ;	<b>1</b>
1(d)(ii)	steady change / change in speed of $9.8 \text{ m/s}$ ; each second ;	<b>2</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
2(a)(i)	$\text{CH}_2$ / one carbon and 2 hydrogen atoms ;	<b>1</b>
2(a)(ii)	same general formula / same functional group / gradation of or similar physical properties ;	<b>1</b>
2(a)(iii)	$\text{C}_4\text{H}_9\text{OH}$ ;	<b>1</b>
2(b)	$  \begin{array}{c}  \text{H} \quad \text{H} \\    \quad   \\  \text{H} - \text{C} - \text{C} - \text{OH} \\    \quad   \\  \text{H} \quad \text{H}  \end{array}  $	<b>1</b>

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>
2(c)(i)	condenser ;	1
2(c)(ii)	cool vapour / liquid / remove energy released as vapour condenses ;	1
2(c)(iii)	ethanol ; lowest boiling point ;	1
2(c)(v)	goes up / increases / OWTTE ;	1

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
3(a)	A small cross centred on the plumbline ;	1
3(b)	sheet swings back to its original position ; the weight provides a restoring <u>moment</u> / force ;	2
3(c)	Suspend the plate (and plumbline) from the second hole ; mark the position of the plumbline (this mark can be awarded in either in 1st or 2nd hanging) ; centre of mass is at the intersection of the two lines ;	3

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
4(a)	magnesium + water / steam → magnesium oxide + hydrogen ;	1
4(b)(i)	reaction which gives out (heat) energy ;	1
4(b)(ii)	energy needed to break bonds / mention of activation energy / energy needed to start the reaction ;	1
4(c)	light / burning splint / flame ; pops / popping sound / explodes ; (Use of a glowing splint gets no marks)	2

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>
4(d)	no reaction/no change/nothing ; copper is unreactive/less reactive than magnesium or hydrogen/ low in reactivity series/OWTTE ;	<b>2</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
5(a)	Wavelength correctly marked ;	<b>1</b>
5(b)	amplitude ; frequency ; hertz ; refraction ;	<b>4</b>
5(c)	At least 1 wave clearly reflected towards the left and upwards ; angle of incidence = angle of reflection ; 3 (or more) wavefronts drawn and wavelength constant = to incident wavelength ;	<b>3</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
6(a)(i)	any two from – malleable or ductile ; conduct <u>heat</u> ;	<b>2</b>
6(a)(ii)	Any two from – solution of a salt ; molten salt ; graphite ; semiconductor ; (accept electrolyte for 1 mark as an alternative to solution of a salt or a molten salt)	<b>max 2</b>

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>
6(b)(i)	copper ;	<b>1</b>
6(b)(ii)	colour / melting point / boiling point / density / hardness / expansivity ;	<b>1</b>
6(c)(i)	zinc sulfate ;	<b>1</b>
6(c)(ii)	$2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$ ;;	<b>2</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
7(a)(i)	0.4 (A) ;	<b>1</b>
7(a)(ii)	<u>Use of</u> $V = I R$ ; $\rightarrow R_{total} = 9 / 0.4 = 22.5 (\Omega)$ ;	<b>2</b>
7(a)(iii)	Indication that the other two resistor values are added (10.5 + 7.5) ; $\rightarrow R = 4.5 (\Omega)$ ;	<b>2</b>
7(b)(i)	2 A circled ;	<b>1</b>
7(b)(ii)	4.5 $\Omega$ circled ;	<b>1</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
8(a)(i)	$\text{Na}^+$ ; 10 ; 17 ;	<b>3</b>
8(a)(ii)	Full outer shell / 8 electrons in outer shell / noble gas structure ;	<b>1</b>
8(a)(iii)	argon ;	<b>1</b>

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Question	Answer	Marks
8(b)(i)	3 hydrogen atoms ; lone pair between nitrogen and each hydrogen ;	2
8(b)(ii)	3 before H <sub>2</sub> AND 2 before NH <sub>3</sub> ;	1
8(c)	78 OR 79 ;	1

Question	Answer	Marks
9(a)	There is a current ; the iron rod is magnetised ; steel bar is attracted to the iron rod / moves towards the iron rod / the spring is compressed ;	3
9(b)(i)	iron is easily (magnetised and) <u>demagnetised</u> / temporary magnet ;	1
9(b)(ii)	to push rod <b>B</b> back into the wall ;	1

Question	Answer	Marks
10(a)	bromine formed / bromine displaced ; iodine formed / iodine displaced ;	2
10(b)	chlorine is less reactive than fluorine ; chlorine is more reactive than bromine and iodine ;	2
10(c)	no reaction / no change / nothing / remains colourless ;	1
10(d)	have 7 electrons in their outer shell ;	1

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>
11(a)(i)	47 ;	<b>1</b>
11(a)(ii)	64 ;	<b>1</b>
11(b)(i)	top line: 111 ; bottom line: 48 ;	<b>2</b>
11(b)(ii)	cadmium / Cd ;	<b>1</b>