



---

**COMBINED SCIENCE**

**0653/41**

Paper 4 Extended Theory

**October/November 2017**

MARK SCHEME

Maximum Mark: 80

---

**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 2017 series for most Cambridge IGCSE<sup>®</sup>, Cambridge International A and AS Level components and some Cambridge O Level components.

---

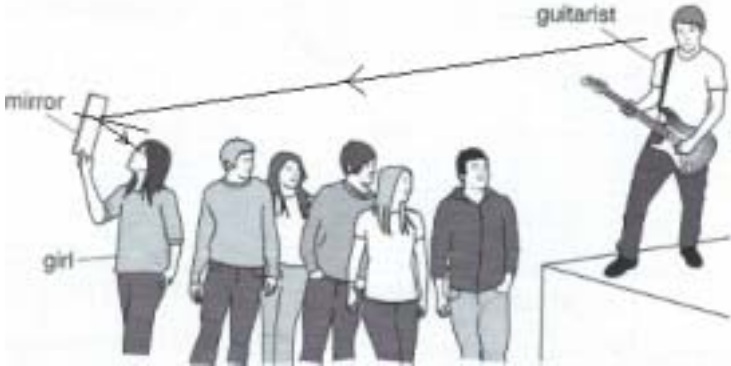
© IGCSE is a registered trademark.

This document consists of **8** printed pages.

Question	Answer	Marks
1(a)	red blood cells ; pulmonary vein ; aorta ; capillaries ;	4
1(b)	thick (wall) ; to resist bursting / withstand high blood pressure ;	2
1(c)	<b>A</b> trachea ; <b>B</b> bronchiole ;	2
1(d)	(nicotine) causes addiction / increases blood pressure / leads to heart disease ; (tar) increases mucus / (tar) builds up in lungs / paralyses / destroys cilia / can cause cancer / avp ;	2

Question	Answer	Marks
2(a)(i)	(negative) cathode <b>and</b> (positive) anode ;	1
2(a)(ii)	(negative) potassium / K ; (positive) bromine / Br <sub>2</sub> ;	2
2(a)(iii)	<b>ions</b> must be able to move / be mobile ;	1
2(b)(i)	(K <sub>2</sub> CO <sub>3</sub> (s) + 2) ... <b>HCl (aq)</b> ... → <b>2 KCl (aq)</b> + ... <b>CO<sub>2</sub> (g)</b> ... + ... <b>H<sub>2</sub>O (l)</b> ... HCl ; RHS ; all three states ;	3
2(b)(ii)	(test) (acidified) silver nitrate (solution) ; (observation) <b>white</b> precipitate / solid ;	2

Question	Answer	Marks
2(b)(iii)	filter (to remove excess solid / potassium carbonate) ; and then one from heat / boil the solution / filtrate / mixture / diagram showing this process ; reference to evaporation / removal of water ; cool / leave (to allow crystals to form) ;	<b>max 2</b>

Question	Answer	Marks
3(a)(i)	80 cycles / vibrations / oscillations <b>per second</b> ;	<b>1</b>
3(a)(ii)	first note louder than second note ;	<b>1</b>
3(a)(iii)	yes (no mark) frequency range lies within frequency range of normal human hearing ;	<b>1</b>
3(b)	radio / electromagnetic waves travel (much) faster than sound waves / ora ;	<b>1</b>
3(c)	 <p data-bbox="331 1273 1686 1345">both rays shown as continuous straight lines, being reflected from and touching the mirror ; angles of incidence and reflection the same by inspection and at least one arrow in the correct direction ;</p>	<b>2</b>
3(d)(i)	extension / deformation is proportional to the load / cause / force = a constant $\times$ extension / $F = kx$ ;	<b>1</b>

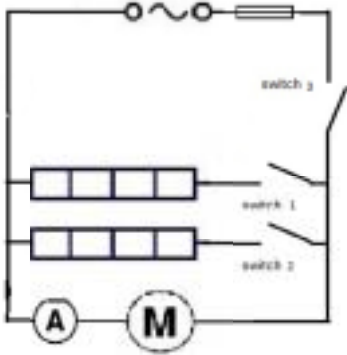
Question	Answer	Marks
3(d)(ii)	tension in the range 80 to 84 N ;	1

Question	Answer	Marks
4(a)	length of cell on diagram is 25 mm ; divided by 0.001 = 25 000 ;	2
4(b)(i)	reduces rate – no mark enzymes made inactive / denatured by acid / no longer at optimum pH ;	1
4(b)(ii)	44°C is optimum temperature ; <b>above</b> 44°C enzymes denatured by heat ; additional detail describing denaturation ;	max 2
4(c)(i)	(an organism) that gets energy from / feeds on <b>dead / waste</b> organic matter ;	1
4(c)(ii)	they decompose / break down / get rid of dead bodies / waste ; allow carbon to be recycled / release carbon dioxide (into the air) ; the idea that plants make use of carbon dioxide / carbon (during photosynthesis) ;	max 2

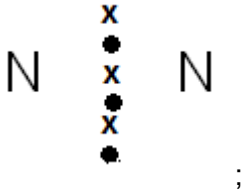
Question	Answer	Marks
5(a)(i)	<u>fractional distillation</u> ;	1
5(a)(ii)	greater lower greater ;	1
5(b)	cracking ;	1

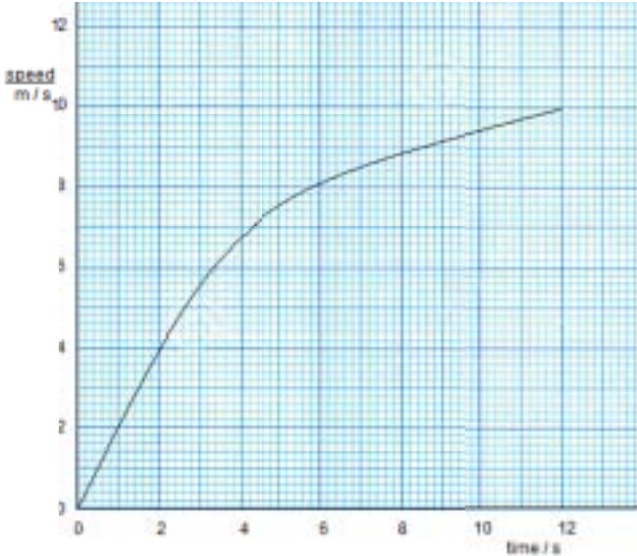
Question	Answer	Marks
5(c)(i)	(test) bromine (water) ; (observation <b>A</b> ) no change <b>and</b> (observation <b>B</b> ) decolourises / turns (brown to) colourless ;	<b>2</b>
5(c)(ii)	ethene ;	<b>1</b>
5(d)(i)	reference to use of (fossil) fuel / named fuel / industrialisation / deforestation ;	<b>1</b>
5(d)(ii)	global warming / consequences of global warming ;	<b>1</b>

Question	Answer	Marks
6(a)	(both) switch 1 and switch 3 ;	<b>1</b>
6(b)(i)	$P = V \times I$ (or rearranged) / 1100 / 240 ; = 4.58 or 4.6 A ;	<b>2</b>
6(b)(ii)	(if everything switched on) then 9.4 A / 2250 W / 0.21 A seen in calculation ; correct comparison of total current with fuse rating ;	<b>2</b>

Question	Answer	Marks
6(c)	 <p>correct symbol for ammeter ; ammeter in fan motor branch, all circuit connections complete ;</p>	2

Question	Answer	Marks
7(a)	plants produce carbon dioxide ; during respiration ;	2
7(b)	large surface area / elongated shape ; increases rate / efficiency of uptake ; by diffusion ;	max 2
7(c)(i)	any time between 10.00 and 13.00 ; maximum rate of oxygen production / steepest gradient ;	2
7(c)(ii)	line drawn with reduced gradient after 10.00 ; (rate of) photosynthesis (oxygen production) dependent on (amount of) light ;	2

Question	Answer	Marks
8(a)(i)	15 ; 16 ;	2
8(a)(ii)	2, 8, 5 ;	1
8(b)(i)	covalent / triple ;	1
8(b)(ii)		1
8(c)	(helium) balloons / avp ;	1
8(d)	(Group I metals are) more reactive <b>than carbon</b> ;	1
8(e)	solid <b>and</b> 165–310 (actual 302) ;	1

Question	Answer	Marks
9(a)(i)	weight / gravitational force ;	1
9(a)(ii)	 <p data-bbox="331 853 873 917">curved line, convex upwards ; from (0,0) and arriving at 10 m / s at 12 s ;</p>	2
9(b)(i)	$\text{efficiency} = \{ \text{energy out} / \text{energy in} \} \times 100 ;$ $\text{energy in} = 100 \times \text{energy out} / \text{efficiency} = 200\,000\,000 \text{ (J)}$	2
9(b)(ii)	any two from hydroelectric / tidal / waves / geothermal / wind ; ;	2
9(c)(i)	{thermal} expansion (of bridge structure) ; <i>owtte</i>	1
9(c)(ii)	buckle / twist / bend / deform etc. ;	1
9(c)(iii)	evaporates ; faster ;	2
9(c)(iv)	line drawn between the two bottom boxes ;	1