



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

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**COMBINED SCIENCE**

**0653/41**

Paper 4 Extended Theory

**October/November 2017**

MARK SCHEME

Maximum Mark: 80

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**Published**

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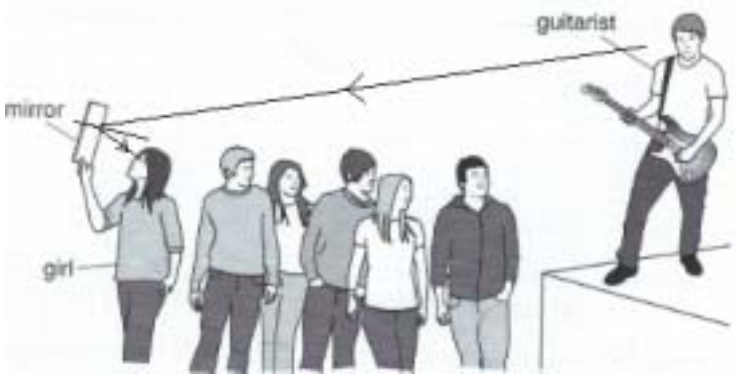
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This document consists of **8** printed pages.

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> ... → 2 KCl (aq) + ... <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) ;	max 2

Question	Answer	Marks
3(a)(i)	80 cycles / vibrations / oscillations <b>per second</b> ;	1
3(a)(ii)	first note louder than second note ;	1
3(a)(iii)	yes (no mark) frequency range lies within frequency range of normal human hearing ;	1
3(b)	radio / electromagnetic waves travel (much) faster than sound waves / ora ;	1
3(c)	 <p>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>	2
3(d)(i)	extension / deformation is proportional to the load / cause / force = a constant $\times$ extension / $F = kx$ ;	1

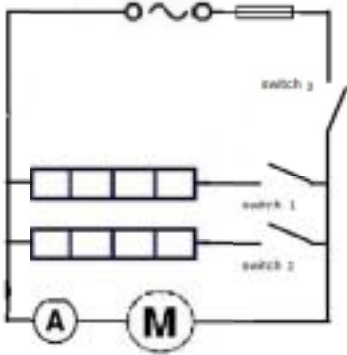
Question	Answer	Marks
3(d)(ii)	tension in the range 80 to 84 N ;	1

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

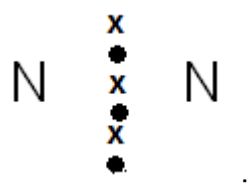
Question	Answer	Marks
5(a)(i)	<u>fractional distillation</u> ;	1
5(a)(ii)	greater lower greater ;	1
5(b)	cracking ;	1

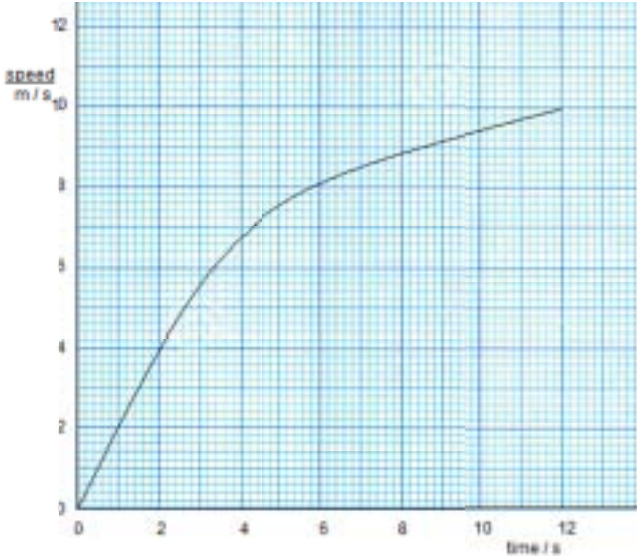
Question	Answer	Marks
5(c)(i)	(test) bromine (water) ; (observation <b>A</b> ) no change <b>and</b> (observation <b>B</b> ) decolourises / turns (brown to) colourless ;	<b>2</b>
5(c)(ii)	ethene ;	<b>1</b>
5(d)(i)	reference to use of (fossil) fuel / named fuel / industrialisation / deforestation ;	<b>1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

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

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