COMBINED SCIENCES **0653/43**

Paper 4 Extended Theory May/June 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.
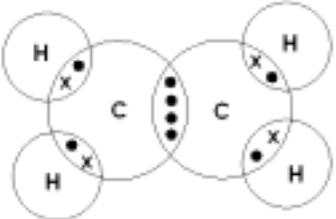
Cambridge will not enter into discussions about these mark schemes.

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Question	Answer	Marks
1(a)	three lines drawn to increases the concentration of carbon monoxide in the blood ; damages the cilia in the airway ; causes more mucus to be produced in the lungs ;	**3**
1(b)(i)	arrow drawn from <u>plasma</u> to alveolar sac ;	**1**
1(b)(ii)	large surface area ; thin wall ; reference to good blood supply ;	**2**
1(c)	carried by haemoglobin ; in red blood cells ; enters left atrium / through the pulmonary vein ; red cells carried in plasma ;	**max 3**
1(d)(i)	more glucose available to be broken down by cells / for oxidation / chemical (energy) converted to thermal / heat (energy)	**1**
1(d)(ii)	faster delivery of oxygen / glucose to cells ;	**1**

Question	Answer	Marks
2(a)(i)	C_8H_{18} ; **allow** $H_{18}C_8$	1
2(a)(ii)	(higher up) lower boiling point ; smaller molecules ; lower intermolecular forces ;	3
2(b)	cracking ;	1
2(c)	(ethene) alkene / unsaturated ; both (ethane) **and** (octane) alkane / saturated ;	2
2(d)	 2 pairs between carbon ; 1 pair between each H and C ; (whether dots or crosses does not affect marks)	2

Question	Answer	Marks
3(a)(i)	**C** **A**	**1**
3(a)(ii)	(Force **B** is 1000 N) no vertical motion / forces (**A** and **B**) are balanced ;	**1**
3(b)	1 km at 15 km / h $\rightarrow$ 1 / 15 h / 0.067 h ; 1 / 15 h = 3 600 × 1 / 15 = 240 (s) ;	**2**
3(c)	KE = ½ mv^2 = ½ × 100 × 4 × 4 = 800 (J) ;	**2**
3(d)(i)	energy input = 120 × 250 = 30 000 (J) ;	**1**
3(d)(ii)	work done = force × distance (moved) / F × d ; = 25 × 1 000 = 25 000 (J) ;	**2**
3(d)(iii)	efficiency (%) = (work got out ÷ work put in) × 100 / (equivalent wording) ; = (25 000 / 30 000) × 100 = 83.3 (%) ;	**2**

Question	Answer	Marks
4(a)	geotropism / gravitropism ;	**1**
4(b)(i)	drawing with shoot bending upwards ; root bending downwards ;	**2**
4(b)(ii)	auxins become more concentrated on lower surface ; cause more growth / cell elongation ;	**2**
4(c)(i)	sulfur dioxide ; dissolves in rain water ;	**2**
4(c)(ii)	denatures the enzymes / makes the enzymes less active ;	**1**

Question	Answer	Marks
5(a)	8 electrons 2nd shell ; 2 electrons 3rd shell ;	**2**
5(b)(i)	gas / H_2 produced / lost ; reaction ends / over ;	**2**
5(b)(ii)	(Mg) + **2**HCl ➔ H_2 + (MgCl_2) **2**HCl ; H_2 ;	**2**
5(c)(i)	increases ; particles collide more often / forcefully / energetically / successfully ;	**2**
5(c)(ii)	increases / changes ; no change ;	**2**

Question	Answer	Marks
6(a)(i)	conduction ;	1
6(a)(ii)	air is a good insulator / poor conductor (of heat) ;	1
6(b)(i)	(Z – no mark) at 800 °C / such a high temperature water is formed as a gas ;	1
6(b)(ii)	ice (crystals) ; water vapour / steam from engines freezes in contact with air at a temperature well below freezing point of water ;	2
6(c)(i)	microwaves ;	1
6(c)(ii)	<table><tr><td></td><td>X-rays</td><td></td><td>visible light</td><td></td><td>micro-waves ;</td><td></td></tr></table>	1
6(d)(i)	speed of radio waves / electromagnetic waves (much) faster than speed of sound ;	1
6(d)(ii)	vibrations produced by engines / owtte ; create series of compressions and rarefactions through air to man / vibrations passed through air from particle to particle / longitudinal (sound) waves are passed through the air ;	2

Question	Answer	Marks
7(a)	$C_6H_{12}O_6$ and $6O_2$;	1
7(b)(i)	line drawn through stoma to cell **Z** ;	1
7(b)(ii)	xylem correctly labelled ;	1
7(c)(i)	by evaporation ; from the surfaces of the mesophyll cells / cells inside the leaf ;	2
7(c)(ii)	(greater in **A**) air around **A** is less humid than around **B** / ora ; transpiration happens more slowly if the air is humid / ora ;	2

Question	Answer	Marks
8(a)	(rubidium) in the range 25 to 50 (°C) inclusive ;	1
8(b)(i)	**C** **A** **B** **D** **C** and **D** correct ; **A** and **B** correct ;	2
8(b)(ii)	chemical (energy) decreases ; thermal / heat (energy) increases ;	2
8(c)(i)	cathode ;	1
8(c)(ii)	chlorine / Cl_2 ;	1
8(c)(iii)	(so that) ions move ;	1

Question	Answer	Marks
9(a)(i)	(4.5 A) idea that current in main circuit = sum of currents in branches ;	**1**
9(a)(ii)	(because) same p.d. across both resistors ; (so) R_2 and R_3 must have different values ; R_2 greater than R_3 ;	**max2**
9(b)(i)	3 A	**1**
9(b)(ii)	voltage across R_1 = 12 – 3 = 9V ; $R_1 = V / I = 9 / 3 = 3\ \Omega$;	**2**