

Cambridge IGCSE™

COMBINED SCIENCE**0653/42**

Paper 4 Theory (Extended)

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MARK SCHEME

Maximum Mark: 80

Published

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This document consists of **11** printed pages.

Question	Answer	Marks
2(a)	separation process crystallisation filtration chromatography description separating an insoluble solid from a mixture of a solid in water separating dyes from a mixture of dyes in a coloured ink separating a salt from an aqueous solution <i>all three correct = (2) one or two correct = (1)</i>	2
2(b)	water, boils / is heated and evaporates / becomes steam / becomes water vapour / leaves the flask ; steam / vapour / it is, cooled in the condenser OR steam / vapour / it, condenses ; salt is left behind / salt does not evaporate (with the water) / only water evaporates ;	3
2(c)(i)	<i>any two from:</i> is ionic / has ionic bonds ; strong attraction / force, between ions (in ionic lattice) ; due to opposite charges / ions have opposite charges ; need lots of energy to, break bonds / separate the ions / separate the particles (therefore high mp) ;	2

Question	Answer	Marks
2(c)(ii)	energy is needed to, change state / make particles move (more) ; more energy needed to, overcome forces between / separate particles when, changing from liquid to gas than from solid to liquid ;	2
2(c)(iii)	particles in solid (-10°C) in regular arrangement, consistent size and touching ; fewer particles in gas ($+110^{\circ}\text{C}$), consistent size and not touching ;	2

Question	Answer	Marks
3(a)	chemical ; thermal ;	2
3(b)	air (above flame) is heated ; less dense air rises ;	2
3(c)(i)	number of wavelengths, per <u>unit</u> time / per second ;	1
3(c)(ii)	microwaves / radio waves ;	1
3(c)(iii)	$(\lambda =) v \div f$ or $3.0 \times 10^8 \div 0.95 \times 10^{14}$; $3.2 (3.16) \times 10^{-6} \text{ (m)}$;	2

Question	Answer	Marks
4(a)(i)	vacuole and cytoplasm circled ;	1
4(a)(ii)	large surface area / elongated shape ; increases, rate of absorption / uptake of water / uptake of mineral (ions) ;	2

Question	Answer	Marks
4(b)(i)	(as light intensity increases) rate of photosynthesis increases, and then levels off / is constant ;	1
4(b)(ii)	more light / less competition for light ; more CO ₂ / less competition for CO ₂ / CO ₂ is released by combustion ;	2
4(c)	magnesium is required to make chlorophyll ; chlorophyll is a green pigment ;	2

Question	Answer	Marks
5(a)	(overall) energy change is endothermic or more energy taken in than given out ; and either bond breaking is endothermic / energy is taken in to break bonds or bonds forming is exothermic / energy is given out when bonds form ;	2
5(b)(i)	2NO(g) + O ₂ (g) → 2NO ₂ (g) ; ; <i>correctly balanced equation = (1)</i> <i>state symbols (g) (g) = (1)</i>	2
5(b)(ii)	reactants higher than products and maximum shown ; activation energy and up-arrow and energy change of reaction and down-arrow ;	2

Question	Answer	Marks
6(a)(i)	max. speed = 0.010 m / s OR 3600 OR 1000 ; both conversions seen 3600 (s) and 1000 (m) and correct substitution ;	2
6(a)(ii)	(a =) $\Delta v \div t$ or $0.005 \div 50$; $0.0001(0) / 1 \times 10^{-4}$; m / s ² ;	3
6(a)(iii)	acceleration ; acceleration is not constant ;	2
6(b)(i)	KE = $\frac{1}{2} mv^2$ (in any form) or $\frac{1}{2} \times 890 \times 0.05 \times 0.05$; = 1.1125 ; (≈ 1.1)	2
6(b)(ii)	GPE (gained) = 1.1 J ; (GPE =) mgh or $890 \times 3.8 \times h$ or $h = 1.1 \div (890 \times 3.8)$; 0.33 mm ;	3

Question	Answer	Marks
7(a)(i)	X pulmonary vein ; Y aorta ;	2
7(a)(ii)	septum labelled ;	1
7(a)(iii)	separates blood with and without oxygen ; blood to lungs at lower pressure or blood to body at higher pressure ;	2

Question	Answer	Marks
7(b)(i)	any two from: large surface / large area ; thin (surface) ; good blood supply ; good ventilation ; AVP, e.g. moist ;	2
7(b)(ii)	Carbon dioxide is a product of respiration. ; Water evaporates from the lining of the alveoli. ; <i>three ticks and two correct = 1 mark</i> <i>three ticks and one correct = 0 marks</i> <i>more than three ticks = 0 marks</i>	2

Question	Answer	Marks
8(a)	hydrogen / H ₂ ; magnesium oxide / MgO / magnesium hydroxide / Mg(OH) ₂ ; hydrochloric acid / HCl ; carbon dioxide AND water / CO ₂ AND H ₂ O ;	4
8(b)(i)	sulfuric acid / hydrochloric acid ;	1
8(b)(ii)	water ;	1

Question	Answer	Marks
8(c)	<i>any three from:</i> magnesium is in Group II ; magnesium has two electrons in the outer shell ; metals are on left of the Periodic Table ; metals have, low / 1–3, electrons in the outer shells ;	3

Question	Answer	Marks
9(a)	a.c. power supply ;	1
9(b)(i)	$(R =) V \div I$ in any form or $240 \div 25$; 9.6 (A) ;	2
9(b)(ii)	$(P =) V \times I$ in any form or 240×9.6 ; 2300 (W) / 2.3 kW ;	2
9(c)	lamp symbol connected in parallel with heater ; lamp symbol in parallel and connected to left of heater and to the left of the heater's switch ;	2