Cambridge Assessment International Education

Cambridge IGCSE™

COMBINED SCIENCE **0653/43**

Paper 4 Extended Theory **October/November 2020**

MARK SCHEME

Maximum Mark: 80

Published

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[Turn over

Question	Answer	Marks
1(a)(i)	*any one from:* biconcave disc / large surface area (to volume ratio) for maximum oxygen absorption ; no nucleus so more space for oxygen transport ; contains haemoglobin ;	**1**
1(a)(ii)	produce antibodies ; phagocytosis ;	**2**
1(b)(i)	there is a circulation to the lungs and a circulation to the body (tissues) ;	**1**
1(b)(ii)	*any two from:* enables blood to go to the body tissues at high pressure ; enables blood to go the lungs at low pressure ; keeps oxygenated blood separate from deoxygenated blood ; enables faster blood flow ;	**2**
1(c)	(increase in breathing rate) enables more oxygen to, diffuse into / enter, the blood (at the lungs) ; (increase in heart rate) transports oxygenated blood faster ;	**2**
1(d)	coronary heart disease (CHD) ; COPD ;	**2**

Question	Answer	Marks
2(a)	(compound **J**) the molecule of **J**, has the formula C_2H_4 / is unsaturated ;	**1**
2(b)(i)	breaking of large hydrocarbon molecules into smaller molecules ;	**1**
2(b)(ii)	heat / use of a catalyst ;	**1**
2(c)	2 electrons shared in single bond between carbon atoms ; all else correct including the symbols ;	**2**

Question	Answer	Marks
2(d)	$CH_4 + H_2O \rightarrow CO + 3H_2$ all formulae correct ; balanced ;	**2**
2(e)	carbon dioxide ; water ;	**2**

Question	Answer	Marks
3(a)(i)	($m = W \div g$ = 820 ÷ 10 =) 82 (kg) ;	**1**
3(a)(ii)	ΔG.P.E. = $mg\Delta h$ / ΔG.P.E. = wΔh / 82 × 10 × 12 ; 9840 (J) ;	**2**
3(b)(i)	use of acceleration = change in speed ÷ time / 27 ÷ 3.0 ; 9.0 ; m / s^2 ;	**3**
3(b)(ii)	**X** marked at time = 3 s ;	**1**
3(b)(iii)	non-constant, deceleration / acceleration (until it comes to rest) ;	**1**
3(c)(i)	(extension = 40.84 – 40.00 =) 0.84 (m) ;	**1**
3(c)(ii)	calculation of k **OR** 1 / k for one test ; calculation of k **OR** 1 / k for second test **AND** shown to be the same ;	**2**

Question	Answer	Marks
4(a)	*any two from:* for growth of bones (of the fetus) ; to, prevent soft bones / keep bones strong / prevent loss of calcium in mother's bones ; to assist calcium absorption ;	**2**
4(b)(i)	tiredness / feeling dizzy / pale complexion / anaemia ;	**1**
4(b)(ii)	liver / red meat / green leafy vegetables ;	**1**
4(c)(i)	the energy (in the food) taken in exceeds the energy needs of the person ;	**1**
4(c)(ii)	country **H** ;	**1**
4(d)(i)	acidic conditions / low pH ;	**1**
4(d)(ii)	best pH for, pepsin / enzyme action in the stomach ;	**1**

Question	Answer	Marks
5(a)(i)	*neutrons:* 12 ; *protons:* 12 ;	**2**
5(a)(ii)	as the number of electrons increases the element becomes less metallic ;	**1**
5(b)	$MgCl_2$;	**1**
5(c)(i)	ions must be mobile / ions in a solid cannot move ; ions can move to the electrodes / for conduction of electricity	**2**
5(c)(ii)	gains electrons ; (gains) two electrons / is discharged ;	**2**
5(d)	energy is taken in for bond breaking / energy is released when bonds are formed / owtte ; (reaction is exothermic because) more energy released than taken in ;	**2**

Question	Answer	Marks
6(a)	<table><tr><td>gamma</td><td>X-rays</td><td>ultraviolet</td><td>visible light</td><td>infrared</td><td>microwaves</td><td>radio waves</td></tr><tr><td></td><td></td><td>x</td><td></td><td></td><td></td><td>✓</td></tr></table> *lowest frequency:* tick in correct place ; *causes sunburn:* cross in correct place ;	2
6(b)(i)	(even at speed of light) it takes the gamma radiation a (very) long time to travel (billions of kilometres) ;	1
6(b)(ii)	$v = f\lambda$ *in any form* / $3.0 \times 10^{8} \div 2.0 \times 10^{-14}$; 1.5×10^{22} (Hz) ;	2
6(c)(i)	infrared ;	1
6(c)(ii)	back / wings / head / darker areas, because black is a good absorber (of radiation) / ORA ;	1

Question	Answer	Marks
7(a)(i)	root(s) ;	1
7(a)(ii)	magnesium ;	1
7(a)(iii)	*any three from:* yellow leaves ; reference to chlorophyll transfers light energy to chemical energy ; chlorophyll is needed for photosynthesis / (lack of chlorophyll) reduces rate of photosynthesis reduced, carbohydrate / glucose / starch production ;	3
7(b)(i)	mistletoe / berries → thrush / (small)bird → cat → hawk OR mistletoe / berries → thrush / (small) bird → hawk organisms in correct order in food chain ; arrows pointing in the correct direction ;	2

Question	Answer	Marks
7(b)(ii)	hawks feed on thrushes which are primary consumers / at the second trophic level (so they are secondary consumers) ; hawks feed on cats which are secondary consumers / at the third trophic level (so they are tertiary consumers) ;	2

Question	Answer	Marks
8(a)	warm hydrochloric acid particles have more kinetic energy ; more successful collisions / more frequent collisions ;	2
8(b)	hard / dense / high melting point / acts as a catalyst / forms coloured compounds ;	1
8(c)(i)	bleaches (damp litmus paper) ;	1
8(c)(ii)	sterilises water / kills microbes / kills bacteria ;	1
8(d)	copper ions = 4.5 (cm) AND solvent front = 8 (cm) (from diagram) ; (4.5 ÷ 8.0 =) 0.56 ;	2

Question	Answer	Marks
9(a)	(gas compared to a liquid) distances between molecules are larger ; forces between molecules are smaller ; molecules are faster-moving / molecules have more KE / move more freely ;	3
9(b)	increases rate of evaporation ; water (vapour) molecules taken away from surface of bath (by moving air, preventing them returning to the bath water) ;	2
9(c)(i)	$P = IV$ *in any form* / 12 ÷ 0.080 ; 150 (V) ;	2
9(c)(ii)	($I = P \div V$ = 18 ÷ 150 =) 0.12 A ; (current in main circuit = 0.12 + 0.080 =) 0.20 A (so 0.5 A fuse gives suitable margin) ;	2