Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE **0653/42**

Paper 4 Extended Theory **March 2019**

MARK SCHEME

Maximum Mark: 80

Published

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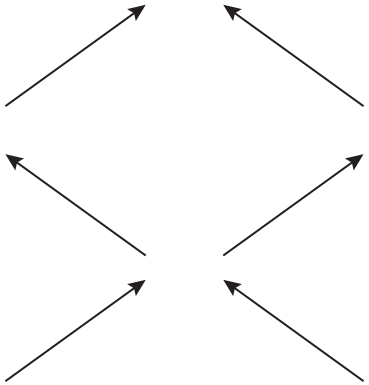
Question	Answer	Marks
1(a)(i)	trophic levels in boxes in the order producer, primary consumer, secondary consumer, tertiary consumer ;	**1**
1(a)(ii)	*food web drawn as follows*  all organisms correct ; arrows pointing in the correct direction ;	**2**
1(a)(iii)	any two from respiration / heat ; not all (prey) eaten ; not all (prey) digested / ref. to egestion (of faeces) ; excretion of waste products / urine ;	**max 2**
1(b)(i)	carbohydrates, proteins ;	**1**
1(b)(ii)	prevents constipation / owtte ;	**1**
1(b)(iii)	apple ;	**1**
1(c)	**lack of** vitamin C ;	**1**

Question	Answer	Marks
1(d)(i)	(person **B**) reference to a more active occupation ;	**1**
1(d)(ii)	(person **C**) males need more energy than females ;	**1**

Question	Answer	Marks
2(a)(i)	fraction **O** molecules are larger / have more carbon atoms; fraction **O** has higher bp / is liquid not gas; fraction **O** is more viscous; fraction **O** molecules have stronger intermolecular attractive forces; fraction **O** is less flammable ; fraction **O** has higher density ;	**max 2**
2(a)(ii)	heat / high temperature / temp of 450 °C etc. **or** high pressure / 200 atm **or** catalyst;	**1**
2(b)	x = 3; y = 6;	**2**
2(c)	four hydrogen atoms used two attached to each carbon; two bonding pairs between carbon atoms; single bonding pair between each carbon and hydrogen;	**3**
2(d)	(family of compounds with) the same general formula ; similar (chemical) properties ;	**2**

Question	Answer	Marks
3(a)	X at point where curve touches x axis the first time ;	1
3(b)(i)	weight of ball = force downwards = 0.12 × 10 = 1.2 N ; resultant force = 8.4 – 1.2 = 7.2 N ;	2
3(b)(ii)	gain in height by ball = 4.1 – 1.4 = 2.7 m ; gain in PE = mgh = 0.12 × 10 × 2.7 ; = 3.24 (J) ;	3
3(c)(i)	½ mv^2 ;	1
3(c)(ii)	(½ mv^2) = ½ × 0.12 × 8^2; = 3.84 (J) ;	2

Question	Answer	Marks
4(a)	prevents backflow of blood ; from ventricle to atrium ;	2
4(b)(i)	produced by respiration / in body cells ; the idea that blood has come from the body (to heart) ;	2
4(b)(ii)	oxygen collected at the lungs / the idea that oxygenated blood comes from the lungs (to the left hand side) ;	1
4(c)(i)	blockage / narrowing of artery ; reference to coronary (arteries) ;	2
4(c)(ii)	avoid smoking ; reduce stress ; reduce fat in diet ; reference to exercise ;	max 1

Question	Answer	Marks
5(a)(i)	transition metals / elements ;	**1**
5(a)(ii)	electrons = 26 ;	**1**
5(b)	stronger more resistant to corrosion ;	**1**
5(c)(i)	coke / carbon ;	**1**
5(c)(ii)	Fe_2O_3 ;	**1**
5(c)(iii)	iron oxide / Fe^{3+} reduced ; carbon monoxide oxidised ;	**2**
5(c)(iv)	aluminium is **too** reactive / aluminium is above carbon in reactivity series ;	**1**
5(c)(v)	(increases) global warming / climate change / consequence of climate change described ;	**1**
5(d)	iron and sulfuric acid ; **or** iron oxide / iron (III) oxide and (dilute) sulfuric acid ;	**1**

Question	Answer	Marks
6(a)	8 (A) ; 4 A in each identical heater in parallel adds to 8 A ;	**2**
6(b)(i)	(warmer) molecules vibrate faster / gain kinetic energy ; the idea that energy is passed from molecule to molecule ;	**2**
6(b)(ii)	molecules in air gain (kinetic) energy (from collisions with wood) ; (faster) molecules transfer energy to more molecules by collision ; (faster) molecules move further apart ; so (warmer) air has lower density ;	**max 3**
6(c)	gap opens again / re-appears ; solids contract on cooling / as temperature falls ;	**2**

Question	Answer	Marks
7(a)	hangs outside (of flower) ; so wind can reach it ;	**2**
7(b)	**F** wind-pollinated – grain is smooth so it travels through the air easily / with less friction ;	**1**
7(c)	pollination – transfer of pollen (from anther to stigma) ; fertilisation – fusion of **nuclei** ;	**2**
7(d)(i)	palisade (cells) ;	**1**
7(d)(ii)	contain chloroplasts / chlorophyll ;	**1**
7(d)(iii)	in the phloem ;	**1**

Question	Answer	Marks
8(a)(i)	**X** anywhere on horizontal part of graph ;	**1**
8(a)(ii)	curved portion steeper and horizontal line at same volume ;	**1**
8(a)(iii)	rate of reaction faster (so steeper curve) ; same final volume of gas (so horizontal line at same height (volume)) ;	**2**
8(b)	456 (g) ;	**1**
8(c)	chlorine ;	**1**

Question	Answer	Marks
9(a)	E = V × I × t ; time in seconds = 60 × 60 × 12 / 43200 ; *E* = 240 × 0.5 × 8 × 60 × 60 × 12 = 41 472 000 J / 41(.5) MJ ;	**3**
9(b)(i)	3.0 × 108 m / s ;	**1**
9(b)(ii)	$v = f\lambda$; $f\ (= v / \lambda) = 3 \times 10^{8} / 589 \times 10^{-9} = 5.09 \times 10^{14}$ (Hz) ;	**2**
9(c)	transverse wave vibrations at right angles to direction of travel, longitudinal in same direction as direction of travel ;	**1**
9(d)(i)	(ultraviolet) shorter wavelength than violet / visible ;	**1**
9(d)(ii)	**skin** cancer / burning of **skin** / other known hazard ;	**1**