Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE **0653/42**

Paper 4 Extended Theory **May/June 2017**

MARK SCHEME

Maximum Mark: 80

Published

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Question	Answer	Marks
1(a)	three lines from 'Enzymes' to are biological catalysts ; work best in a narrow pH range ; are made from amino acids ;	**3**
1(b)	(correct) 46 °C is optimum temperature / rate decreases **above and below** 46 °C ; correct reference to **denaturation** ;	**2**
1(c)(i)	glucose / sugar / simple sugar ;	**1**
1(c)(ii)	glycogen ;	**1**
1(c)(iii)	nitrogen ;	**1**

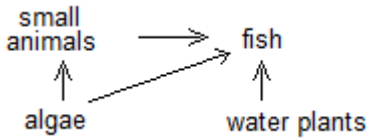
Question	Answer	Marks
2(a)(i)	**A** potassium / K **B** lithium / Li **C** sodium / Na 1 or 2 correct, 1 mark all 3 correct, 2 marks	**2**
2(a)(ii)	exothermic ; chemical (potential) ; two from thermal (allow heat) / light / sound / kinetic ;	**3**
2(a)(iii)	in the range 1 to 14 (seconds) inclusive ;	**1**
2(b)	(too) dangerous / (risk of) explosion ;	**1**
2(c)(i)	resists corrosion / does not rust ;	**1**
2(c)(ii)	stronger / more difficult to damage ;	**1**

Question	Answer	Marks
3(a)(i)	**C** **B**	**1**
3(a)(ii)	(**D** is 500 000 N) the idea that height remains constant / forces (**B** and **D**) are balanced / equal **and opposite** / the resultant force in the vertical direction is zero ;	**1**
3(a)(iii)	(decreases) the weight decreases ;	**1**
3(b)(i)	acceleration = increase in speed ÷ time / (160 – 100) ÷ 30 ; = 2 m / s^2 ;	**2**
3(b)(ii)	potential energy change = mgh or mgΔh / 50 000 $\times$ 10 $\times$ 2000 ; = 1 $\times$ 10^9 (J) ;	**2**

Question	Answer	Marks
4(a)(i)	valve **A** closes and valve **B** opens ;	**1**
4(a)(ii)	high(er) pressure required to send blood around the body / travel a long distance / ora ; high(er) pressure in aorta and low(er) pressure in pulmonary artery ; low pressure in pulmonary artery prevents damaging capillaries in lungs ;	**Max 2**
4(b)(i)	reduces blood flow in coronary artery / arteries ; by presence of cholesterol / fatty deposits / plaque ;	**2**
4(b)(ii)	less fatty diet / reduced stress / reduced smoking / more exercise ;	**1**
4(c)(i)	any valid fight or flight situation described ;	**1**
4(c)(ii)	**destroyed** by the liver ;	**1**
4(d)	reference to auxins ; greater concentration on dark side (of stem) ; cause greater (cell) elongation /growth (on that side) ;	**3**

Question	Answer	Marks
5(a)(i)	fractional distillation ;	**1**
5(a)(ii)	larger molecules / hydrocarbons have larger inter-molecular forces / ora ;	**1**
5(a)(iii)	larger inter-molecular forces means higher boiling point / ora ;	**1**
5(b)(i)	(**D**) alkane / saturated ; (**E**) alkene / unsaturated ;	**2**
5(b)(ii)	bromine (water / solution) ; (**D**) no change ***and*** (**E**) decolourises ;	**2**
5(b)(iii)	cracking ;	**1**
5(c)	(C_7H_{16}) + …**11**…(O_2) ➔ …**7**…(CO_2) + …**8**…(H_2O) ;;	**2**

Question	Answer	Marks
6(a)(i)	conduction ;	**1**
6(a)(ii)	(kinetic) energy of air molecules inside transferred to molecules in aircraft wall (fuselage) ; (kinetic) energy transferred between molecules in aircraft wall (fuselage) ; (kinetic) energy transferred from aircraft wall (fuselage) to air molecules outside ; the idea that energy is transferred via vibrating/colliding molecules/particles ;	**Max 2**
6(b)(i)	(Z) molecules shown not touching / apart ;	**1**
6(b)(ii)	molecules in jet engine moving faster ; because they are at a higher temperature / have greater kinetic energy ; **or** molecules in water moving more slowly ; because they are at a lower temperature / have smaller kinetic energy ; **or** the idea that molecules from the jet exhaust are able to move more freely ; because they are separated / far apart ; **or** the idea that molecules in water have more restricted movement ; because molecules are close together / touching ;	**2**
6(c)(i)	total distance = speed $\times$ time / $3 \times 10^5 \times 0.0002$; = 60 (km) ; so distance aircraft to transmitter = ½ $\times$ 60 / 30 (km) ;	**3**
6(c)(ii)	(long wavelength end) it is in the microwave part of spectrum / it is a microwave / it is at the low frequency end ; lower frequency waves have longer wavelength / ref. to inverse proportionality / reference to the formula $v = f \times \lambda$;	**2**

Question	Answer	Marks
7(a)	an area where the organisms interact with each other ; and (interact with) their environment ;	2
7(b)	 all organisms written only once ; feeding relationships shown using arrows ;	2
7(c)(i)	no light ; for photosynthesis ;	2
7(c)(ii)	bacteria take in / use the oxygen ; for their respiration ;	2

Question	Answer	Marks
8(a)(i)	6 ;	1
8(a)(ii)	non-metal together with one from electrical / thermal insulator / low melting / boiling point ovp ;	1
8(b)(i)	(2), 8, 7 ;	1
8(b)(ii)	**one** shared pair and six non-bonding electrons on each C*l* ;	1
8(c)(i)	ionic ;	1
8(c)(ii)	sodium loses one (electron) ; chlorine gains one (electron) ;	2

Question	Answer	Marks
8(d)	reference to full outer shell ;	**1**

Question	Answer	Marks
9(a)(i)	correct symbols for ammeter and lamp ; only the shown components connected in series ;	**2**
9(a)(ii)	voltmeter connected in parallel with lamp ; correct symbol for voltmeter ;	**2**
9(b)	$P = V \times I = 1.5 \times 0.6 = 0.9$ (W) ;	**1**
9(c)(i)	total resistance more, (so current decreases / so dimmer lamps) ;	**1**
9(c)(ii)	the idea that (compared to one bulb) the (total) potential difference (across two bulbs) is the same but the current is lower (V the same I lower) ; (if V is the same, but I is less) then less power (dissipated) / less total energy transformed per unit time ; **or** the relation $P = V \times I$ / $E = V \times I \times t$ therefore shows that the power / energy per unit time is lower (when two bulbs are used) ;	**2**