Cambridge Assessment International Education

Cambridge IGCSE™

COMBINED SCIENCE **0653/42**

Paper 4 Theory (Extended) **March 2020**

MARK SCHEME

Maximum Mark: 80

Published

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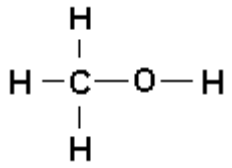
Question	Answer	Marks
1(a)(i)	arrow drawn correctly from grass and flowering plants to beetle ; arrows drawn from beetle to snake and from beetle to owl ;	**2**
1(a)(ii)	owl / snake ; they are at the third trophic level / they are secondary consumers ;	**2**
1(b)(i)	$(6H_2O + 6)$ **CO_2** $\rightarrow$ $(C_6H_{12}O_6 +)$ **6** (O_2) **CO_2** and **6** both correct ;	**1**
1(b)(ii)	absorbs / traps, (sun)light (energy) ; transfers / converts, light energy into chemical energy ;	**2**
1(b)(iii)	storage (of energy) ;	**1**
1(b)(iv)	glycogen ;	**1**

Question	Answer	Marks
2(a)	 ;	**1**
2(b)(i)	contains oxygen / is not carbon and hydrogen only ;	**1**
2(b)(ii)	all bonds are between non-metal atoms ;	**1**
2(c)(i)	$(2CH_3OH +)$ **$3O_2$** $\rightarrow$ **$2CO_2$** + **$4H_2O$** all formulae correct ; (correct formulae) balanced ;	**2**

Question	Answer	Marks
2(c)(ii)	*idea that* energy is taken in to break bonds / that energy is released when bonds form ; (exothermic means) energy released is greater (than taken in) / (during an exothermic reaction) temperature increases / chemical energy converted to thermal ;	**2**
2(d)	global warming / climate change / consequence of climate change, e.g. extreme weather events / rising sea level ;	**1**

Question	Answer	Marks
3(a)(i)	(volume) = $\pi r^2 \ell$ / shows radius as 5 cm ; = $3.14 \times 5 \times 5 \times 80$; (= $6280\ cm^3$)	**2**
3(a)(ii)	(mass =) volume × density / 6280×7.86 ; = 49 400 / 49 360.8 (g) ; = <u>49.4</u> (kg) ; *(3 sig. fig. required in final answer)*	**3**
3(b)	atoms in, molten / liquid iron further apart than in solid iron ; (same mass) occupies greater volume in liquid iron / greater volume for same mass equals lower density ; *(answers must be comparative)*	**2**
3(c)	*any two from:* radiation is reflected ; and so less is absorbed ; (reflection is) better by a shiny surface / metal foil has shiny surface ;	**max 2**

Question	Answer	Marks
4(a)(i)	the breakdown of food into smaller pieces ; without chemical change (to the food molecules) ;	**2**

Question	Answer	Marks
4(a)(ii)	chewing food / churning action by stomach ;	1
4(b)(i)	small intestine ;	1
4(b)(ii)	(*lipase breaks down*) fat (*into*) fatty acids and glycerol ; (*protease breaks down*) protein (*into*) amino acids ;	2
4(b)(iii)	mouth ;	1
4(c)	consists of chemical reactions ✓ ; produces water ✓ ; *(if more than two statements ticked then incorrect ticks cancel correct ones to a min of 0)*	2

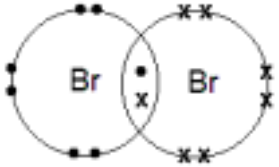
Question	Answer	Marks
5(a)	circle above original sample and at 6 cm (by inspection) ;	1
5(b)(i)	reduced because oxygen is, lost / removed ;	1
5(b)(ii)	carbon is less reactive than sodium (*or reverse argument*) ;	1
5(c)(i)	chlorine / Cl_2 ;	1
5(c)(ii)	gains electrons ; gains 2 electrons / so that the ion is discharged ;	2
5(d)	(bronze is) stronger / harder / more resistant to damage / more resistant to corrosion ;	1

Question	Answer	Marks
6(a)	acceleration = change of speed ÷ time / 0.5 ÷ 2 ; = 0.25 ; m / s^2 ;	3

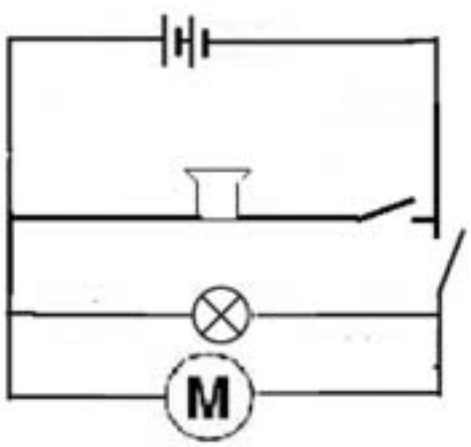
Question	Answer	Marks
6(b)(i)	work done = force × distance / 500 × 10 × 25 ; = 125 000 (J) ;	**2**
6(b)(ii)	electrical energy = power × time / 5000 × 56 ; = 280 000 (J) ;	**2**
6(b)(iii)	*any one from:* transferred / lost as, thermal / sound energy ; used to do work against friction (in machinery) ; used to do work against air resistance ; other correct way in which electrical energy is used, e.g. moving the crane ;	**max 1**

Question	Answer	Marks
7(a)(i)	increase in length = 85 – 80 = 5 (mm) ; so percentage increase = 5 ÷ 80 × 100 = 6.25 / 6.3 (%) ;	**2**
7(a)(ii)	(*statement or implication that*) water leaves the potato (by osmosis) ; *idea that* osmosis occurs when water moves from a high water potential to a low water potential / down a water potential gradient / from a solution of low concentration to a solution of high concentration ; *further detail* – reference to (water loss from potato) **cells** / (water moves) through a partially permeable membrane ;	**3**
7(b)	(root hairs have) greater surface area / *idea that* water can be obtained from a wider area or deeper in soil ; for increased (rate of) water absorption ;	**2**
7(c)(i)	used to make <u>chlorophyll</u> ;	**1**
7(c)(ii)	develops / has, yellow leaves ;	**1**

Question	Answer	Marks

Question	Answer	Marks
8(a)	 shared pair ; seven outer electrons in each bromine atom ;	2
8(b)	distance between bromine molecules increases ; (because) energy is used to, break / overcome intermolecular forces ;	2
8(c)	no colour change ; bromine is less reactive than chlorine / bromine does not displace chlorine ;	2
8(d)(i)	high temperature ; catalyst ;	2
8(d)(ii)	(*from*) orange (*to*) colourless ;	1
8(e)	covalently bonded substances have (relatively) low melting points and boiling points / ionic compounds would have much higher melting points and boiling points ; attractive intermolecular forces are (relatively) low ;	2

Question	Answer	Marks
9(a)	light travels faster than sound ;	1
9(b)	$v = f\lambda$ / ($\lambda =$) $v \div f$ / 2200 ÷ 600 ; = 3.67 / 3.7 (m) ;	2
9(c)(i)	parallel ;	1
9(c)(ii)	$P = I V$ / ($I =$) $P \div V$ / 20 ÷ 12 ; = 1.7 / 1.67 (A) ;	2

Question	Answer	Marks
9(c)(iii)	 correct symbols for lamp and switch ; lamp, siren and motor all in parallel ; switch for motor and lamp ; switch for siren only ;	4