Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE **0653/42**

Paper 4 Extended Theory **March 2017**

MARK SCHEME

Maximum Mark: 80

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.
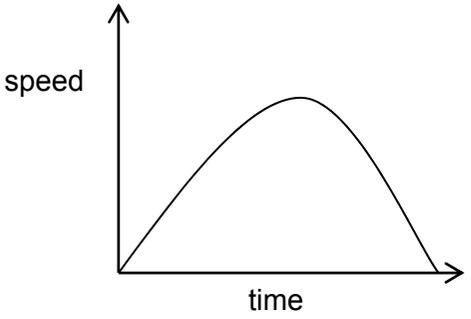
Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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This document consists of **7** printed pages.

Question	Answer	Marks
1(a)	three lines drawn to connect 'Human liver cells' to... contain genetic material in the nucleus ; destroy hormones ; have a cell membrane ;	**3**
1(b)	the breakdown of large / insoluble molecules ; produces / into small / soluble molecules ; that can be absorbed ;	**max 2**
1(c)(i)	**A** because the optimum temperature is approximately 37 °C / body temperature ;	**1**
1(c)(ii)	**F** because the pH optimum is 8 / alkaline ;	**1**
1(c)(iii)	particles are moving too slowly to react ; enzyme molecules become <u>denatured</u> ;	**2**

Question	Answer	Marks
2(a)	draws a gas syringe *or* an inverted measuring cylinder over water ; syringe or measuring cylinder labelled ;	**2**
2(b)	decreases ; concentration (of acid) decreases ; particles collide less often ;	**3**
2(c)	**2HCl + (CaCO$_3$) → (CaCl_2) + CO$_2$ + H$_2$O** ;;	**2**
2(d)	limewater ; (turns) milky / cloudy / white solid / ppt ;	**2**
2(e)	(acid) sulfuric (acid) / H_2SO_4 ; (base) magnesium oxide / MgO / magnesium hydroxide / Mg(OH)$_2$ / magnesium carbonate / MgCO$_3$;	**2**

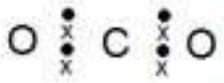| Question	Answer	Marks
3(a)(i)	upwards vertical arrow touching the lift ;	1
3(a)(ii)	(5000 N – no mark) lift not moving / forces balanced / equal **and opposite** ;	1
3(a)(iii)	$5000 + 80 \times 10 = 5800$ (N) ;	1
3(b)(i)	speed = distance/time (or rearranged) ; time (= distance/speed) = 30/2 = 15 (s) ;	2
3(b)(ii)	KE $= \frac{1}{2}mv^2$; $= \frac{1}{2} \times 80 \times 2 \times 2 = 160$ (J) ;	2
3(b)(iii)	PE $= mgh / F \times h$; $= 80 \times 10 \times 30 = 24\,000$ (J) ;	2
3(c)	 ;	1

Question	Answer	Marks
4(a)(i)	photosynthesis ; glucose / starch / sugar ;	**2**
4(a)(ii)	reference to plants eaten by animals (process 6) ; reference to respiration (process 3) ; carbon dioxide produced ;	**3**
4(b)(i)	decomposers ;	**1**
4(b)(ii)	excretion / egestion ; of urine / faeces ;	**2**
4(c)(i)	carbon dioxide is a greenhouse gas ; radiation / heat **from earth** prevented from escaping / trapped in atmosphere ; the idea that increased carbon dioxide levels increase the ability of the atmosphere to trap heat / act as a greenhouse ;	**max 2**
4(c)(ii)	(sulfur dioxide) may cause acid rain ; any valid consequence of acid rain; sulfur dioxide may cause respiratory problems in humans ;	**max 2**

Question	Answer	Marks
5(a)(i)	carbon monoxide ;	**1**
5(a)(ii)	Fe_2O_3 ;	**1**
5(b)(i)	(Aluminium is) too reactive / more reactive than C / carbon ;	**1**
5(b)(ii)	electrolysis ;	**1**
5(c)(i)	(anode) chlorine / Cl_2 (cathode) copper ; (both required)	**1**
5(c)(ii)	(Cu ions) gain electrons ; two electrons (gained) ;	**2**

Question	Answer	Marks
5(d)(i)	Noble gases chemically stable / inert / unreactive / atoms have full outer electron shells / argon atoms do not lose or gain electrons to become stable ;	**1**
5(d)(ii)	(to provide) inert atmosphere / used **in** lamps / **in** light bulbs / lasers / steel making ;	**1**

Question	Answer	Marks
6(a)	at least two diverging rays from filament to lens ; all rays emerging from lens parallel ;	**2**
6(b)	the idea that water molecules are moving ; evaporation occurs when faster / more energetic molecules escape (from the surface) ; reference to decreasing force of attraction / increasing separation (as evaporation occurs) ; condensation occurs when molecules (in water vapour) slow down ; reference to increasing force of attraction / decreasing separation ;	**max3**
6(c)	($v = f \lambda$ or $\lambda = v/f$) λ = 330/50 = 6.6 (m) ;	**1**
6(d)	volume of ocean increases / seawater expands ; sea level rises (to flood coastal land) ;	**2**

Question	Answer	Marks
7(a)(i)	any two from warmth / suitable temperature ; oxygen ; water ;	1
7(a)(ii)	auxins increase in concentration at lower surface (of the radicle / root) ; auxin inhibits growth on lower side ; ref. to differential growth ;	3
7(b)(i)	(no) root hairs not growing (only) downwards / grow in different directions ;	1
7(b)(ii)	root hairs can search more widely for water / minerals / help to anchor the plant ;	1

Question	Answer	Marks
8(a)	methane / CH_4 is smaller (molecule) / has lower surface area ; methane / CH_4 has weaker intermolecular forces / requires less energy to overcome intermolecular forces ;	2
8(b)(i)	cracking ;	1
8(b)(ii)	no change ;	1
8(c)(i)	H_2O ;	1
8(c)(ii)	 ; (oxygen non-bonding electrons not essential)	1
8(c)(iii)	ionic / electrovalent ;	1

Question	Answer	Marks
9(a)	correct symbols for ammeter and lamp ; complete series circuit ;	**2**
9(b)	half length lowers resistance ; (same voltage, so) current / ammeter reading increases ;	**2**
9(c)(i)	$(P = IV) = 0.6 \times 1.5 = 0.9$; W / watts ;	**2**
9(c)(ii)	$E = Pt$; $t = 540/0.9 = 600\,s / 10$ minutes ; allow ecf	**2**