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**COMBINED SCIENCE**

**0653/42**

Paper 4 Extended Theory

**March 2017**

MARK SCHEME

Maximum Mark: 80

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**Published**

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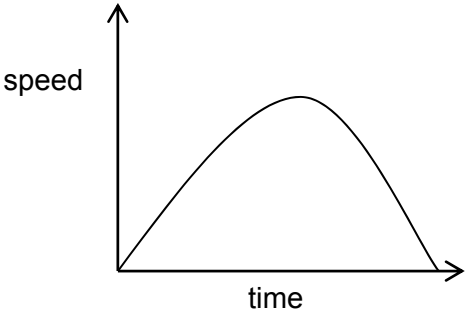
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Question	Answer	Marks
1(a)	three lines drawn to connect 'Human liver cells' to... contain genetic material in the nucleus ; destroy hormones ; have a cell membrane ;	3
1(b)	the breakdown of large / insoluble molecules ; produces / into small / soluble molecules ; that can be absorbed ;	max 2
1(c)(i)	<b>A</b> because the optimum temperature is approximately 37 °C / body temperature ;	1
1(c)(ii)	<b>F</b> 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 <b>or</b> 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)	<b>2HCl + (CaCO<sub>3</sub>) → (CaCl<sub>2</sub>) + CO<sub>2</sub> + H<sub>2</sub>O ;;</b>	2
2(d)	limewater ; (turns) milky / cloudy / white solid / ppt ;	2
2(e)	(acid) sulfuric (acid) / H <sub>2</sub> SO <sub>4</sub> ; (base) magnesium oxide / MgO / magnesium hydroxide / Mg(OH) <sub>2</sub> / magnesium carbonate / MgCO <sub>3</sub> ;	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 <b>and opposite</b> ;	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)	 <p style="text-align: center;">;</p>	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 <b>from earth</b> 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)	$\text{Fe}_2\text{O}_3$ ;	1
5(b)(i)	(Aluminium is) too reactive / more reactive than C / carbon ;	1
5(b)(ii)	electrolysis ;	1
5(c)(i)	(anode) chlorine / $\text{Cl}_2$ (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 <b>in</b> lamps / <b>in</b> 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)	$(v = f \lambda \text{ or } \lambda = v/f)$ $\lambda = 330/50 = 6.6 \text{ (m)}$ ;	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 <sub>4</sub> is smaller (molecule) / has lower surface area ; methane / CH <sub>4</sub> 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 <sub>2</sub> O ;	1
8(c)(ii)	 (oxygen non-bonding electrons not essential)	1
8(c)(iii)	ionic / electrovalent ;	1

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