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**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**

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| Question | Answer | Marks |
|---|---|---|
| 1(a) | three lines drawn to connect 'Human liver cells' to...<br>contain genetic material in the nucleus ;<br>destroy hormones ;<br>have a cell membrane ; | **3** |
| 1(b) | the breakdown of large / insoluble molecules ;<br>produces / into small / soluble molecules ;<br>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 ;<br>enzyme molecules become denatured ; | **2** |

| Question | Answer | Marks |
|---|---|---|
| 2(a) | draws a gas syringe ***or*** an inverted measuring cylinder over water ;<br>syringe or measuring cylinder labelled ; | **2** |
| 2(b) | decreases ;<br>concentration (of acid) decreases ;<br>particles collide less often ; | **3** |
| 2(c) | **2HC*l*** + (**$CaCO_3$**) → ($CaCl_2$) + **$CO_2$** + **$H_2O$** ;; | **2** |
| 2(d) | limewater ;<br>(turns) milky / cloudy / white solid / ppt ; | **2** |
| 2(e) | (acid) sulfuric (acid) / $H_2SO_4$ ;<br>(base) magnesium oxide / MgO / magnesium hydroxide / $Mg(OH)_2$ / magnesium carbonate / $MgCO_3$ ; | **2** |

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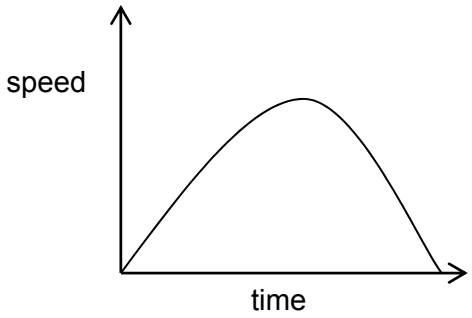
| Question | Answer | Marks |
|---|---|---|
| 3(a)(i) | upwards vertical arrow touching the lift ; | **1** |
| 3(a)(ii) | (5000 N – no mark)<br>lift not moving / forces balanced / equal **and opposite** ; | **1** |
| 3(a)(iii) | 5000 + 80 × 10 = 5800 (N) ; | **1** |
| 3(b)(i) | speed = distance/time (or rearranged) ;<br>time (= distance/speed) = 30/2 = 15 (s) ; | **2** |
| 3(b)(ii) | KE = ½ $mv^2$ ;<br>= ½ × 80 × 2 × 2 = 160 (J) ; | **2** |
| 3(b)(iii) | PE = $mgh$/$F$ × $h$ ;<br>= 80 × 10 × 30 = 24 000 (J) ; | **2** |
| 3(c) |  <br>; | **1** |

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| Question | Answer | Marks |
|---|---|---|
| 4(a)(i) | photosynthesis ;<br>glucose / starch / sugar ; | **2** |
| 4(a)(ii) | reference to plants eaten by animals (process 6) ;<br>reference to respiration (process 3) ;<br>carbon dioxide produced ; | **3** |
| 4(b)(i) | decomposers ; | **1** |
| 4(b)(ii) | excretion / egestion ;<br>of urine / faeces ; | **2** |
| 4(c)(i) | carbon dioxide is a greenhouse gas ;<br>radiation / heat **from earth** prevented from escaping / trapped in atmosphere ;<br>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 ;<br>any valid consequence of acid rain;<br>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 / $Cl_2$<br>(cathode) copper ; (both required) | **1** |
| 5(c)(ii) | (Cu ions) gain electrons ;<br>two electrons (gained) ; | **2** |

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

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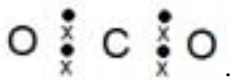
| Question | Answer | Marks |
|---|---|---|
| 7(a)(i) | any two from<br>warmth / suitable temperature ;<br>oxygen ;<br>water ; | **1** |
| 7(a)(ii) | auxins increase in concentration at lower surface (of the radicle / root) ;<br>auxin inhibits growth on lower side ;<br>ref. to differential growth ; | **3** |
| 7(b)(i) | (no)<br>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 ;<br>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) |  ;<br>(oxygen non-bonding electrons not essential) | **1** |
| 8(c)(iii) | ionic / electrovalent ; | **1** |

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

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