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**CO-ORDINATED SCIENCES** **0654/31**

Paper 3 Theory (Core) **October/November 2017**

MARK SCHEME

Maximum Mark: 120

**Published**

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| Question | Answer | Marks |
|---|---|---|
| 1(a)(i) | cell wall ;<br>cytoplasm ;<br>vacuole ; | **3** |
| 1(a)(ii) | label line to any of the chloroplasts ; | **1** |
| 1(b) | *LHS*<br>carbon dioxide AND water ;<br>*RHS*<br>glucose AND oxygen ; | **2** |
| 1(c) | cell membrane ;<br>nucleus ;<br>cytoplasm ; | **3** |

| Question | Answer | Marks |
|---|---|---|
| 2(a)(i) | protons correctly labelled ;<br>neutrons correctly labelled ;<br>electrons correctly labelled ; | **3** |
| 2(a)(ii) | 3 ; | **1** |
| 2(a)(iii) | lithium / Li ; | **1** |
| 2(a)(iv) | fluorine / F ; | **1** |

| Question | Answer | Marks |
|---|---|---|
| 2(b) |  <br>elements and uses correctly connected ;<br>uses and properties correctly connected ; | **2** |

| Question | Answer | Marks |
|---|---|---|
| 3(a)(i) | A and D ; | **1** |
| 3(a)(ii) | A or B ; | **1** |
| 3(a)(iii) | C and E ; | **1** |
| 3(b)(i) | increase CSA / diameter ; | **1** |
| 3(b)(ii) | contract in cold weather ;<br>damage cables / pylons ; | **2** |
| 3(c) | nuclei split ; | **1** |
| 3(d)(i) | $\gamma$ / gamma ;<br>written in left hand box ; | **2** |
| 3(d)(ii) | $\alpha$ $\beta$ $\gamma$ ;<br>most ionising ... least ionising | **1** |

| Question | Answer | Marks |
|---|---|---|
| 4(a) | DNA ;<br>heredity ;<br>protein ; | **3** |
| 4(b)(i) | Juan and Sara ; | **1** |
| 4(b)(ii) | 100% circled ; | **1** |
| 4(b)(iii) | Ben is homozygous dominant / will always pass on a, dominant allele / T ; | **1** |
| 4(c) | <table><tr><td></td><td>*T*</td><td>*t*</td></tr><tr><td>*T*</td><td>**TT**</td><td>**Tt**</td></tr><tr><td>*t*</td><td>**Tt**</td><td>**tt**</td></tr></table> ; | **1** |

| Question | Answer | Marks |
|---|---|---|
| 5(a)(i) | 78 ; | **1** |
| 5(a)(ii) | argon / other noble gas ; | **1** |
| 5(b)(i) | **B** absence of water (vapour) / no water ;<br>**C** absence of <u>oxygen</u> / no oxygen ; | **2** |
| 5(b)(ii) | no change in mass<br>**AND**<br>idea that nothing enters or leaves the test-tube ; | **1** |
| 5(c)(i) | use of named indicator e.g.(red) litmus ;<br>correct result e.g. (litmus) turns blue ; | **2** |
| 5(c)(ii) | nitric acid ; | **1** |

| Question | Answer | Marks |
|---|---|---|
| 5(c)(iii) | idea of improving crop yield ;<br>soil does not contain enough nutrients / nitrogen (compounds)<br>**or**<br>to replace nitrogen compounds ;<br>reference to use of nitrogen in plants to produce amino acids / proteins / DNA ; | **max 2** |

| Question | Answer | Marks |
|---|---|---|
| 6(a) | conduction – polymer / foam / air is a poor heat conductor / is an insulator ;<br>convection – (trapped) air is unable to move by convection ; | **2** |
| 6(b)(i) | all symbols correct ;<br>circuit correctly connected ; | **2** |
| 6(b)(ii) | something vibrates ; | **1** |
| 6(b)(iii) | large amplitude ;<br>high frequency ; | **2** |
| 6(c) | on<br>off<br>off<br>on<br><br>2 or 3 correct ;<br>4 correct ; | **2** |

| Question | Answer | Marks |
|---|---|---|
| 7(a)(i) | (number of new HIV infections) increases then decreases ;<br>peak (number of infections) at 1985 / 130 000 cases ;<br>correct data manipulation ; | **max 2** |

| Question | Answer | Marks |
|---|---|---|
| 7(a)(ii) | 40 000 / 80 000 × 100 ;<br>50 (%) ; | **2** |
| 7(b)(i) | contaminated needles / injecting drugs ;<br>blood transfusion ;<br>sexual fluids / (unprotected) sexual intercourse ;<br>blood to blood contact ;<br>breast feeding ;<br>during birth ; | **max 2** |
| 7(b)(ii) | education ;<br>provide, condoms / barrier contraception ;<br>free testing ;<br>needle exchange ;<br>screening blood transfusions ; | **max 2** |

| Question | Answer | Marks |
|---|---|---|
| 8(a)(i) | **Q** hydrogen<br>**R** hydrogen<br>**S** hydrogen<br>**T** carbon dioxide<br><br>2 or 3 correct ;<br>4 correct ; | **2** |
| 8(a)(ii) | limewater ;<br>goes milky ; | **2** |
| 8(a)(iii) | **R** increases<br>AND<br>acid is being used up / acid concentration is decreasing ;<br>**S** increases<br>AND<br>reaction produces an alkaline product / calcium hydroxide concentration increases ; | **2** |

| Question | Answer | Marks |
|---|---|---|
| 8(a)(iv) | endothermic (because) temperature decreases / thermal energy taken in ; | **1** |
| 8(b)(i) | increases ; | **1** |
| 8(b)(ii) | rate decreases ;<br>rate increases ; | **2** |

| Question | Answer | Marks |
|---|---|---|
| 9(a) | arrow vertically downwards ; | **1** |
| 9(b)(i) | time between 0–12.5 s ; | **1** |
| 9(b)(ii) | time between 12.5 and 22.5 s ; | **1** |
| 9(c)(i) | B – particles close together and randomly arranged ; | **1** |
| 9(c)(ii) | section **X** ;<br>ice melts at 0°C / temperature is constant ; | **2** |

| Question | Answer | Marks |
|---|---|---|
| 10(a) | E D B A ; | **1** |
| 10(b) | brain / spinal cord ; | **1** |
| 10(c) | rapid circled ;<br>automatic circled ; | **2** |
| 10(d) | central (nervous system) / CNS ;<br>peripheral (nervous system) ; | **2** |
| 10(e) | brain is closer ;<br>(impulse) takes less time ; | **2** |

| Question | Answer | Marks |
|---|---|---|
| 11(a)(i) | coal ; | **1** |
| 11(a)(ii) | reference to long time required to form fossil fuels ; | **1** |
| 11(b)(i) | heating / cooking ;<br>fuel for diesel engines / fuel for named heavy vehicle ; | **2** |
| 11(b)(ii) | no new compounds / separation of existing compounds from a mixture ; | **1** |
| 11(c) | alkanes **K M** ;<br>ethanol **J** ;<br>natural gas **M** ;<br>unsaturated **L** ; | **4** |
| 11(d)(i) | join together (in chains) / owtte ; | **1** |
| 11(d)(ii) | carbon dioxide ;<br>carbon monoxide ;<br>water ; | **max 2** |

| Question | Answer | Marks |
|---|---|---|
| 12(a) | sound wave – longitudinal<br>water wave – transverse ; | **1** |
| 12(b) | double headed arrow showing distance between two identical points on two consecutive waves ; | **1** |
| 12(c)(i) | kinetic (energy) ; | **1** |
| 12(c)(ii) | (gravitational) potential (energy) ; | **1** |
| 12(d)(i) | 20 (N) ;<br>forwards / to the right ; | **2** |

| Question | Answer | Marks |
|---|---|---|
| 12(d)(ii) | the swimmers speed increases / acceleration ;<br>resultant force / unbalanced force in direction of motion / to right ; | **2** |
| 12(e) | energy transferred to particles from surroundings (body) ;<br>fastest molecules escape ;<br>average energy of the rest of particles reduced / thermal energy removed from <u>liquid</u> ; | **max 2** |
| 12(f) | mass = density × volume **or** 996 × 480 ;<br>478 080 (kg) ; | **2** |
| 12(g) | at Y reflection only is shown ;<br>at X refraction (and reflection is shown) ;<br>total internal reflection occurs when angle of incidence exceeds critical angle / angle of incidence = angle of reflection for reflection / refraction away from normal going from denser to less dense medium ; | **3** |

| Question | Answer | Marks |
|---|---|---|
| 13(a)(i) | <table><tr><th>organ</th><th>blood vessel leading to the organ</th><th>blood vessel leading away from the organ</th></tr><tr><td>heart</td><td>vena cava</td><td>aorta</td></tr><tr><td>lungs</td><td>pulmonary artery</td><td>pulmonary vein</td></tr><tr><td>liver</td><td>Hepatic portal vein</td><td>hepatic vein</td></tr><tr><td>kidney</td><td>renal artery</td><td>renal vein</td></tr></table><br>1 row correct ;<br>2 rows correct ;<br>3 rows correct ;<br>4 rows correct ; | **4** |
| 13(a)(ii) | valves ; | **1** |
| 13(b)(i) | transport / carry / deliver, **oxygen** ; | **1** |

| Question | Answer | Marks |
|---|---|---|
| 13(b)(ii) | white blood cells ;<br>platelets ;<br>plasma ; | **max 2** |