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**COMBINED SCIENCE**

**0653/31**

Paper 3 Core Theory

**October/November 2017**

MARK SCHEME

Maximum Mark: 80

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**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.

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| Question | Answer                                                            | Marks |
|----------|-------------------------------------------------------------------|-------|
| 1(a)     | red blood cells ;<br>pulmonary vein ;<br>aorta ;<br>capillaries ; | 4     |
| 1(b)(i)  | activity is affected by the adrenaline ;                          | 1     |
| 1(b)(ii) | (destroyed) by the liver ;                                        | 1     |
| 1(c)     | <b>A</b> trachea ;<br><b>B</b> bronchiole ;                       | 2     |
| 1(d)     | becomes faster ;<br>becomes deeper ;                              | 2     |

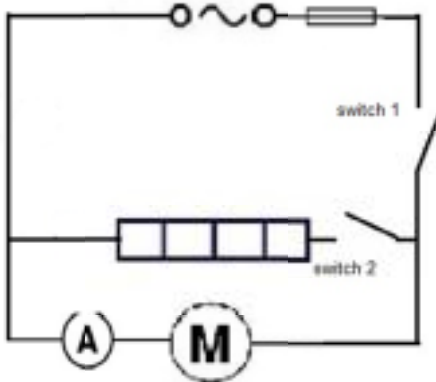
| Question  | Answer                                                                           | Marks |
|-----------|----------------------------------------------------------------------------------|-------|
| 2(a)(i)   | (negative) cathode <b>and</b><br>(positive) anode ;                              | 1     |
| 2(a)(ii)  | (negative) lead ;<br>(positive) bromine / Br <sub>2</sub> ;                      | 2     |
| 2(a)(iii) | ionic / electrovalent ;                                                          | 1     |
| 2(a)(iv)  | new substance(s) made ;                                                          | 1     |
| 2(b)(i)   | hydrochloric (acid) / HCl ;                                                      | 1     |
| 2(b)(ii)  | Increases ;                                                                      | 1     |
| 2(b)(iii) | (test) (acidified) silver nitrate ;<br>(observation) white precipitate / solid ; | 2     |

| Question  | Answer                                                                                                                            | Marks |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------|-------|
| 3(a)(i)   | 80 waves / cycles / vibrations / oscillations per second ;                                                                        | 1     |
| 3(a)(ii)  | first note louder than second note ;                                                                                              | 1     |
| 3(a)(iii) | yes (no mark)<br>frequency range of guitar lies within frequency range of normal human hearing / is within range 20 Hz – 20 kHz ; | 1     |
| 3(b)      | electromagnetic waves ;                                                                                                           | 1     |
| 3(c)(i)   | any two from<br>upright ;<br>virtual ;<br>same size ;                                                                             | max 2 |
| 3(c)(ii)  | 45° ;                                                                                                                             | 1     |
| 3(d)(i)   | answer in range 80–84 N ;                                                                                                         | 1     |
| 3(d)(ii)  | string breaks (as graph goes up vertically) / permanently stretches / <i>owtte</i> ;                                              | 1     |

| Question | Answer                                                                                                                                       | Marks |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 4(a)     | Any two from<br>(large) petals ;<br>anther(s) / are inside the flower ;<br>stigma / is inside the flower ;                                   | max 2 |
| 4(b)     | (flower) <b>D</b> AND any two from<br>anther is higher than stigma ;<br>anther produces pollen ;<br>pollen is more likely to fall on it ;    | max 2 |
| 4(c)     | sexual reproduction ;<br>from different parents / different genetic material ;<br>(seeds contain) some (genetic material) from each parent ; | max 2 |

| Question | Answer                                                                             | Marks |
|----------|------------------------------------------------------------------------------------|-------|
| 4(d)(i)  | primroses → snails → thrushes → buzzards<br>correct order ;<br>correct arrows ;    | 2     |
| 4(d)(ii) | snails, thrushes, buzzards ;<br>(get their energy by) feeding on other organisms ; | 2     |

| Question  | Answer                                                                                                                                                                                                                             | Marks |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 5(a)(i)   | molecule / compound of carbon and hydrogen / C and H bonded ;<br>only (C&H) ;                                                                                                                                                      | 2     |
| 5(a)(ii)  | C=C double bond ;<br>4 correct C–H bonds ;<br>$  \begin{array}{c}  \text{H} \quad \quad \text{H} \\  \diagdown \quad \diagup \\  \text{C} = \text{C} \\  \diagup \quad \diagdown \\  \text{H} \quad \quad \text{H}  \end{array}  $ | 2     |
| 5(a)(iii) | carbon dioxide / CO <sub>2</sub> ;<br>water / H <sub>2</sub> O ;                                                                                                                                                                   | 2     |
| 5(b)(i)   | coal ;<br>petroleum ;                                                                                                                                                                                                              | 2     |
| 5(b)(ii)  | methane ;                                                                                                                                                                                                                          | 1     |

| Question  | Answer                                                                                                                                                                                     | Marks |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 6(a)(i)   | fuse ;                                                                                                                                                                                     | 1     |
| 6(a)(ii)  | to protect fan heater from overload / current too high ;                                                                                                                                   | 1     |
| 6(a)(iii) | (both) switch 1 and switch 2 ;                                                                                                                                                             | 1     |
| 6(b)(i)   |  <p>correct symbol for ammeter ;<br/>ammeter in fan motor branch, all circuit connections complete ;</p> | 2     |
| 6(b)(ii)  | $R = V / I$ or $= 240 / 0.2$ ;<br>$(=) 1200$ ;<br>ohm(s) / $\Omega$ ;                                                                                                                      | 3     |

| Question | Answer                                                                                                      | Marks |
|----------|-------------------------------------------------------------------------------------------------------------|-------|
| 7(a)     | carbon dioxide + water ;<br>→ sugar / glucose ;                                                             | 2     |
| 7(b)(i)  | any time between 10.00 and 13.00 ;<br>maximum rate of oxygen production / gradient of graph is steep(est) ; | 2     |

| Question | Answer                                                                                                                                      | Marks |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 7(b)(ii) | letter <b>X</b> drawn at 14.00 anywhere below line graph ;<br>(rate of) photosynthesis (oxygen production) dependent on (amount of) light ; | 2     |
| 7(c)     | reduces / causes less / prevents transpiration ;                                                                                            | 1     |

| Question  | Answer                                                                                                                                                                                                                                                                                                                                                                                                         | Marks |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 8(a)(i)   | paint(ing) / oil(ing) / grease / plastic coat / AVP ;                                                                                                                                                                                                                                                                                                                                                          | 1     |
| 8(a)(ii)  | oxygen ;                                                                                                                                                                                                                                                                                                                                                                                                       | 1     |
| 8(a)(iii) | add salt / catalyst / increase temperature / heat ;                                                                                                                                                                                                                                                                                                                                                            | 1     |
| 8(b)(i)   | <div style="display: inline-block; border: 1px solid black; padding: 2px 10px;">(calcium)</div> + <div style="display: inline-block; border: 1px solid black; padding: 2px 10px;">water</div> → <div style="display: inline-block; border: 1px solid black; padding: 2px 10px;">calcium<br/>hydroxide</div> + <div style="display: inline-block; border: 1px solid black; padding: 2px 10px;">Hydrogen</div> ; | 1     |
| 8(b)(ii)  | exothermic ;                                                                                                                                                                                                                                                                                                                                                                                                   | 1     |
| 8(b)(iii) | (calcium is) less reactive / sodium is more reactive ;                                                                                                                                                                                                                                                                                                                                                         | 1     |
| 8(c)(i)   | transition (metals / elements) ;                                                                                                                                                                                                                                                                                                                                                                               | 1     |
| 8(c)(ii)  | (copper alloys are) harder / more resistant to wear ;                                                                                                                                                                                                                                                                                                                                                          | 1     |

| Question | Answer                                           | Marks |
|----------|--------------------------------------------------|-------|
| 9(a)(i)  | friction / frictional force / resistance force ; | 1     |
| 9(a)(ii) | equal (magnitude) ;<br>opposite (direction) ;    | 2     |
| 9(b)     | light ;<br>electrical ;                          | 2     |

| Question  | Answer                                                                       | Marks    |
|-----------|------------------------------------------------------------------------------|----------|
| 9(c)(i)   | gap will close :<br>(thermal) expansion (of bridge structure) <i>owtte</i> ; | <b>2</b> |
| 9(c)(ii)  | evaporates ;<br>faster ;                                                     | <b>2</b> |
| 9(c)(iii) | line drawn between the two bottom boxes ;                                    | <b>1</b> |



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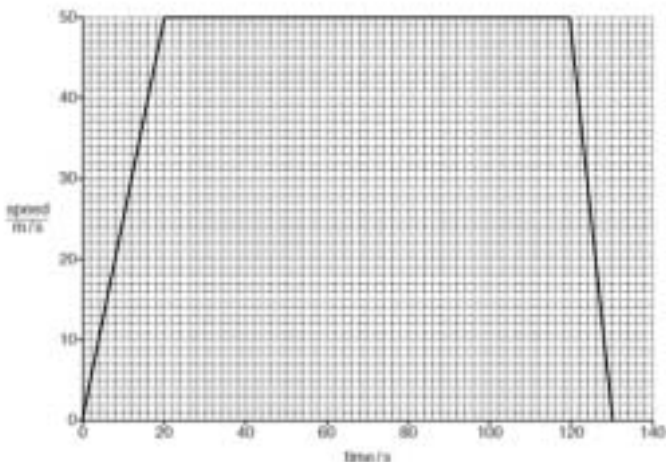
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| Question | Answer                                                                                             | Marks |
|----------|----------------------------------------------------------------------------------------------------|-------|
| 1(a)     | blood ;<br>ovary ;<br>14 ;<br>fertilised ;                                                         | 4     |
| 1(b)     | sperm cell / egg cell ;<br>zygote / body cell ;                                                    | 2     |
| 1(c)     | genetic material is identical / clones ;<br>because it has come from same egg and sperm / zygote ; | 2     |

| Question  | Answer                                                                                                                                         | Marks |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 2(a)(i)   | (metal <b>A</b> )    calcium / Ca<br>(metal <b>B</b> )    magnesium / Mg<br>(metal <b>C</b> )    zinc / Zn<br>(metal <b>D</b> )    iron / Fe ; | 2     |
| 2(a)(ii)  | hydrogen ;                                                                                                                                     | 1     |
| 2(a)(iii) | increases (rate) ;                                                                                                                             | 1     |
| 2(a)(iv)  | any one from<br>change / increase / decrease concentration / surface area / (solid) particle size ;<br>use / add a catalyst ;                  | max 1 |
| 2(b)      | (iron(II) ions)    green ppt / solid ;<br>(iron(III) ions)    brown ppt / solid ;                                                              | 2     |
| 2(c)(i)   | Any two from<br>high_density ;<br>high_melting point ;<br>(form) coloured compounds ;<br>catalysts ;                                           | 2     |

| Question | Answer                                                                       | Marks |
|----------|------------------------------------------------------------------------------|-------|
| 2(c)(ii) | (alloys are) harder / more resistant to wear / more resistant to corrosion ; | 1     |

| Question | Answer                                                                                                                                                                                                        | Marks |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 3(a)     | force arrow vertically upward labelled 'uplift' ;<br>force arrow vertically downward labelled 'weight' or 'gravitational force' ;<br>(the two vertical) arrows in contact with helicopter / of equal length ; | 3     |
| 3(b)     | chemical ;<br>kinetic ;<br>gravitational / potential ;                                                                                                                                                        | 3     |
| 3(c)(i)  | one section of plot correct ;<br>all 3 sections of the plot correct ;<br>                                                  | 2     |
| 3(c)(ii) | distance = speed $\times$ time (= $50 \times 100$ ) ;<br>= 5000 (m) ;                                                                                                                                         | 2     |

| Question | Answer                                                                                                                                                                                      | Marks |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 4(a)     | iodine ;<br>goes (from brown) to blue-black ;                                                                                                                                               | 2     |
| 4(b)     | Any three from<br>results show starch present (around <b>A</b> and / or <b>B</b> ) ;<br>inactive / denatured enzyme ;<br>because <b>A</b> is boiled ;<br>because <b>B</b> is acidic / pH3 ; | max 3 |
| 4(c)     | Any two from<br>breaks down large / insoluble molecules ;<br>into small / soluble molecules ;<br>so that they can be absorbed ;                                                             | max 2 |
| 4(d)     | molar ;<br>flat / has cusps / large surface area ;<br>for grinding food into smaller pieces ;                                                                                               | 3     |

| Question  | Answer                                                               | Marks |
|-----------|----------------------------------------------------------------------|-------|
| 5(a)      | number of protons <u>in</u> an atom / nucleus ;                      | 1     |
| 5(b)(i)   | C ;<br>A ;                                                           | 2     |
| 5(b)(ii)  | ionic / electrovalent ;                                              | 1     |
| 5(b)(iii) | releases heat / thermal energy / temperature goes up / gets hotter ; | 1     |
| 5(c)(i)   | (pale) green ;                                                       | 1     |
| 5(c)(ii)  | bromine / Br <sub>2</sub> ;                                          | 1     |
| 5(d)(i)   | electrolysis ;                                                       | 1     |

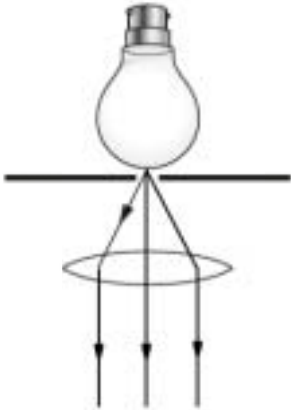
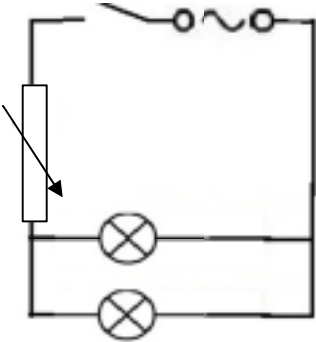
| Question | Answer                                       | Marks |
|----------|----------------------------------------------|-------|
| 5(d)(ii) | add water / use (copper chloride) solution ; | 1     |

| Question | Answer                                                                                                                                         | Marks |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 6(a)(i)  | conduction ;                                                                                                                                   | 1     |
| 6(a)(ii) | metal / named metal ;                                                                                                                          | 1     |
| 6(b)(i)  | arrows up and across room ;<br>arrows down and back towards radiator ;                                                                         | 2     |
| 6(b)(ii) | convection ;                                                                                                                                   | 1     |
| 6(c)(i)  | X-rays ;                                                                                                                                       | 1     |
| 6(c)(ii) | tick under radio waves ;                                                                                                                       | 1     |
| 6(d)     | description of charging by friction ;<br>reference to positive and negative charges / opposite charges attract ;<br>some experimental detail ; | 3     |

| Question | Answer                                                                                                                                                      | Marks |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 7(a)(i)  | lower surface<br>when upper leaf is greased water loss is not reduced by much ;<br>when lower surface is covered there is a great reduction in water loss ; | 2     |
| 7(a)(ii) | most transpiration occurs through the stomata ;<br>which are (mostly) found on lower surface of leaf ;                                                      | 2     |
| 7(b)     | <u>xylem</u> ;<br>position of tissue correctly labelled ;                                                                                                   | 2     |
| 7(c)     | carbon dioxide, sugar / glucose, oxygen ;                                                                                                                   | 1     |

| Question | Answer                                                                                                                                                                | Marks |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 7(d)     | Any two from<br>carnivores cannot produce their own food / cannot photosynthesise ;<br>carnivores get energy by eating herbivores ;<br>herbivores feed on producers ; | max 2 |

| Question  | Answer                                                                                                                                                                                                                                                                                                                                                                                                                      | Marks |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 8(a)(i)   | <div style="display: flex; align-items: center; gap: 10px;"> <div style="border: 1px solid black; padding: 2px 5px;">(copper oxide)</div> <div>+</div> <div style="border: 1px solid black; padding: 2px 5px;">carbon</div> <div>→</div> <div style="border: 1px solid black; padding: 2px 5px;">copper</div> <div>+</div> <div style="border: 1px solid black; padding: 2px 5px;">carbon dioxide</div> <div>;</div> </div> | 1     |
| 8(a)(ii)  | respiration / (reaction of) acid + carbonate / thermal_decomposition / fermentation ;                                                                                                                                                                                                                                                                                                                                       | 1     |
| 8(a)(iii) | (solid) coal ;<br>(liquid) petroleum ;                                                                                                                                                                                                                                                                                                                                                                                      | 2     |
| 8(b)(i)   | ethanol ;                                                                                                                                                                                                                                                                                                                                                                                                                   | 1     |
| 8(b)(ii)  | compound / molecule containing / of only carbon and hydrogen ;                                                                                                                                                                                                                                                                                                                                                              | 1     |
| 8(b)(iii) | (because it) contains oxygen / O (as well as C and H) ;                                                                                                                                                                                                                                                                                                                                                                     | 1     |

| Question  | Answer                                                                                                                                                              | Marks    |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 9(a)(i)   | <p>two more rays from hole to lens ;<br/>all rays emerge from lens parallel ;</p>  | <b>2</b> |
| 9(a)(ii)  | focal length ;                                                                                                                                                      | <b>1</b> |
| 9(b)(i)   | <p>correct symbol for variable resistor ;</p>                                    | <b>1</b> |
| 9(b)(ii)  | <p>less than 20 A ;<br/>current from source is larger than in each branch ;</p>                                                                                     | <b>2</b> |
| 9(b)(iii) | <p>remains lit (no mark)<br/>still a complete circuit through that branch <i>owtte</i> ;</p>                                                                        | <b>1</b> |



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**Cambridge Assessment**  
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| Question  | Answer                                                                                                                        | Marks        |
|-----------|-------------------------------------------------------------------------------------------------------------------------------|--------------|
| 1(a)      | xylem ;<br>mesophyll cells ;<br>stomata ;                                                                                     | <b>3</b>     |
| 1(b)      | any two from<br>photosynthesis ;<br>transport of ions ;<br>support / turgor ;<br>AVP ;                                        | <b>max 2</b> |
| 1(c)      | ions / named ion ;<br>soluble nutrients / named soluble nutrient ;<br>hormones / named hormone ;<br>carbon dioxide ;<br>AVP ; | <b>max 2</b> |
| 1(d)(i)   | transport of oxygen ;                                                                                                         | <b>1</b>     |
| 1(d)(ii)  | to replace iron lost during menstruation / period ;                                                                           | <b>1</b>     |
| 1(d)(iii) | feeling tired / dizzy ;                                                                                                       | <b>1</b>     |

| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Marks        |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| 2(a)(i)  | Any two from<br>electrical conductor ;<br>thermal / heat conductor ;<br>malleable ;<br>ductile ;<br>sonorous ;                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>max 2</b> |
| 2(a)(ii) | high density / high melting point / coloured compounds ;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>1</b>     |
| 2(b)(i)  | <div style="display: flex; align-items: center; justify-content: center;"> <div style="border: 1px solid black; padding: 5px; margin: 0 10px;">(iron)</div> <div style="margin: 0 10px;">+</div> <div style="border: 1px solid black; padding: 5px; margin: 0 10px;">sulfuric acid</div> <div style="margin: 0 10px;">→</div> <div style="border: 1px solid black; padding: 5px; margin: 0 10px;">iron sulfate</div> <div style="margin: 0 10px;">+</div> <div style="border: 1px solid black; padding: 5px; margin: 0 10px;">hydrogen</div> </div> ; | <b>1</b>     |
| 2(b)(ii) | (anion) chloride ;<br>(acid) hydrochloric (acid) ;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>2</b>     |
| 2(c)     | number of protons in an atom / nucleus ;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>1</b>     |

| Question  | Answer                                                                                                                                                    | Marks |                  |  |                  |                  |                 |                  |   |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------------|--|------------------|------------------|-----------------|------------------|---|
| 3(a)      | (Q =) friction / (water) resistance ;<br><br>(R =) gravitational force / weight ;                                                                         | 2     |                  |  |                  |                  |                 |                  |   |
| 3(b)      | (forces P and R) equal / balanced ;                                                                                                                       | 1     |                  |  |                  |                  |                 |                  |   |
| 3(c)(i)   | P / uplift ;                                                                                                                                              | 1     |                  |  |                  |                  |                 |                  |   |
| 3(c)(ii)  | <table border="1"><tr><td>gamma</td><td></td><td></td><td>visible<br/>light</td><td></td><td>micro-<br/>waves</td><td>radio<br/>waves ;</td></tr></table> | gamma |                  |  | visible<br>light |                  | micro-<br>waves | radio<br>waves ; | 1 |
| gamma     |                                                                                                                                                           |       | visible<br>light |  | micro-<br>waves  | radio<br>waves ; |                 |                  |   |
| 3(c)(iii) | sound ;                                                                                                                                                   | 1     |                  |  |                  |                  |                 |                  |   |
| 3(d)      | nuclear / batteries ;                                                                                                                                     | 1     |                  |  |                  |                  |                 |                  |   |
| 3(e)      | either 30 km = 30 000 m or 1 hour = 3600 s ;<br><br>(30 000 / 3600) = 8.3 m / s ;                                                                         | 2     |                  |  |                  |                  |                 |                  |   |

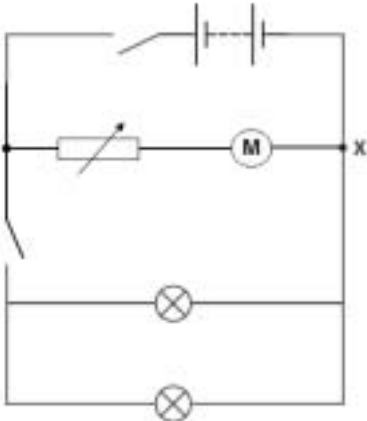
| Question  | Answer                                                                                                                                                            | Marks        |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| 4(a)      | <b>A</b> oesophagus ;<br><b>B</b> colon / large intestine ;                                                                                                       | <b>2</b>     |
| 4(b)(i)   | stomach ;<br><b>any two</b> from<br>stomach has acidic conditions ;<br>pH 2 is acidic ;<br>enzyme only worked in tube 1 / tube 1 was acidic / at the optimum pH ; | <b>max 3</b> |
| 4(b)(ii)  | enzyme will become inactive / destroyed at this temperature ;                                                                                                     | <b>1</b>     |
| 4(b)(iii) | large / protein molecules are broken down ;<br>by the action of an enzyme / acid ;                                                                                | <b>2</b>     |
| 4(b)(iv)  | chewing food (in mouth) ;                                                                                                                                         | <b>1</b>     |

| Question | Answer                                                                                                                     | Marks |
|----------|----------------------------------------------------------------------------------------------------------------------------|-------|
| 5(a)(i)  | distillation ;                                                                                                             | 1     |
| 5(a)(ii) | decrease ;                                                                                                                 | 1     |
| 5(b)     | (filtration)      remove (named) solids ;<br>(chlorination)    kill microbes / bacteria / sterilizes ;                     | 2     |
| 5(c)(i)  | (refinery gas)    bottled gas / heating / cooking ;<br>(gas oil)          diesel fuel / diesel engines / diesel vehicles ; | 2     |
| 5(c)(ii) | compound / molecule containing hydrogen and carbon ;<br>only (C and H);                                                    | 2     |
| 5(d)(i)  | <b>A   F ;</b>                                                                                                             | 1     |
| 5(d)(ii) | <b>B ;</b>                                                                                                                 | 1     |

| Question | Answer                                                                                                                                   | Marks    |
|----------|------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 6(a)     | temperature at which a solid changes to a liquid <i>owtte</i>                                                                            | <b>1</b> |
| 6(b)(i)  | conduction <b>and</b> convection ;                                                                                                       | <b>1</b> |
| 6(b)(ii) | (reduces convection) as no (gas) circulation (possible) <i>owtte</i> ;<br>(reduces conduction) as foam is a bad conductor <i>owtte</i> ; | <b>2</b> |
| 6(c)     | infra-red                                                                                                                                | <b>1</b> |
| 6(d)     | $d = m/V = (1900/2000)$ ;<br>$= 0.95 \text{ (g/cm}^3\text{)}$ ;                                                                          | <b>2</b> |

| Question | Answer                                                                                     | Marks |
|----------|--------------------------------------------------------------------------------------------|-------|
| 7(a)     | transpiration ;                                                                            | 1     |
| 7(b)(i)  | <u>carbon dioxide</u> from the air ;<br>is used in photosynthesis / reacts with water ;    | 2     |
| 7(b)(ii) | by respiration ;<br>carbon dioxide released ;                                              | 2     |
| 7(c)     | <i>rainfall reduced (no mark)</i><br>less water being transpired / evaporated from trees ; | 1     |
| 7(d)     | soil easily eroded ;<br>due to lack of tree roots ;                                        | 2     |

| Question  | Answer                                                                                                                                              | Marks |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 8(a)(i)   | (left) cathode ;<br>(right) anode ;                                                                                                                 | 2     |
| 8(a)(ii)  | orange / brown gas ;                                                                                                                                | 1     |
| 8(b)      | (reduced) oxygen is removed ;                                                                                                                       | 1     |
| 8(c)      | K<br>Ca<br>Mg<br>Cu ;;                                                                                                                              | 2     |
| 8(d)(i)   | any two from<br>heat / increase temperature ;<br>increase surface area of magnesium ;<br>increase concentration of acid ;<br>use / add a catalyst ; | 2     |
| 8(d)(ii)  | magnesium chloride ;                                                                                                                                | 1     |
| 8(d)(iii) | filter / filtration ;                                                                                                                               | 1     |

| Question | Answer                                                                                                                                                                                                                                                                                                                  | Marks    |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 9(a)     |  <p>motor in parallel with headlamps ;</p> <p>variable resistor in motor branch, correct symbol ;</p> <p>switch for headlamps after motor branch, before first headlamp branch ;</p> <p>all wires required for complete circuit ;</p> | <b>4</b> |
| 9(b)     | (decreasing resistance) increases current (so faster motor) ;                                                                                                                                                                                                                                                           | <b>1</b> |
| 9(c)     | <p>in parallel ;</p> <p>the same as ;</p> <p>less than ;</p>                                                                                                                                                                                                                                                            | <b>3</b> |
| 9(d)     | <p>rain / water / damaged insulation / AVP ;</p> <p>protect from rain or water / use of protective cover / sensible suggestion related to hazard identified ;</p>                                                                                                                                                       | <b>2</b> |