Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE **0653/31**

Paper 3 Extended Theory **May/June 2016**

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.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2016 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

1 **(a)** xylem ;
phloem ;
upwards and downwards ;
transpiration ; [4]

(b) **(i)** *parts of cell in their order*
1 cell wall ;
gives the cell shape / support ;
2 (large) vacuole ;
for support / storage of water / sugar / other correct nutrients ; [4]

(ii) no chloroplasts present ;
ref. to no requirement for photosynthesis ; [2]

2 **(a)** **(i)** gas syringe / measuring cylinder of water inverted over water ;
delivery tube with bung from conical flask to gas syringe / measuring cylinder ; [2]

(ii) particles become less crowded / less concentrated / fewer particles ;
less frequent collisions / less chance of collision ; [2]

(b) $2HCl + CaCO_3 \rightarrow (CaCl_2 +) CO_2 + H_2O$
formulae correct ;
balanced dependent on correct formulae ; [2]

(c) limewater ;
milky / white precipitate ; [2]

(d) nitric acid ;
sodium carbonate / oxide / hydroxide ; [2]

3 **(a)** **(i)** curved line / not a straight line ; [1]

(ii) idea that gradient of graph = acceleration /
acceleration = change in speed ÷ 2 (or other suitable) / = 4.25 / 4.3 (m/s^2) ; [2]

(iii) idea that under graph = distance travelled ;
$(\frac{1}{2} \times 2 \times 8.5) + (10 \times 8.5)$ 93.5 (m) ; [2]

(b) convex lens drawn across front of camera where rays change direction and
labelled correctly ; [1]

(c) **(i)** K.E. = $\frac{1}{2} mv^2$;
$\frac{1}{2} \times 10 \times 8.5 \times 8.5 = 361 / 361.25$ (J) ; [2]

(ii) no energy is actually lost / destroyed / owtte ;
some energy transformed to thermal (heat) / sound ; [2]

4 **(a)** **(i)** **B** and **C** (in either order) ; [1]

(ii) aorta ; [1]

(iii) (high pressure needed) to send blood to the body ; [1]

(b) thick wall ;
to withstand high pressure (of blood) ;
or
elastic fibres in wall ;
to allow recoil / propel blood through the artery ; [2]

(c) **(i)** to supply oxygen / glucose to the heart muscle ; [1]

(ii) plaque / cholesterol / fatty deposits ; [1]

(iii) smoking ;
fatty diet ;
lack of exercise ; [max 2]

5 **(a)** **(i)** **U** ;

(ii) **P** ; [2]

(b) **(i)** **A** / **D** ; [1]

(ii) **C** ;
(contains a) double bond / unsaturated ; [2]

(iii) they are compounds / not (single) elements ; [1]

(c) four shared pairs shown ; [1]

(d) **(i)** more (fossil) fuels burned / increased numbers of vehicles /
references to increasing deforestation / slash and burn / other correct ; [1]

(ii) global warming / runaway greenhouse effect / any relevant negative consequence ; [1]

6 **(a)** mass ;
density ; [2]

(b) thermometer scale goes below the freezing point of water / 0 °C / goes down to negative values ; [1]

(c) (i) infrared ;
adjacent to microwaves ; [2]

(ii) all e / m waves / radiations travel at same speed (in a vacuum) ; [1]

(iii) paint bulb black / focus or reflect radiation onto bulb ; *owtte* [1]

7 (a) ideas of:
food chain **A** has two trophic levels / **B** has three ;
energy is always lost between trophic levels ; [2]

(b) less energy needed / reduces energy wasted ;
by respiration ;
by movement ;
by maintaining body temperature ; [max 2]

(c) (i) run off from rain / accidental spillage ; [1]

(ii) (surface plants / named example) grow rapidly / reference to algal bloom ;
(plants lower in lake / named example) die ;
due to lack of light / inability to photosynthesise ; [3]

8 (a) (i) 2, 8, 1 ; [1]

(ii) (any) oil / paraffin ;
Rb is very reactive / prevents reaction with oxygen / water ; [2]

(iii) rubidium / Rb and chlorine / Cl_2 ; [1]

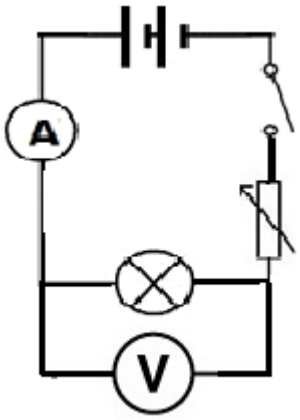
(b) (i) temperature increase ; [1]

(ii) +1 / Li^+ ;
–2 / O^{2-} ;
electron(s) transfer / lost from lithium (atoms) to oxygen (atoms) ; [3]

9 (a) (i) variable resistor / resistance / rheostat ; [1]

(ii) to change the current in / p.d. across the lamp / owtte ;
to change the resistance in the (main) circuit ;
(in any order) [2]

(b)



voltmeter correctly connected in parallel with lamp only ;
other components all in series ;
[accept equivalent circuits, variable resistor in any position other than in parallel with voltmeter] [2]

(c) (i) (R =) V / I ;
= 6 / 3 = 2 (Ω) ; [2]

(ii) R increases with p.d. / current ;
description of non-uniform increase ; [2]