



**Cambridge International Examinations**  
Cambridge International General Certificate of Secondary Education

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**COMBINED SCIENCE**

**0653/31**

Paper 3 Extended Theory

**May/June 2016**

MARK SCHEME

Maximum Mark: 80

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**Published**

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- 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)  $2\text{HCl} + \text{CaCO}_3 \rightarrow (\text{CaCl}_2 +) \text{CO}_2 + \text{H}_2\text{O}$   
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  $\div$  2 (or other suitable) = 4.25 / 4.3 ( $\text{m/s}^2$ ) ; [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)  $\text{K.E.} = \frac{1}{2} m v^2$  ;  
 $\frac{1}{2} \times 10 \times 8.5 \times 8.5 = 361 / 361.25$  (J) ; [2]
- (ii) no energy is actually lost / destroyed / owtte ;  
some energy transformed to thermal (heat) / sound ; [2]

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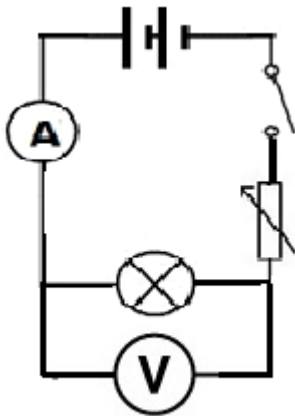
- 4 (a) (i) B and C (in either order) ; [1]
- (ii) aorta ; [1]
- (iii) (high pressure needed) to send blood to the body ; [1]
- (b) thick wall ;  
to withstand high pressure (of blood) ;  
*or*  
elastic fibres in wall ;  
to allow recoil / propel blood through the artery ; [2]
- (c) (i) to supply oxygen / 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]

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- (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]

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(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)  $(R =) V/I ;$   
 $= 6/3 = 2 (\Omega) ;$

[2]

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

[2]