

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

Cambridge International General Certificate of Secondary Education

## **MARK SCHEME for the May/June 2015 series**

### **0653 COMBINED SCIENCE**

**0653/33**

Paper 3 (Extended Theory), maximum raw mark 80

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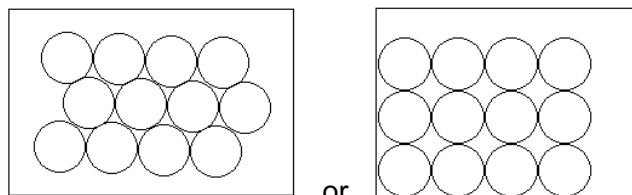
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- 1 (a) (i) shared pair of electrons ;  
hydrogen atoms labelled and no other electrons ; [2]
- (ii) ref. to the sharing of electrons/the idea that nuclei attracted to the  
electrons/opposite charges attract ; [1]
- (iii)  $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$   
formulae ; balanced ; [2]
- (iv) chemical (potential) to heat/thermal ; [1]
- (b) full outer electron shell ;  
so, unreactive (with oxygen)/ not flammable ; [2]
- 2 (a) (i) label line and letter **C** showing the nucleus ;  
label line and letter **R** showing the cytoplasm ; [2]
- (ii)  $\text{O}_2$  and  $\text{H}_2\text{O}$  in correct places ;  
equation correctly balanced ; [2]
- (b) (i)  $(830 + 670 = ) 1500 \text{ kJ}$  ; [1]
- (ii) cycling and swimming ;  
needs 1680 kJ/greater amount of energy needed ; [2]
- (iii) carry more oxygen / oxygen more quickly (to muscle cells) ;  
carry more glucose / glucose more quickly (to muscle cells) ;  
reference to respiration/energy release (in muscle cells) ;  
carry more carbon dioxide / carbon dioxide more quickly (from muscle cells) ; [max 2]
- (iv) activities may be done at a faster / slower rate ;  
avp ; [1]
- 3 (a) **A to B**: accelerating / going faster ;  
**B to C**: constant speed ; [2]
- (b)  $\frac{1}{2} \times \text{base} \times \text{height} / \frac{1}{2} \times 10 \times 25$  ;  
(squares counted allowed)  
 $= 125 \text{ (m)}$  ; [2]
- (c) (acceleration =) change in speed  $\div$  time ;  
 $= -25 / 10 = -2.5$  (accept 2.5) ;  
 $\text{m/s}^2$  ; [3]

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(d)



(at least 12 circles in total with approximately uniform diameter)  
 diagram must show a regular arrangement ;  
 most circles touching ;

[2]

- 4 (a) (i) named indicator / pH meter ;  
 correct colour change / pH value < 7 ; [2]
- (ii) calcium chloride ;  
 water ; [2]
- (b) (i) rate increases ; [1]
- (ii) reference to particles moving (not vibrating) faster / gaining kinetic energy ;  
 rate of collision / collision frequency increases ;  
 the chance of reaction / reactive collisions is increased ; [max 2]  
 (allow correct reference to increased energy of collision)
- (c) (i) (increasing) combustion of fossil fuels / named fossil fuel ; [1]
- (ii) global warming / increased greenhouse effect /  
 consequence of global warming described e.g. rising sea level /  
 climate change / examples of extreme weather events ; [1]
- 5 (a) (i) arrow tail shown on any anther ;  
 arrow head on any stigma on the other flower ; [2]  
 (allow 1 if the arrow links the correct structures but in reverse)
- (ii) anthers hanging outside the flower ;  
 stigma hanging outside the floret / flower ;  
 stigma feathery / has large surface area ; [max 2]
- (b) (i) germination took place in dish 1 and did not take place in dish 3  
 (because it was too cold in dish 3) ; [1]
- (ii) germination took place in dish 1 but not dish 4 ; [1]  
 (because it was too acidic in dish 4)
- (iii) oxygen ; [1]
- (iv) enzymes do not work / are not active ;  
 acidity too high / pH too low ;  
 ref. to denaturation / active site destroyed / shape of molecule changed ; [max 2]

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- 6 (a) (i) harp ; [1]  
(ii) harp ; [1]
- (b) frequency below the lower limit of hearing / owtte ; [1]
- (c)  $(\lambda =) v/f$  ;  
 $(\lambda =) 330 \div 1000 = 0.33 (m)$  ; [2]

(d)

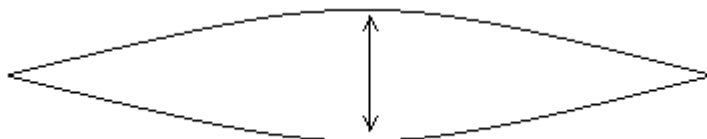


diagram illustrates a string vibrating after being plucked ;  
vibrating string collides with air molecules / implication that sound / the wave  
requires a medium to travel ;  
producing compressions and rarefactions in air / longitudinal waves /  
pressure waves ; [3]

- 7 (a) (i) high temperature ;  
catalyst ;  
high pressure ; [max 2]
- (ii) molecules of **X** and **Y** are smaller than molecules of **D** / ora ; [1]
- (iii) **X** has no effect on bromine solution and **Y** decolourises bromine solution ; [1]
- (b) two Cs in each ;  
single C-C bond in ethane and double C=C bond in ethene ;  
all else correct ; [3]
- (c) (i) opposite charges attract / the ions are negative / have the opposite charge ; [1]
- (ii) electrons move from bromide ions to the anode ;  
(allow bromide ions are oxidised) [1]

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8 (a) (i)  $400/21\,000 \times 100 = 1.9$  ;  
 $100 - 1.9 = 98.1$  ; [2]

(ii) traps / captures light energy ;  
 converts it to chemical energy / enables formation of glucose / starch /  
 cellulose / other correct biological substance ; [2]

(b) (i) excretion / urine ;  
 faeces ;  
 not all parts of grass digested / absorbed ; [max 2]

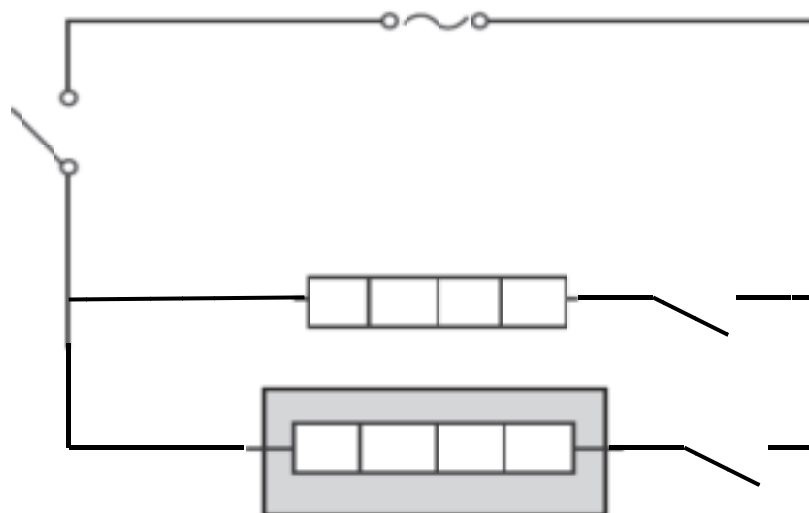
(ii) break down dead zebra / waste materials from zebra ;  
 which releases chemicals ;  
 example of recycled chemical substance ; [max 2]

9 (a) (i) convection ; [1]

(ii) warm air rises ;  
 warm air is less dense ; [2]  
 (ora)

(iii) description of thermal insulation / lagging ; [1]

(b)



switches in both heater branches (can be either side of heater) ;  
 rest of circuit completed properly ; [2]

(c) (i) (p.d. =) current  $\times$  resistance /  $I \times R$  ;  
 $= 30 \times 8 = 240$  ;  
 V ; [3]

(ii) (power =)  $4 \times 240 = 960$  (W) ; (allow e.c.f. from (c)(i) ) [1]