

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the May/June 2015 series

0653 COMBINED SCIENCE

0653/31

Paper 3 (Extended Theory), maximum raw mark 80

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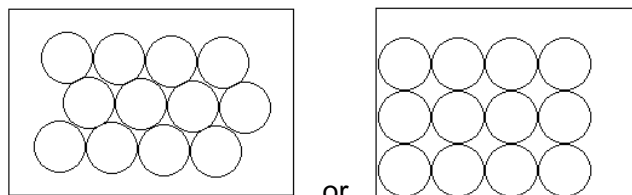
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- 1 (a) (i) shared pair of electrons ;
hydrogen atoms labelled and no other electrons ; [2]
- (ii) ref. to the sharing of electrons / the idea that nuclei attracted to the
electrons / opposite charges attract ; [1]
- (iii) $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$
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) O_2 and H_2O 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) ;
 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)

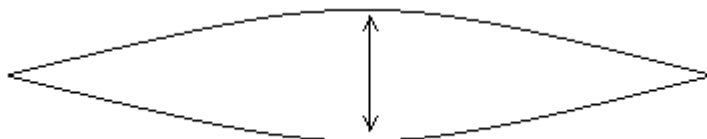


diagram illustrates a string vibrating after being plucked ;
vibrating string collides with air molecules / implication that sound / the wave
requires a medium to travel ;
producing compressions and rarefactions in air / longitudinal waves /
pressure waves ; [3]

- 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]

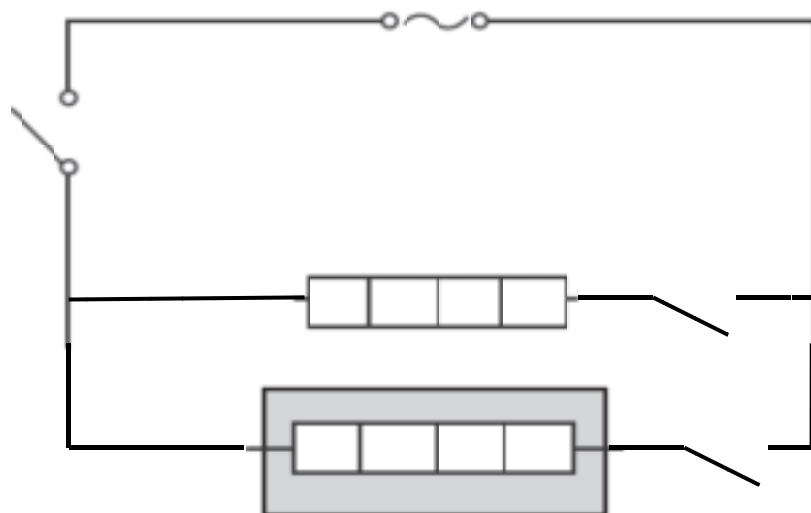
(ii) break down dead zebra/waste materials from zebra ;
 which releases chemicals ;
 example of recycled chemical substance ; [max 2]

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]