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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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) $2H_2 + O_2 \rightarrow 2H_2O$
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 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) ½ × base × height / ½ × 10 × 25 ;
(squares counted allowed)
= 125 (m) ;　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　[2]

(c) (acceleration =) change in speed ÷ time ;
= − 25 / 10 = − 2.5 (accept 2.5) ;
m/s^2 ;　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　[3]

(d)
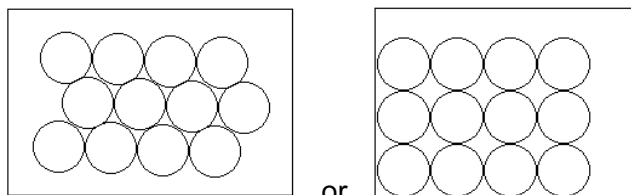
or

(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]

6 (a) (i) harp ; [1]

(ii) harp ; [1]

(b) frequency below the lower limit of hearing / owtte ; [1]

(c) (λ =) v/f ;
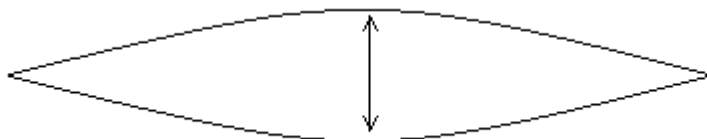(λ =) 330 ÷ 1000 = 0.33 (m) ; [2]

(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 ; [1]
(allow bromide ions are oxidised)

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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 <u>chemical</u> energy / enables formation of glucose / starch /
cellulose / other correct biological substance ; [2]

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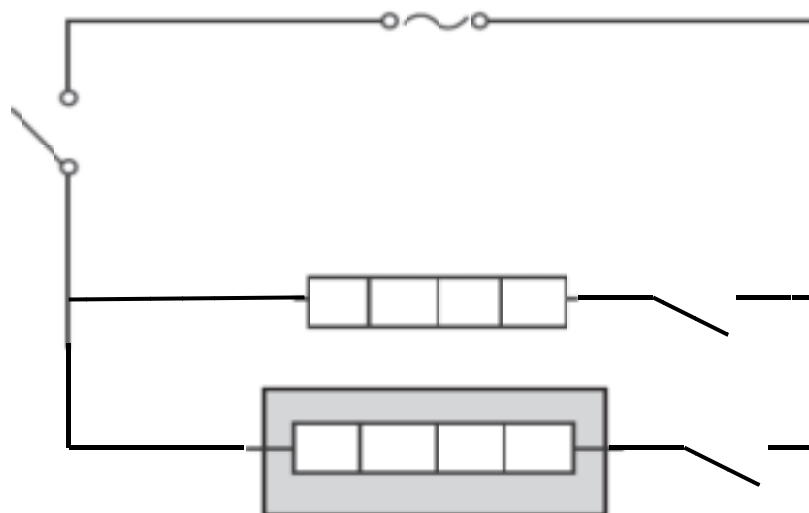not all parts of grass digested / absorbed ; [max 2]

(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 × 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]

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