CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2014 series

0653 COMBINED SCIENCE

0653/32 Paper 3 (Extended Theory), maximum raw mark 80

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.

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CAMBRIDGE
International Examinations

1 **(a)** iron oxide
carbon
oxygen
calcium carbonate ;;
(*1 mark for 2 or 3 correct, 2 marks for 4 correct*) [2]

(b) **(i)** carbon dioxide ; [1]

(ii) iron (oxide loses oxygen) and is reduced ;
carbon (monoxide gains oxygen) and is oxidised ; [2]
(allow correct reference to electron transfer)

(iii) carbon dioxide is a greenhouse gas / <u>increases</u> the greenhouse effect /
reference to global warming ;
description of how greenhouse effect operates ;
the idea that climates could change / example of one consequence of climate change ;
[max 2]

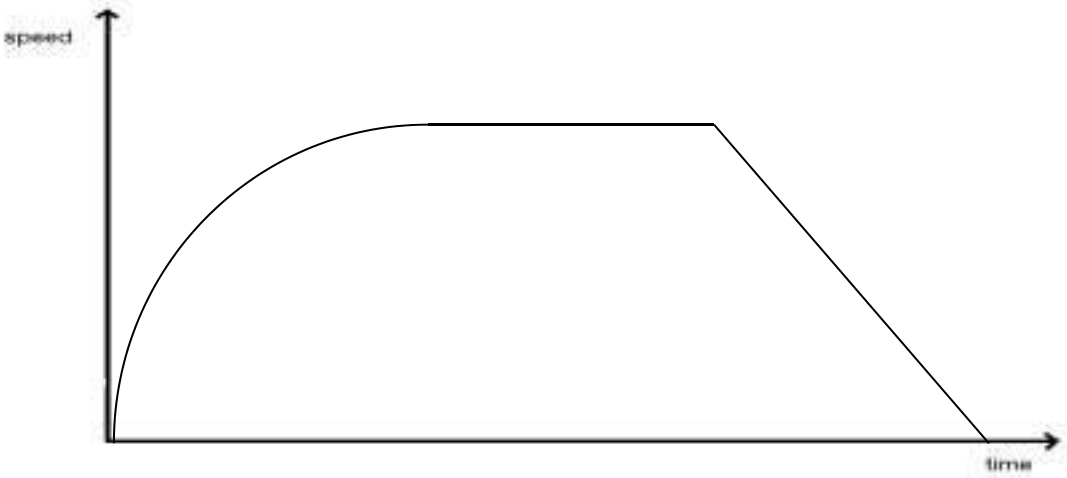
(c) **(i)** brown / pink / copper (coloured) deposit ;
blue colour fades / becomes greener ;
temperature increase / change ; [max 2]

(ii) copper ions become atoms ;
iron atoms became ions ;
(reaction occurs) because iron higher in reactivity series than copper ; [max 2]

[Total: 11]

2 **(a)** 135 km / hr = 135 000 m / hr ;
135 000 m / hr = 135 000 / 60 × 60 m / s = **37.5** (m / s) ; [2]

(b)



curved line from origin to level out at horizontal (allow any reasonable shape of curve) ;
horizontal line in middle of graph ;
straight line descending to meet time axis ; [3]

(c) **(i)** (stage 1 / first 500 m) no mark
reference to acceleration occurring (in this stage) / acceleration requires a resultant / unbalanced (driving) force ; [1]

(ii) chemical (potential) energy in the rider ;
kinetic energy of the bicycle and rider ;
heat / thermal / sound energy during braking ; [max 2]
(*2 marks for 3 correct, 1 mark for 2 correct*)

[Total: 8]

3 **(a)** **A** trachea ;
B bronchiole ; [2]

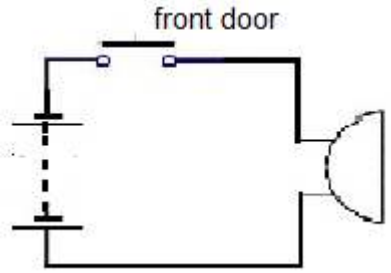
(b) large surface (area) ;
thin cells in alveoli (and blood capillaries) ;
good blood supply ; [max 2]

(c) **(i)** 0.5 (dm^3) ;
42 (dm^3) ; [2]

(ii) faster rate of respiration ;
for muscle contraction ;
more oxygen needed / oxygen needed more quickly ;
need to get rid of more carbon dioxide /
need to remove carbon dioxide more quickly ; [max 3]

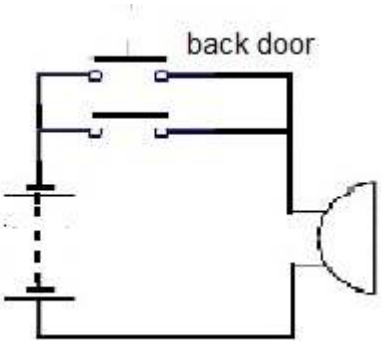
[Total: 9]

4 (a) (i)



correct use of circuit symbols ;
complete functioning circuit ; [2]

(ii)



correctly placed second switch in parallel to first switch ; [1]

(b) (i) number of vibrations per unit time ; [1]

(ii) v = fλ / (λ =) v/f ;
= 330 / 400 = **0.825 / 0.83** (m) ; [2]

(c) (i) (R =) V / I ;
= 4 × 1.5 / 2 = **3** ;
ohms / Ω ; [3]

(ii) (E =) V I t / I^2 R t;
= 6 × 2 × 10 / 2^2 × 3 × 10 = **120** ;
joules / J ; [3]

[Total: 12]

5 (a) (i)

	in nucleus	outside nucleus
number of protons	14	0 / blank
number of neutrons	14	0 / blank
number of electrons	0 / blank	14

1 mark for each column ;; [2]

(ii) 4 ;
number of electrons in outer shell shown by group number / owtte ; [2]

(b) (i) 4 shared pairs ;
atoms correctly labelled with symbols ;
(max 1 mark if valence electrons ≠ 8) [2]

(ii) $CH_4 + 2O_2 \rightarrow CO_2 + 2\ H_2O$
all correct formulae ;
then correctly balanced ; [2]

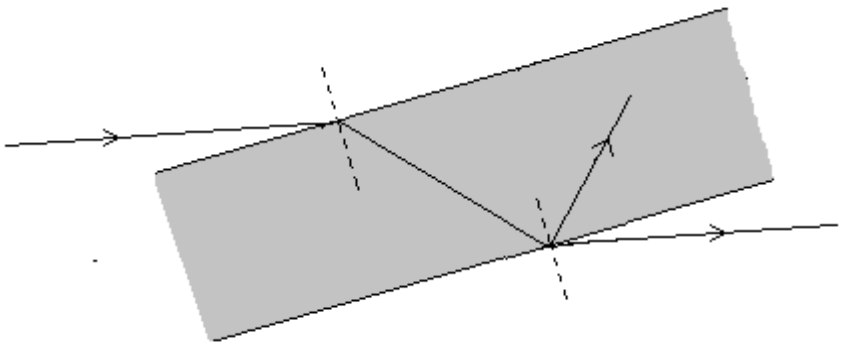
[Total: 6]

6 (a) (i) infra-red ; [1]

(ii) good absorber (of radiation) ; [1]

(b) molecules / particles move faster / gain more (kinetic) energy ;
faster /more energetic molecules escape (from liquid) / evaporate ; [2]

(c)



refracted emergent ray bent away from normal ;
angle of reflection equal to angle of incidence (by inspection) ;
emergent ray parallel to original incident ray (by inspection) ; [3]

[Total: 7]

7 **(a)** phototropism ; [1]

(b) **(i)** auxins move across stem / move to shaded side ;
cause cell elongation (on shaded side) ;
more growth on shaded side / reference to differential growth (between lit and shaded sides) ; [3]

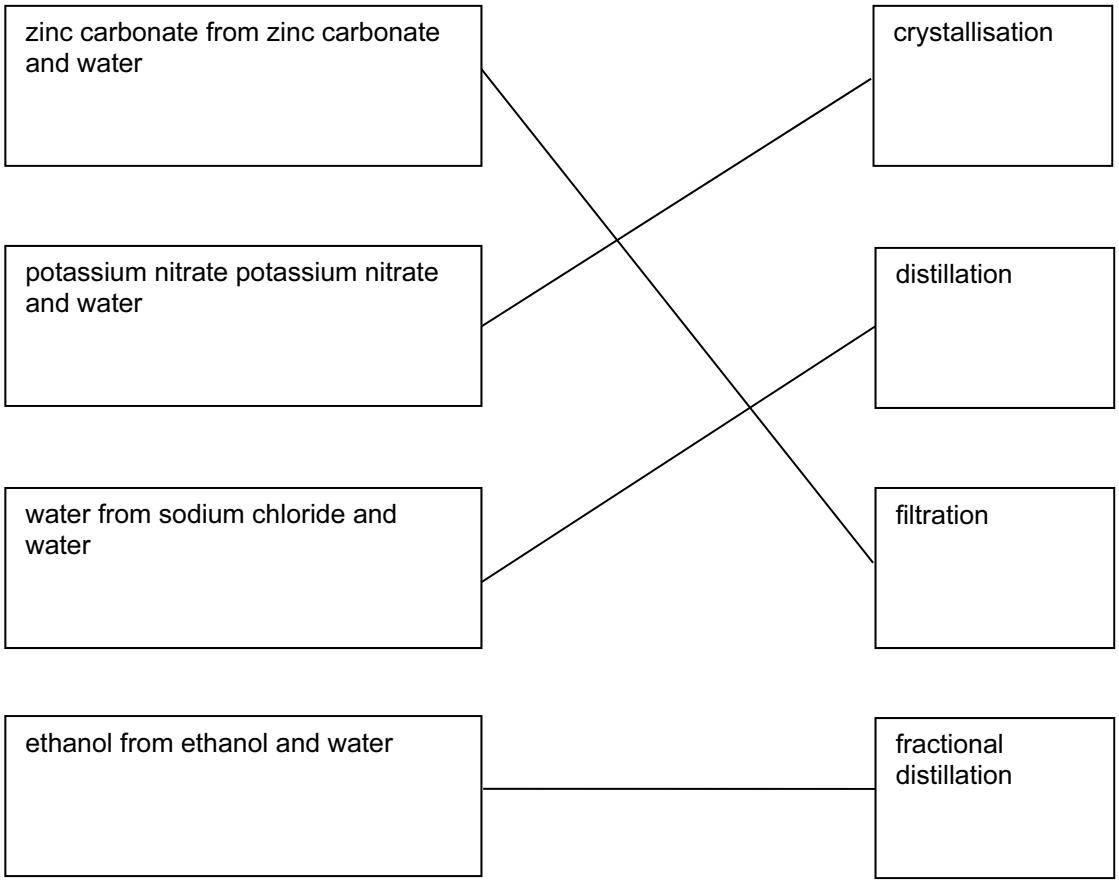
(ii) auxins cannot move back from tip / through plastic ; [1]

(iii) growth is less in the absence of light / owtte ;
auxins prevented from moving on one side / auxins cannot reach the right side / owtte ; [2]

(c) increase in blood glucose ;
increase in pulse / heart rate / blood pressure ;
for increased metabolic activity / rate of respiration ; [max 2]

[Total: 9]

8 **(a)**



all correct 2 marks, 3 or 2 correct 1 mark ;; [2]

(b) (i) (marks may be awarded from a combination of words with a clear diagram)
solutions spotted on / added to (chromatography) paper / the line / origin ;
paper suspended in water / solvent with spots above the solvent ;
spots move up the paper (with the water/solvent) / reference to distance moved related to solubility ; [3]

(ii) **A** and **C** ; [1]

(iii) both produce spots at same position as dye **X** / owtte ; [1]

[Total: 7]

9 (a) (i) burning / combustion of (fossil) fuels / burning material that produces sulfur / nitrogen oxides ; [1]

(ii) acid gases carried by the wind ;
react with / dissolve in (rain) water (to form acid rain) ;
(acid) rain falls on land/river / drains into river ; [max 2]

(b) (i) rate of water flow into the river may vary ;
variation in amount and location of rainfall ;
variation in factory working / energy requirements ;
variation in wind speed and direction ;
may get pollutants from other sources (which themselves change pH) ; [max 2]
(marks can also be awarded for other valid reasons)

(ii) 3 ;
all animals needing a higher pH than 4.5 would not survive ; [2]

(iii) enzymes will not function as well / will not be at optimum ;
enzymes may be denatured / simple description of denaturation in terms of molecular shape change ; [2]

[Total: 9]