UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2009 question paper for the guidance of teachers

0653 COMBINED SCIENCE

0653/03 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.

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1 (a) (i) label to palisade cell ;

(ii) for photosynthesis ;
(in which) water is combined with carbon dioxide ;
to provide turgor / support ; [max 2]

(b) (i) xylem / vessel ; [1]

(ii) osmosis ; [1]

(c) (i) increase in temperature increases, (rate of) transpiration / water loss ;
particles move faster / have more kinetic energy ;
diffusion faster ;
evaporation faster ; [max 3]

(ii) temperature increase increases, rate / amount, of water drawn up ;
transpiration reduces, pressure / water potential (at top of plant) ;
water moves up plant down, pressure / water potential, gradient ; [max 2]

[Total: 10]

2 (a) [**D C A B**]
D first and **B** last ;
C and **A** right way round ; [2]

(b) alpha radiation completely absorbed by paper ; [1]

(c) (i) polonium(–210) ;
longest half-life / decays most slowly ; [2]

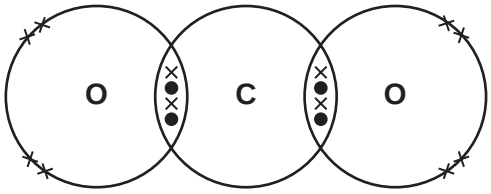
(ii) polonium(–210) and/or radon(–222) ;
emits alpha radiation / alpha radiation is most ionising ; [2]

[Total: 7]

3 (a) (i) elements contain only one type of atom / H_2 shows only H atoms bonded ;
compounds contain different atoms bonded / are made of more than one element ;
example quoted e.g. CO_2 contains carbon and oxygen ;

(ii) **A** releases more sulfur dioxide;
sulfur dioxide dissolves in / reacts with water ;
to form acid rain ;
more sulfur dioxide and less water from **A** compared to **B** so potentially acid much more concentrated ;
negligible amounts of sulfur dioxide from **C** / **C** releases mainly water ; [max 3]

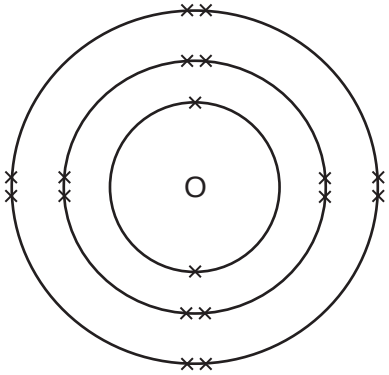
(b) (i)



shared electrons ;
lone pairs / four other electrons in both Os ; [2]

(ii) *32 + (16 × 2)*
64 ; [1]

(c)



18 electrons;
arranged as shown ; [2]

[Total: 10]

4 (a) (i) sugar / maltose ;

(ii) small intestine / duodenum ;

(b) (i) person with only one copy still produces amylase ; [1]

(ii) cannot digest starch / cannot produce sugar from starch ;
cannot absorb, starch / sugar / glucose ;
into the blood ;
cells / body, do not get sugar ;
cannot use (starch / sugar) for respiration ; [max 3]

(iii) phenotypes of parents produces amylase produces amylase

genotypes of parents Aa .....**Aa**.....

gametes A and a A and a

gametes from one parent

gametes from other parent	A	a
A	AA	Aa
a	Aa	**aa**

second parent shown as **Aa** ;
all gametes correct ;
all offspring genotypes correct ;
aa offspring identified as not producing amylase ; [4]

[Total: 10]

5 **(a)** **(i)** effervescence / gas given off / fizzing ;

(ii) **Y** is coloured / green ;

(b) **(i)** copper carbonate → copper oxide + carbon dioxide ; [1]

(ii) carbon / C ; [1]

(iii) $2CuO + C \rightarrow 2Cu + CO_2$
(symbols C and CO_2 ; then balanced ;) [2]

(iv) (gain)
because copper ions are positively charged ;
and so must gain negative charges / electrons, to be neutralised / discharged /
because atoms are not charged / owtte ; [2]

(c) **(i)** (dilute) sulfuric acid ; [1]

(ii) allow more reactive metals except alkali metals ;
e.g. Ca Mg A*l* Zn Fe [1]

(iii) displacement / redox / reduction / oxidation ; [1]

(iv) because the metal from **(i)** is more reactive than copper /
or statements which imply it e.g. magnesium is able to "take" sulfate from copper ; [1]

[Total: 12]

6 **(a)** **(i)** 15 s ; [1]

(ii) 30 s ; [1]

(iii) C to D and G to H / 60 s to 80 s and 140 s to 160 s ; [1]

(iv) 300 + 600 + 200 ;
= 1100 m ; [2]

(b) constant speed / no acceleration ;
balanced forces / equal and opposite forces / total force is zero ; [2]

(c) centre of mass high ;
narrow, base / tyre / wheel ;
easy to move so centre of mass not over base ;
weight produces turning force ; [max 3]

(d) $1 / R = 1 / R_1 + 1 / R_2$;
substitution and working ;
resistance = 0.67 Ω [3]

[Total: 13]

7 **(a)** **(i)** *[increase (soil erosion)]*
soil not protected from rain by leaves ;
soil not held by roots ;
easily washed away / more run-off ; (ignore wind) [max

(ii) *[decrease (species diversity)]*
loss of habitats ; (not 'homes')
loss of particular food supplies / disrupts food chains ;
more hunting (by humans) ; [max 2]

(b) **(i)** other animals might be harmed by the poison ;
poison may accumulate up the food chain ;
poison needs to be put down repeatedly ;
not all rats will eat poison ;
rats may develop resistance ; [max 2]

(ii) owls will not kill all the rats / owls may eat other species / owls may harm other species ; [1]

[Total: 7]

8 **(a)** conduction ; [1]

(b) (density =) mass / volume ;
use of 200 ;
2.7 g / cm^3 ; [3]

(c) immerse in water ;
measure <u>volume</u> of water displaced ; [2]

[Total: 6]

9 **(a)** two correct displayed formulae of ethene ;
segment of poly(ethene) molecule showing (at least) four carbon atoms with single bonds and at least eight hydrogen atoms ;
result is a (very) long chain / spare bonds at each end on diagram ; [3]

(b) orange solution decolourised ;
ref. to, double bonds (in ethene) / unsaturated compounds ; [2]

[Total: 5]