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

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UNIVERSITY of CAMBRIDGE
International Examinations

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

(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]

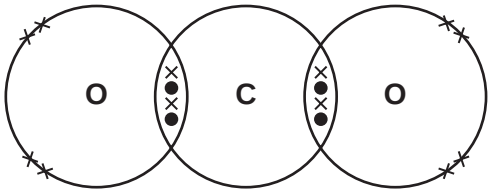
(ii) polonium(–210) and/or radon(–222) ;
emits alpha radiation / alpha radiation is most ionising ; [2]

[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 ; [2]

(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]

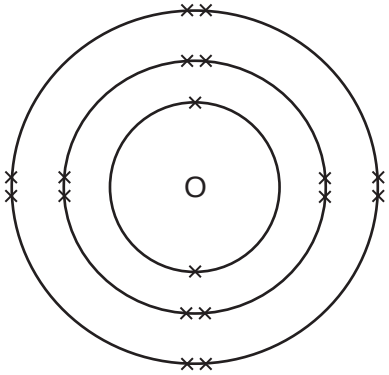
(b) (i)



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 ; [1]

(ii) small intestine / duodenum ; [1]

(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 ; [1]

(ii) **Y** is coloured / green ; [1]

(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 2]

(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]