UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2008 question paper

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.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

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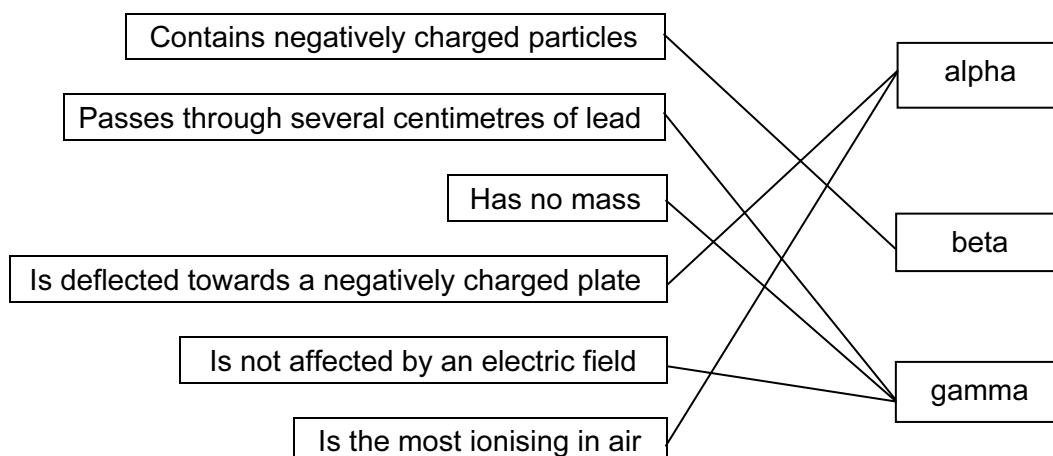
1 (a) chlorophyll
chloroplast
(cell) wall
cell membrane
two correct for one mark; [2]

(b) (i) at least two more rectangles drawn, in a line and connected; [1]

(ii) (damages) phloem (vessels)/sieve tubes; *no mark if xylem is also referred to*
through which sugar is transported;
root cells cannot make their own, sugar/carbohydrate/glucose/sucrose; [max 2]

(c) (i) asexual/vegetative; [1]

(ii) can reproduce without a partner;
so reproduction possible even if few other plants around;

offspring are <u>genetically</u> identical to parent/clones;
so if parent is adapted to environment they will be as well;

young plants already have roots;
so have a better chance of survival than a germinating seedling; [max 3]

(d) transpiration/water loss from leaves/evaporation;
water vapour diffuses out of leaves;
water drawn up through xylem vessels;

also allow other functions, e.g.
form pitchers; to trap insects for nitrogen source;
produce tendrils; for climbing;
store food; as starch/other named;
store water; in dry environment;
excretion; loss of named waste product;
respiration; release energy from glucose; *not 'produce' energy* [max 2]

[Total: 11]

2 (a)

Contains negatively charged particles		alpha
Passes through several centimetres of lead		
Has no mass		beta
Is deflected towards a negatively charged plate		
Is not affected by an electric field		gamma
Is the most ionising in air		

any two correct for one mark;; [3]

(b) a form of an element with same number of protons/atomic number;
different number of neutrons/different mass number; [2]

(c) ionising/destroys cells; [1]

(d) (i) 10 minutes; [1]

(ii) five half lives/working;
50 minutes; *allow ecf* [2]

(e) (i) radiation from sources in the environment; [1]

(ii) 1160 (cpm); [1]

[Total: 11]

3 (a) (i) gasoline or petrol/diesel/fuel oil/propane/butane/naphtha; [1]

(ii) different boiling points/intermolecular attractive forces; [1]

(b) O_2;
$20(O_2)$; [2]

(c) a covalent bond;
shared electrons;
two shared pairs of electrons/double bond; [2]

[Total: 6]

4 **(a)** it decreased;
more steeply at first/other description of shape of curve;

(b) burning less fossil fuels;
using better quality fuels/removed S from fuel before burning;
'scrubbers' to clean emissions; [max 2]

(c) they are harmful to human health;
cause breathing problems/named illness;

cause acid rain;

damages buildings;
by reacting with/damaging, limestone;

harms/kills, plants/trees;

acidifies lakes/rivers;
so fish/shellfish cannot live there/harms aquatic organisms; [max 3]

[Total: 7]

5 **(a)** **A** – **B** constant acceleration;
B – **C** constant speed; [2]

(b) total distance covered = area under graph;
(0.5 x 5 x 4) + (40 x 4) + (0.5 x 5 x 4);
= 180m; [3]

[Total: 5]

6 **(a)** **(i)** copper oxide + hydrogen → copper + water; [1]

(ii) appropriate colour change/electrical conductivity; [1]

(b) **(i)** oxide ion has 2 more electrons (than protons)/has gained 2 electrons;
oxygen atom has same number of electrons as protons; [2]

(ii) two;
because copper ion has +2 charge to balance the –2 oxide charge;
and so to discharge the Cu^{2+} ion two electrons are required; [max. 2]

(c) **(i)** copper sulphate/copper(II) sulphate ; *not formula* [1]

(ii) zinc is <u>more reactive than copper</u>; [1]

(iii) zinc (atoms) oxidised;
because electrons are removed/transfer to copper ions; [2]

[Total: 10]

7 (a) one mark per two correct labels;
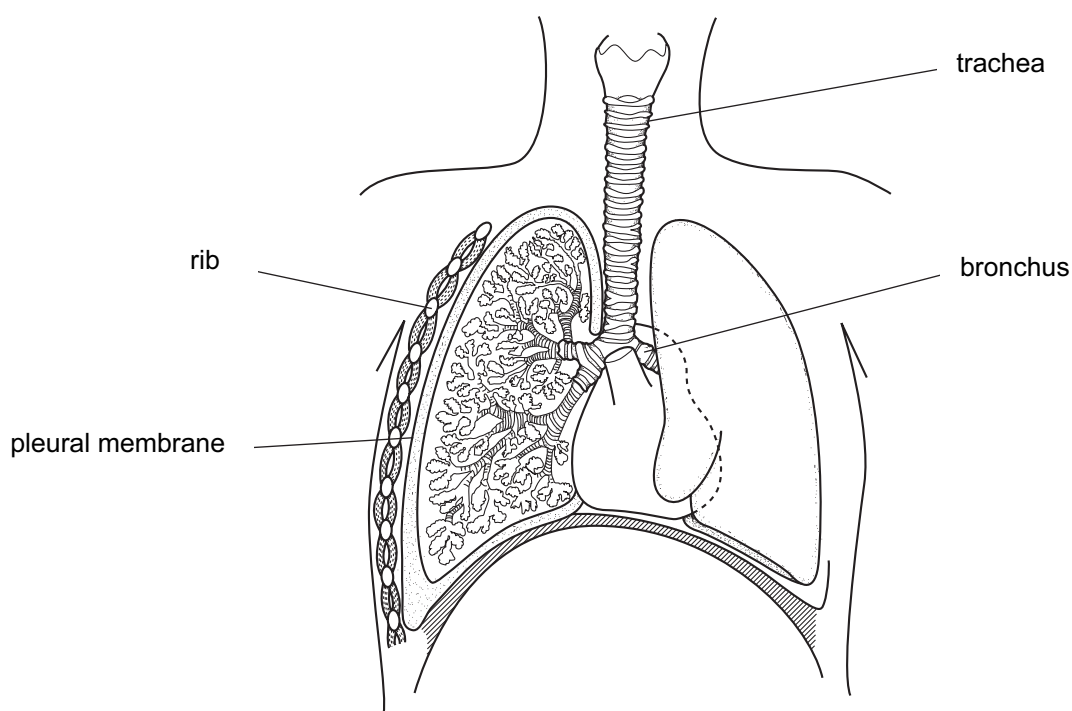
(b) less (surface) area;
for diffusion; [2]

(c) contain haemoglobin;
which combines with oxygen; *ignore 'transports oxygen' as this is in the question.*

no nucleus;
more room for haemoglobin;

(bi)concave;
increases surface area which increases rate of oxygen, uptake/release;

small;
get close to tissues/squeeze through smallest capillaries; [max 3]

(d) respiration;
to release energy; *not to 'produce' energy* [2]

[Total: 9]

8 (a) (i) work done = force x distance;
= 1000 x 2000 = 2000 000 J;

(ii) power = work / time;
= 2000 000 / 100 = 20 000 W; allow J/s   [2]
                                 allow ecf

(b) (i) electromagnetic/transverse;   [1]

(ii) reflection;   [1]

(c) correct formula; $\dfrac{1}{R} = \dfrac{1}{R_1} + \dfrac{1}{R_2}$;

1/R = ¼ + ¼;
R = 2 ohms;   [3]

(d) extension = 12 cm/appropriate working;
(4 x mass =) 200 g;   [2]

                                                       [Total: 11]

9 (a) F C G;
D;   [2]

(b) (i) oxygen/gas/material <u>is given off</u>/<u>leaves the flask</u>;   [1]

(ii) increasing the mass of MnO_2 increases the rate;   [1]

(iii) acts as a catalyst;
catalyst speeds up reaction (without being consumed);

evidence from table:
mass of MnO_2 does not decrease (so is not consumed);
detail which reasonably accounts for effect on rate of increasing amount of catalyst;
ref. decreasing activation energy;   [max 3]

(iv) higher temp means particles move faster; *not vibrate*
so collision frequency increases;
so collision energy increases/hit each other harder;
any correct discussion of activation energy;   [max 2]

(c) 34;   [1]

                                                       [Total: 10]