UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2010 question paper for the guidance of teachers

0654 CO-ORDINATED SCIENCES

0654/23 Paper 2 (Core Theory), maximum raw mark 100

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)** trachea labelled ;
heart labelled ;
bronchiole labelled ;

(b) (right ventricle)
pulmonary artery and pulmonary vein included in the list ;
pulmonary artery comes before pulmonary vein ;
capillaries come between pulmonary artery and pulmonary vein ;
ends in left atrium ; [4]

(c) in red blood cells ;
reference to haemoglobin / oxyhaemoglobin ; [2]

(d) from mother's blood ;
by diffusion ;
through the placenta ;
to fetus, in umbilical cord / through umbilical vein ; [max 3]

[Total: 12]

2 **(a)** **(i)** reactants / electrolyte / anode / cathode used up / no more chemical reaction possible ; [1]

(ii) reference to appropriate size / power / current ; [1]

(b) **(i)** it is a conductor / contains or provides electrolyte ; [1]

(ii) change the type of metal used in electrodes / other correct e.g. change electrode separation or depth / temperature ; [1]

(c) **(i)** gasoline / diesel / petrol (not petroleum) ; [1]

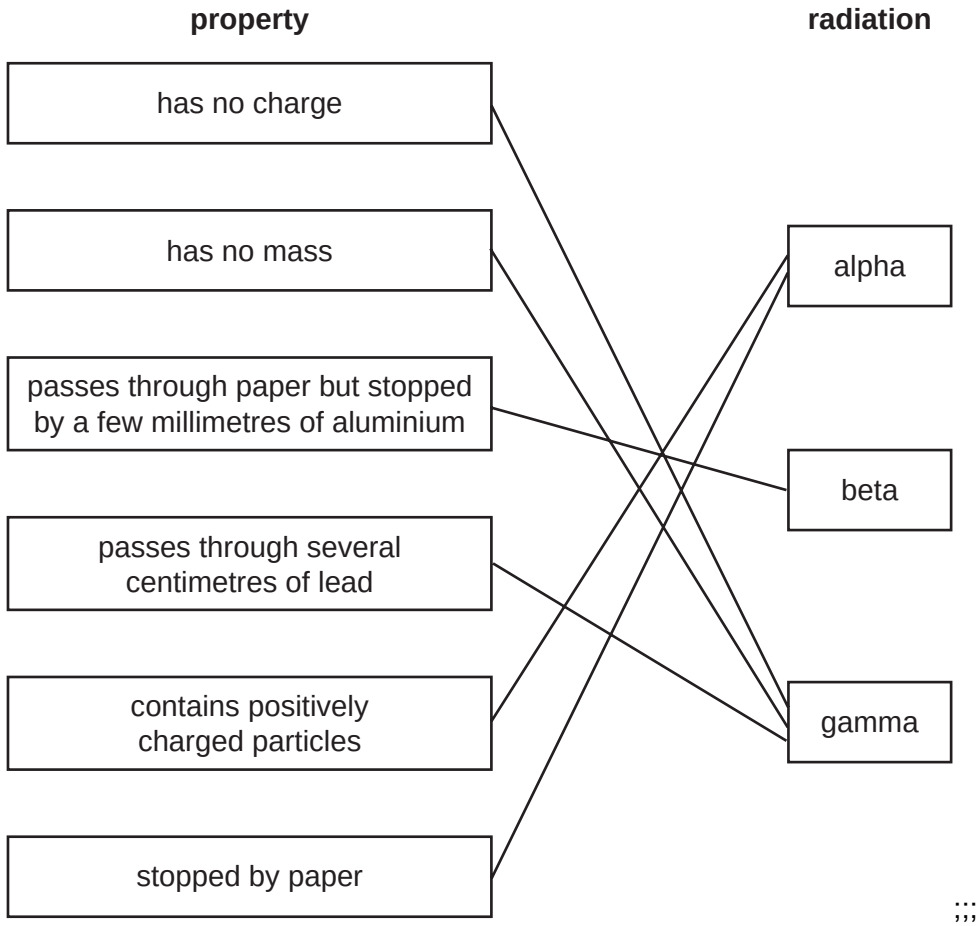
(ii) <u>fractional</u> distillation / fractionation ; [1]

(iii) water ;
carbon dioxide ;
carbon monoxide ; [max 2]
(allow common pollutants e.g. NO_x)

(iv) reference to named pollutant e.g. CO, NO_x, CO_2, SO_2, particulates ;
effect of named pollutant ;
no pollutants produced when normal engine switched off / using electric motor ;
more slow moving traffic in towns so normal engine more likely to be switched off ; [max 3]

[Total: 11]

3 (a)



;;;

(6 correct – 3 marks, 4 correct – 2 marks, 2 correct – 1 mark) [3]

(b) (i) removes electrons / produces ions when it hits atoms ; [1]

(ii) particles are larger / heavier / carry more charge ; [1]

(iii) causes ionisation within cells ;
mutation ;
cancer ;
radiation burns / burns skin ;
damages / kills cells / damages DNA ;
radiation sickness ; [max 2]

[Total: 7]

4 (a) (i) (atmospheric) nitrogen converted into nitrogen compounds / specified nitrogen compound ;

(ii) (nitrogen fixing) bacteria ;
in soil / on root nodules ;
or
atmospheric nitrogen combines with oxygen / nitrogen oxides form ;
in thunderstorms / (using energy) from lightning ;
or
nitrogen combines with hydrogen / converted to ammonia ;
in industry / in Haber process ; [max 2]
(marking points taken from one route only)

(iii) nitrogen too unreactive / too much energy needed to break bonds in nitrogen molecules ; [1]

(b) (i) sugar beet ; [1]

(ii) (86 + 14) × 2.5 = 250 (kg) ; [1]

(c) (i) neutralisation ; [1]

(ii) 16 ; [1]

(iii) add sodium hydroxide solution / strong alkali ;
warm ;
suitable reference to ammonia / alkaline gas produced ; [3]

(d) (i) three or more of the symbols shown linked into chain with continuation bonds shown ; [1]

(ii) carbon, hydrogen, oxygen ; (all required) [1]

[Total: 13]

5 **(a)** **(i)** cells / batteries / power supply, connecting wires, lamp ;
ammeter, voltmeter ;

(ii) (R =) V / I ;
= 1 / 0.6 = 1.67 (ohms) ; [2]

(b) **(i)** power = voltage × current = 25 000 × 50 = 1 250 000 (W) ; [1]

(ii) high voltage means low current ;
energy loss is I^2R owtte ;
less energy lost if current is low ;
can use thinner wires / lighter wires ; [max 3]

(iii) good electrical conductor ;
low density ;
unreactive / does not corrode readily ;
ductile / malleable ; [max 2]

[Total: 10]

6 **(a)** **(i)** nucleus ;
cell wall ; [2]

(ii) blue only ; [1]

(iii) blue only ; [1]

(b) **(i)** something drawn in cytoplasm ;
and the word chloroplast ; [2]

(ii) carbon dioxide ;
and water ;
produce glucose / sugar / starch / carbohydrate, and oxygen ;
(can take all marks from a correct equation) [3]

(iii) provides food ;
for energy / for materials to make new cells ;

provides oxygen ;
for respiration ; [max 3]

[Total: 12]

7 **(a)** **(i)** constant speed ;

(ii) slowing down / decelerating ;

(b) chemical ;
kinetic ; [2]

(c) **(i)** energy needed to turn liquid into gas ;
particles need to separate / overcome forces ;
energy gained from surroundings / heat taken from skin / blood / body ; [max 2]

(ii) shiny foil traps layer of air around body, stops convection ;
air is a good insulator ;
shiny foil is a poor radiator of heat ;
reflects radiation back in ;
heat can still escape by conduction ; [max 3]

[Total: 9]

8 **(a)** **(i)** **ff** ; [1]

(ii) normal / no cystic fibrosis ; [1]

(iii) child would be **ff** ;
so would need an **f** allele from each parent ;
parent with **FF**, cannot provide an **f** allele / can only have **FF** or **Ff** children ;
(take from genetic diagram if clear or explained) [3]

(b) **(i)** digests / breaks down, starch ;
to, maltose / sugar ; [2]

(ii) only small molecules can pass through wall of alimentary canal / be absorbed ;
enzymes / pancreatic juice produce small molecules from large ones / examples ; [2]

[Total: 9]

9 (a) (i) (distance covered in one minute = 18 × 600 =) 1080 (m) ;

(ii) work = F × d ;
1000 × 1080 = 1 080 000 (J) ; (ecf) [

(b) forces are balanced, etc. ; [1]

(c) (i) 0.12 m^2 ; [1]

(ii) (pressure = force / area =) 18 000 / 0.12 = 150 000 (N / m^2) ; (ecf) [1]

(iii) force = pressure × area = 150 000 × 0.01 ;
= 1500 (N) ; [2]

[Total: 8]

10 (a) (i) (**R** and **T**)
same number of outer electrons / both in Group 7 ; [1]

(ii) (**Q** and **S**)
conductors / group 1 or group 2 elements / 1 or 2 electrons in outer shell ; [1]

(iii) (**P** and **T**)
boiling point is below 20 °C / room temperature / at 20 °C they have boiled ; [1]

(b) (i) lose its outer electron / lose one electron ; [1]

(ii) solid ;
it is an ionic compound / giant structure / lattice / (large) attractive forces between ions ;
reference to opposite electrical charges attracting ;
so ions not free to move (independently) / stay together / not enough energy at 20 °C to overcome attractions / separate ions ; [max 3]

(c) (i) (colourless solution) turns orange ; [1]

(ii) chlorine is more reactive than bromine ; [1]

[Total: 9]