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

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UNIVERSITY of CAMBRIDGE
International Examinations

1 **(a)** trachea labelled ;
heart labelled ;
bronchiole labelled ; [3]

(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]

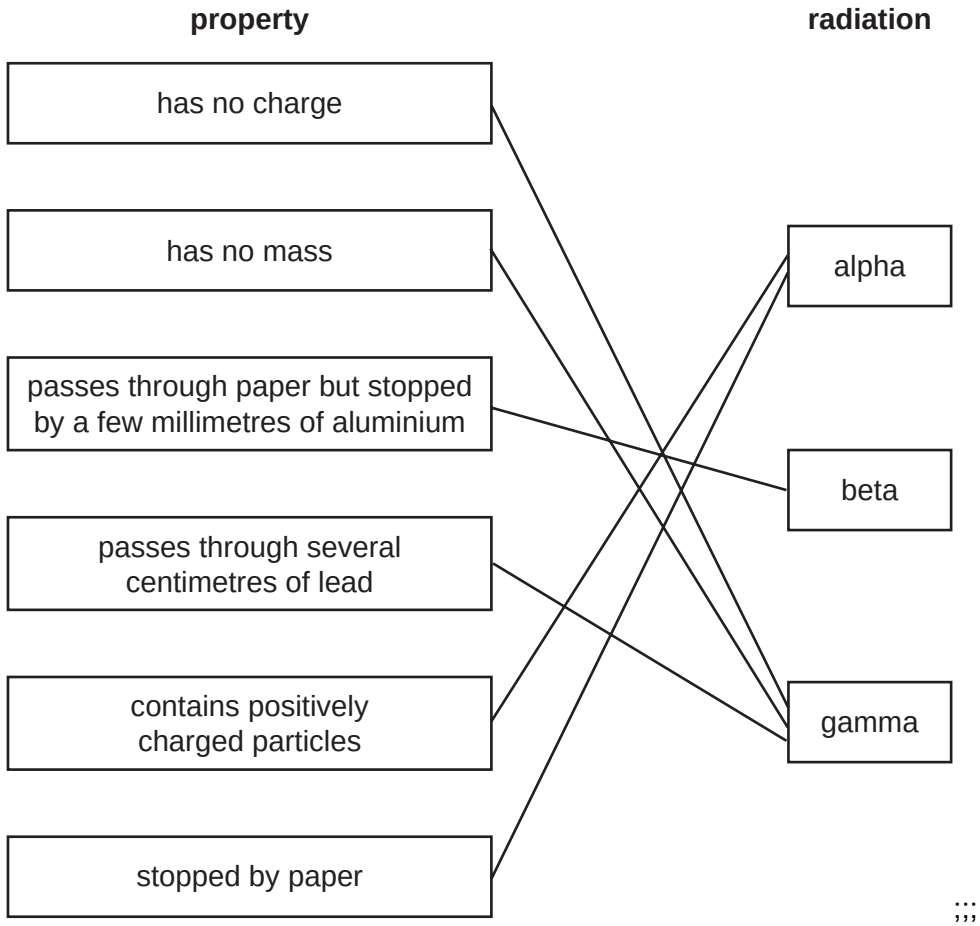
(ii) <u>fractional</u> distillation / fractionation ; [1]

(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 ; [1]

(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 ; [2]

(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 ; [1]

(ii) slowing down / decelerating ; [1]

(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) ; [1]

(ii) work = F × d ;
1000 × 1080 = 1 080 000 (J) ; (ecf) [2]

(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]