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

0654 CO-ORDINATED SCIENCES

0654/02 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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UNIVERSITY of CAMBRIDGE
International Examinations

1 **(a)** **(i)** (electricity into) heat ; [1]

(ii) (electricity into) kinetic energy / electricity into movement ; [1]

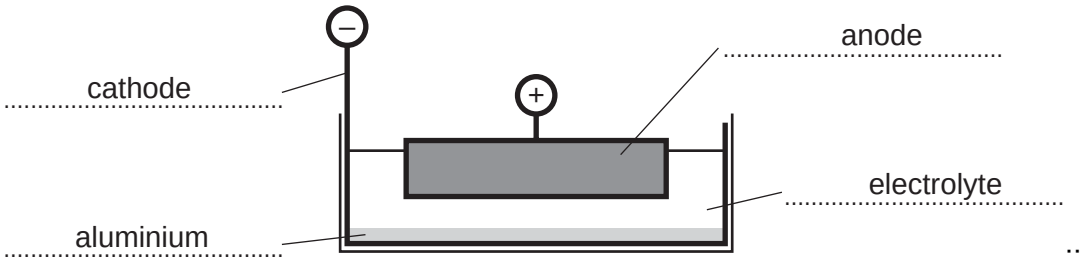
(b) heat ;
high ;
friction ; [3]

[Total: 5]

2 **(a)** 27.8 % ; [1]

(b) oxidation is addition of oxygen / bonding with oxygen / reduction is removal of oxygen ;
e.g. silicon (dioxide) is reduced because oxygen is removed / carbon is oxidised because it joins with oxygen ; [2]

(c)



;;

all correct = 2 marks, 2 correct = 1 mark [2]

(d) **(i)** weathering / erosion / transportation ; [1]

(ii) colloid / sol ; [1]

(iii) heated to a high temperature / it is fired ; [1]

[Total: 8]

3 **(a)** **(i)** food source / energy source / nutrients ;
for embryo / for germination ; [2]

(ii) protein - growth / repair ;
starch - energy ; [2]

(iii) add biuret reagent / add copper sulfate and potassium hydroxide (solution) ;
purple colour indicates protein ; [2]

(b) **(i)** Dunfield ; [1]

(ii) Mandarin ; [1]

(iii) (more) photosynthesis / CO_2 is a limiting factor ; [1]

(iv) carbon dioxide in the atmosphere is increasing ;
ref to a reason for this, e.g. burning fossil fuels / deforestation ;
idea of needing to plan for future food production ; [max 2]

[Total: 11]

4 (a) (i) 5 ; [1]

(ii) phosphorus / P ;
15 electrons so 15 protons so atomic number 15 /
5 electrons in outer shell / in group 5 and three shells / period 3 ; [2]

(b) (i) nitrogen / N ; [1]

(ii) join together / form chains / form polymers ;
proteins / polypeptides ; [2]

(c) (i) element contains one type of atom but compound contains different atoms (bonded) ;
H_2 / N_2 is an element and NH_3 is compound ; [max 2]

(ii) (damp), red litmus (paper) ; (allow universal indicator)
turns blue ;
OR
mix with HC*l* gas ;
dense white smoke ; [2]

[Total: 10]

5 (a) (i) carbon dioxide ; [1]

(ii) limewater ;
goes cloudy ; [2]

(b) (i) density = mass / volume ;
= 15/5.6 = 2.7 g / cm^3 ; [2]

(ii) solid - particles touching, regular arrangement ;
liquid - most particles touching, irregular arrangement ; [2]

(c) overweight ;
effect on health ;

tooth decay ;
explanation ; [max 2]

(d) (i) temperature rise proportional to energy input ; [1]

(ii) working ;
40 000 ; [2]

(iii) energy needed to raise the temperature of 1 kg of a substance by 1 °C ; [1]
(allow other units)

(iv) power = energy / time ;
40 000 / 600 = 66.7 W ; (allow ecf) [2]

(v) current = 66.7 / 12 = 5.5 A ;
so fuse will not melt ; [2]

(e) (i) beta ;
alpha would be completely stopped and gamma not stopped at all ; [2]

(ii) lead ; [1]

[Total: 20]

6 (a) **A**
B
D
C
Any two correct for one mark ;; [2]

(b) (i) contracts / gets shorter ;
pulls ulna closer to, bone **B** / humerus / bone **A**, scapula ; [2]

(ii) transmit force from muscle to bone ; [1]

(c) (i) artery ;
capillary ; [2]

(ii) breathing rate / breathing depth, increases ;
heart rate increases ; [2]

[Total: 9]

7 (a) (i) fractional distillation / fractionation ; [1]

(ii) two from
gasoline has:
lower viscosity ;
lower boiling point / more volatile ;
lower melting point ;
less coloured ;
higher flammability ; [max 2]

(iii) made from (bodies of once living) organisms ;
organisms made of carbon compounds / organic compounds ; [2]

(b) (i) (catalytic / thermal) cracking / thermal decomposition ; [1]

(ii) alkanes paired with saturated ;
alkenes paired with unsaturated ; [2]

(iii) alkene molecules contain a double bond ;
two carbon atoms required at either end of the double bond / owtte ; [2]
(allow diagram of second point)

(c) sulfur dioxide would be released into atmosphere ;
which may cause breathing difficulties / asthma ;
(sulfur dioxide may cause) acid rain ;
which cause water pollution in water systems / damages aquatic life /
damages plant life ; [max 3]

[Total : 13]

8 (a) (i) homeostasis ; [1]

(ii) small intestine / ileum / duodenum ; [1]

(iii) secretes insulin ; [1]

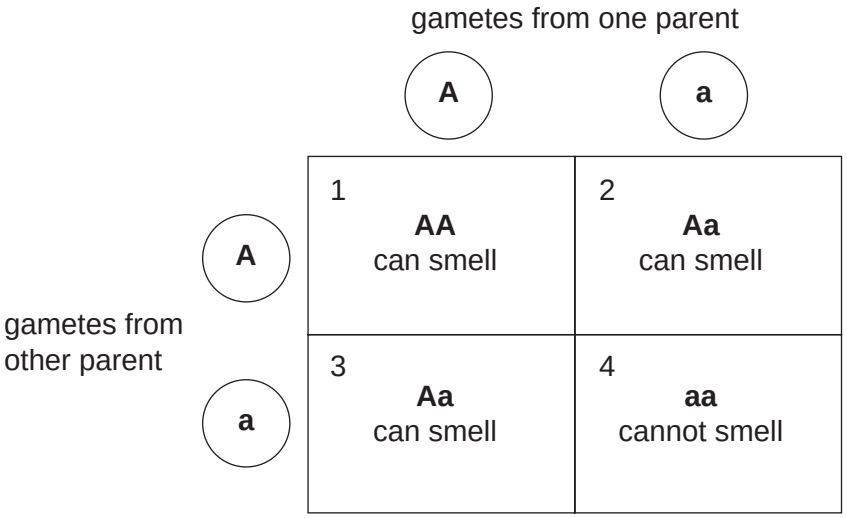
(iv) diabetes ; [1]

(v) through placenta ;
from mother's blood ;
by diffusion ;
correct reference to umbilical cord ; [max 2]

(b) (i)

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

gametes **A** and **a** **A** and **a**



second parent correct ;
all gametes correct ;
genotypes of offspring correct ;
phenotypes of offspring correct (need not be in the boxes) ; [4]

(ii) 3 in 4 / 75 % / 0.75 ; [1]

[Total: 11]

9 (a) (i) (KE =)½ mv^2 ;
= 0.5 × 4000 × 0.5 × 0.5 = 500 J ; [2]

(ii) **(**momentum =)m × v ;
= 4000 × 0.5 = 2000 kg m / s ; [2]

(b) (i) 3 000 N ; [1]

(ii) work done = force × distance ;
= 3000 N × 2 = 6000 J ; [2]
(allow e.c.f. from **b(i)**)

(c) total area = 1.6m^2 ;
pressure = 40000 / 1.6 = 25000 N / m^2 ; [2]

(d) blood loses heat through ears ;

larger surface area for radiation; max 1 [1]

(e) (i) number of waves per second, etc. ; [1]

(ii) elephant , human and rabbit ; [1]

(iii) cat ; [1]

[Total: 13]