UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 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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1 (a) (i) 5.1 (±0.1) ; [1]

(ii) as radiation dose goes up so do incidences of leukaemia/radiation dose and incidences are (directly) proportional ; [1]

(iii) radiation burns/radiation sickness/death/genetic mutation ; [1]

(b) alpha – stopped by paper etc ;
beta – not stopped by paper/only partially stopped by aluminium [2]

(c) (i) time taken for half atoms to decay/time taken for count/rate to decrease by half ; [1]

(ii) 3 half lives ;
12 days ; [2]

[Total: 8]

2 (a) A evaporation ;
B condensation ;
C transpiration/evaporation ;
D precipitation ; [4]

(b) less transpiration ;
less water vapour in the air ;
less rainfall ;
more runoff ;
more flooding ; [max 2]

(c) (i) plasma ; [1]

(ii) osmosis ;
moves/diffuses, through partially permeable membrane ;
ppm. is cell membrane
from where there is a lot of water to where there is less/high water potential to low water potential ; [max 3]

(d) kills, bacteria/micro-organisms/pathogens ;
that might cause illness/example of illness ; [2]

[Total: 12]

3 **(a)** a group of atoms ;
(covalently) bonded ; [2]

(b) the hard water/hardness in **A** reacted with the soap ;
soap precipitated as scum ;
less soap available to help washing/soap needed to improve washing ; [3]

(c) **(i)** 11 ; [1]

(ii) 2 ;
Ca in Group II/20 electrons with e.c. 2.8.8.2/calcium has valency of 2 ; [2]

[Total: 8]

4 **(a)** **(i)** voltmeter in parallel with lamp ;
variable resistor and ammeter in series ;
everything else correct ; [3]

(ii) to vary current/voltage/potential difference (through/across lamp) ; [1]

(iii) R = V/I ;
= 5.3 ; (allow in working rather than in table) [2]

(iv) filament gets hot ;
resistance is not constant ;
voltage and current are not directly proportional ; [max 2]

(b) damaged outer insulation ;
short circuit/risk of shock/risk of fire/death ; [2]

[Total: 10]

5 **(a)** **(i)** feathers ;
beak ;
wings ; [max 2]

(ii) **B** reptiles ;
C amphibians ; [2]

(iii) *Rana temporaria* ; [1]

(iv) webbed feet ;
(big surface area) for pushing against water (when swimming) ;

eyes near top of head ;
to see above water surface ;

strong hind legs ;
to push against water (when swimming) ; [2]

(b) (i) **A**, because the body temperature does not change ; [1]

(ii) mammals ; [1]

(iii) good environment for cells ;
enzymes have optimum temperature ;
idea of affecting rate of (metabolic) reactions ;
can be active in all temperatures ; [max 2]

(iv) food used to generate heat/keep warm ;
in respiration ; [2]

[Total: 13]

6 **(a)** magnesium sulphate ; + hydrogen ; [2]

(b) (i) (Expt. 2) shortest time to collect 30 cm^3 gas/same volume of gas/OWTTE ; [1]

(ii) reduce (acid) temperature ;
reduce acid concentration ;
decrease surface area of magnesium/use same mass of Mg but larger pieces ; [max 2]

(iii) reaction ;
is exothermic ;
releases (heat) energy ;
which is transferred to the flask/surroundings ; [max 2]

[Total: 7]

7 **(a) (i)** working;
= 5000 N ; [2]

(ii) 15 – 25 N/cm^2 ;
explanation e.g. uses 50 N/cm^2 at 40 m and 10 N/cm^2 at 0 m ; [2]

(b) momentum = m x v ;
= 1.2 x 10 = 12 kg m / s ; [2]

(c) (i) any electromagnetic wave etc ; [1]

(ii) vibrations at right angles to direction of wave ;
(transverse)
or vibrations in same direction as wave ;
(longitudinal) [1]

[Total: 8]

8 **(a)** seedling **C**/no tip ;
(had no tip) and did not grow ; [2]

(b) both have grown (taller) ;
shoot **B** has bent towards the light but shoot **A** has grown straight up ; [2]

(c) seedling **D**/tip covered ;
(had its tip covered) and has not grown towards the light ; [2]

(d) for photosynthesis ;
light is energy source ;
plant can grow faster with more light ; [max 2]

[Total: 8]

9 **(a)** **(i)** electrode connected to negative side of power pack labelled ; [1]

(ii) chlorine ; [1]

(iii) hydrogen ; [1]

(iv) because solution becomes alkaline ;
because sodium hydroxide is formed in the solution ; [2]

(b) **(i)** (halogen) displacement/redox ;
chlorine is more reactive than iodine ; [2]

(ii) chlorine + potassium iodide $\rightarrow$ potassium chloride + iodine ; [1]

[Total: 8]

10 **(a)** **(i)** the current alternates/is alternating ;
50 times per second ; [2]

(ii) current = 5000 / 250 = 20 A ; [1]

(b) efficiency = useful energy out/total energy in ;
half energy is wasted ; [2]

(c) aluminium is a good conductor of heat ;
wood good insulator/heat cannot travel through (and burn hand) ; [2]

[Total: 7]

11 (a) (i) proteins/peptides/polypeptides ; [1]

(ii) N ; [1]

(b) (i) hexane has a lower boiling point/is more volatile/evaporates more easily ; [1]

(ii) compound of only carbon and hydrogen ;
which contains only single (covalent) bonds ; [2]

(iii) electrons are shared ;
in pairs/one electron from each atom is shared/OWTTE ;
reference to full outer shell ; [max 2]

(c) (i) biodiesel is a renewable energy source ;
a "carbon neutral" energy source ;
carbon dioxide produced is removed from the atmosphere by growing (new) soybeans/carbon dioxide is re-used/OWTTE ;
by the process of photosynthesis ; [max 2]

(ii) sulfur compounds burn to produce SO_2/sulfur oxide ;
acid rain;
these cause damage to buildings/irritate respiratory systems ;
extra cost involved in removing sulfur from diesel ; [max 2]

[Total: 11]