UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2011 question paper

for the guidance of teachers

0654 CO-ORDINATED SCIENCES

0654/32 Paper 3 (Extended 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.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

* Cambridge will not enter into discussions or correspondence in connection with these mark schemes.

Cambridge is publishing the mark schemes for the October / November 2011 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

1 (a) wings ;
6 legs ;
body in three parts *(not segments)* / head, thorax and abdomen ;
<u>one pair of</u> compound eyes ;
<u>one pair of</u> antennae ;   [max 2]

(b) (i) protease / trypsin / pepsin   **OR**   lipase ;   [1]

(ii) amino acids   **OR**   fatty acids and glycerol ;   [1]

(c) reference to phagocytosis / description of phagocytosis ;
reference to antibodies ;   [2]

(d) (i) vibrations ;
reference to air / particles / compressions and rarefactions / wave travels
through air ;   [2]

(ii) (midge buzz) higher pitch ;
because higher frequency ;   [2]

[Total: 10]

2 (a) strong / hard / low malleability ;
coins must not easily be damaged / must be easily recognised over long
periods / owtte ;
OR
malleable ;
can be shaped (in manufacturing process) ;
OR
(chemically) unreactive ;
coins must not easily corrode ;   [max 2]

(b) (i) $SnO_2 + 2C \rightarrow Sn + 2CO$
symbols ;
balanced ;   [2]

(ii) aluminium more reactive than carbon ;
tin less reactive than carbon ;
aluminium is more reactive than tin / aluminium is more strongly bonded to
oxygen (than tin is) ;   [max 2]
(allow 1 for aluminium is more / very reactive)

(iii) reference to use of carbon electrodes ;
aluminium oxide / bauxite, is melted / reference to solution in cryolite ;
aluminium ions are positive / cations* ;
ions, attracted / move to, negative electrode / cathode;
ions, gain electrons from / are discharged, at negative electrode* ;   [max 3]
(allow $Al^{3+} + 3e^- \rightarrow Al$ for marking points with *)

(c) calculate mass of copper – $7.80 \times 0.89 = 6.94\,g$;

use moles = mass ÷ molar mass – $6.94 \div 64 = 0.108$;

[Total: 11]

3 **(a)** traps layer of air ;
good insulator / poor conductor ;   [2]

(b) **(i)** weight = $10\,800\,N$;
(work done =) force × distance ;
= $10\,800 \times 100 = 1\,080\,000\,J$;
OR
(P.E. gained =) mgh ;; (2 marks)
= $1080 \times 10 \times 100 = 1\,080\,000\,J$;   [max 3]

(ii) (KE =) $\frac{1}{2}\,mv^2$;
= $\frac{1}{2} \times 1080 \times 0.2 \times 0.2 = 21.6\,J$;   [2]

(c) force = $1000 \times 10 = 10\,000\,N$;
pressure = force / area ;
$10\,000 / (4 \times 300) = 8.3\,N/cm^2$;   [3]

[Total: 10]

4 **(a)** **(i)** formed as fossil fuel / remains ;
decomposition of organic matter ;
digestive system of ruminants ;
reference to volcanism ;   [max 2]

(ii) 8 ;
four covalent bonds means four pairs of electrons ;   [2]
(correct dot / cross diagram gains both marks)

(b) **(i)** alkanes and alkenes ;   [1]

(ii) the larger / heavier / greater surface area of / greater number of atoms in
molecules / less saturated ;
the higher the boiling point ;   [2]

(iii) (shake liquid with) bromine / (potassium) manganate(VII) ;
mixture <u>goes</u> colourless if liquid is **D** / alkene ;
because **D** is unsaturated / reference to unsaturation ;   [3]

[Total: 10]

5 (a) pollen tube grows (down style) ;
male gamete travels down (tube) ;
male gamete fuses with female gamete ;
zygote produced ;
ovule becomes seed ;
ovary becomes fruit ;
(allow 'sex cell' or 'nucleus' instead of 'gamete')   [max 4]

(b) (i) increase growth / yield of plants ;
(plants need nitrates) to produce proteins ;
proteins needed to produce new cells ;   [max 2]

(ii) Q has nitrogen-fixing bacteria in its roots / nodules ;
provide plants with, nitrogen-containing compounds / ammonium ions ;   [2]

(iii) nitrates may be washed into the river ;
cause algal bloom / algae / water plants ;
increases numbers of (aerobic) bacteria ;
(bacteria) reduces oxygen content of water ;   [max 3]

                                                                [Total: 11]

6 (a) (i) arrows go down ;   [1]
(accept full convection current drawn if cold air is labelled)

(ii) particles closer together ;
air becomes more dense ;   [2]

(b) solid regular arrangement and all particles touching ;
liquid irregular arrangement and most particles touching ;   [2]

(c) (E =) mass × specific heat capacity × temperature change / $mc\Delta t$;
= 0.05 × 450 × 25 ;
= 562.5 J ;   [3]

(d) (i) (resistance =) voltage / current = $250 / 0.05 = 5000\,\Omega$;

(ii) $1/R = 1/R_1 + 1/R_2$;
= $1/5000 + 1/5000 = 2/5000$;
$R = 2500\,\Omega$;

(allow $R = \dfrac{R_1 R_2}{R_1 + R_2}$

$= \dfrac{5000 \times 5000}{5000 + 5000}$

$R = 2500\,\Omega$)

OR
(R =) V/I – with correct method ;
$I = 2 \times 0.5 = 0.10\,A$;
$R = 250/0.10 = 2500\,\Omega$;

[max 3]

[Total: 12]

7 (a) (i) example of physical weathering ; e.g. freeze-thaw, sandblasting, wave action
on cliffs, expansion-contraction
reference to formation of small rock fragments ;
reference to movement (of fragments) by rivers ;   [3]
(allow reference to movement of calcium ions by rivers)

(ii) burning, hydrocarbons / fossil fuel / named material ;
respiration ;
decomposition / decay, (of organic matter) ;
action of acid (rain) on carbonate (rock) ;   [max 2]

(iii) hard / strong ;
giant (ionic) structure / lattice ;
energy of collision sufficient to break ship / owtte ;
extra detail e.g. strong chemical bonds ;   [max 3]

(b) (i) photosynthesis ;   [1]

(ii) $C_6H_{12}O_6$;
glucose ;   [2]

(iii) algae produce oxygen which coral uses ;
coral produces carbon dioxide which algae use ;   [2]

(c) (i) carbon dioxide, dissolves in / reacts with / mixes with, sea / rain, water ;
makes water, <u>more</u> acidic / less alkaline ;
carbon dioxide / non-metal oxides are acidic ;   [max 2]

(ii) (accept any reasonable science based idea):
e.g. calcium carbonate / reef may react with more acidic water / lower pH
makes it more difficult for coral to extract ions from sea / coral (polyps) / algae
do not survive in more acidic water / enzymes are denatured ;   [max 1]

[Total: 16]

8 (a) from blood ;
        from red blood cells ;
        from haemoglobin ;
        by diffusion ;   [max

    (b) (i) evaporation ;
              (evaporation) requires energy / takes heat from body ;   [2]

        (ii) temperature rises higher when no fluids drunk ;
              temperature rises more rapidly when no fluids drunk ;
              comparative figures (e.g. reaches 40 °C with no fluids, 38.7 °C with fluids) ;   [max 2]

       (iii) body short of water when no fluids drunk ;
              reference to need to maintain water content of body ;
              so less sweat produced ;
              (accept reverse argument)   [max 2]

        (iv) (sodium / potassium / chloride), ions / minerals lost in sweat ;
              (these ions) replaced by drink ;
              glucose provides, fuel for / energy by, respiration ;   [max 2]

                                                                                         [Total: 10]

9 (a) force = mass × acceleration ;
        acceleration = 1 200 000 / 400 000 ;
        = 3 m/s^2 ;   [3]

    (b) cause cancer ;
         mutations / damage to DNA ;
         kill cells / radioactive sickness / burns ;   [max 2]

    (c) (i) to stop crisps, spoiling/oxidising, / to keep crisps fresh ;
              to stop micro-organism respiration ;
              nitrogen is unreactive ;   [max 2]

        (ii) pressure inside packet is greater than airplane pressure ;
              reference to collision of particles with packet ;
              particles inside packet hit packet more often than particles outside ;
              resultant force inside packet increases ;
              so volume inside packet increases ;   [max 3]

                                                                                         [Total: 10]