UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2012 question paper

for the guidance of teachers

0653 COMBINED SCIENCE

0653/23   Paper 2 (Core Theory), maximum raw mark 80

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.

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1 (a) (speed =) distance / time ;
= 25 / 2 = 12.5 (km / h) ;

(b) (i) chemical ;   [1]

(ii) heating engine / heating surroundings / light / sound ;   [1]

(c) metal track expands in summer / hot weather ;
metal can expand into gap ;
prevents damage to tracks ;   [max 2]

(d) ethanol is renewable source / no sulfur dioxide produced ;   [1]

(e) (i) 5 (km / h) ; (accept 4 / reference to greater than 3 but equal to and less than 5)   [1]

(ii) 1200 (W) ;   [1]

(iii) wind speed variable / wind unreliable / owtte ;   [1]

[Total: 10]

2 (a) (i) nucleus ;   [1]

(ii) 18 ;
evidence of neutrons = nucleon number minus proton number ;   [2]

(iii) hydrogen ;   [1]

(b) (i) any typical metal property for **X** and corresponding non-metal for **Y** ;   [1]
e.g. **X** conductor **Y** insulator
      X malleable **Y** not malleable

(ii) **Y** is reactive / specific example, **Z** is unreactive ;   [1]

(c) (i) reference to oxygen (**not** air) ;
which joins / reacts with carbon ;   [2]

(ii) soil (too) acidic ;
lime, reacts with / neutralises acid / reduces acidity ;
to increase fertility ;   [max 2]

[Total: 10]

3 (a) an animal that eats plants ;
only eats plants / does not eat meat ;
reference to getting energy from, its food / plants ;   [m

(b) eat a lot ;
eat / take in, more energy than they use ;
excess, carbohydrate / protein, converted to fat ;   [max 2]

(c) (i) the greater the body mass, the greater the chance of survival ;
idea that effect is greater at lower body masses / levels off at higher body masses ;
use of figures ;   [max 2]

(ii) insulator / poor conductor / reduces conduction ;   [1]

(d) carbon dioxide ;
methane ;   [2]

(e) (i) (mean) body mass is increasing ;   [1]

(ii) marmots have more time to feed (from spring onwards) / marmots lose less weight during hibernation (as winters are shorter) ;
as spring arrives earlier, plants grow faster and as marmots are herbivores they have more plants to eat, therefore increasing mass ;   [max 1]

[Total: 11]

4 (a) add magnesium to acid ;
insert bung ;
measure time for known volume of gas to collect / measure volume of gas at fixed time intervals / measure how long reaction lasts ;   [3]

(b) (i) temperature / surface area of magnesium ;   [1]

(ii) time for (same volume) of gas to collect is shorter ;
because rate of reaction is greater ;   [2]

(c) (i) ion is charged, atom is neutral / proton and electron numbers are the same in atom, but differ in the ion / the atom is reactive, the ion is stable / ion has all electron shells full, while atom outer shell is not full ;   [1]

(ii) $MgCl_2$;   [1]

(iii) hydrogen ;   [1]

[Total: 9]

5 **(a)** **(i)** between 10 and 20 (Hz) to between 20 000 and 25 000 (Hz) ;

 (ii) *frequency* – number of waves produced / passing a point per second ;
 wavelength – distance between consecutive, peaks / troughs ;

 (b) **(i)** needs, air / particles / a medium ; [1]

 (ii) quieter / lower volume ; [1]

 (iii) microwaves ; [1]

 (c) angle of incidence labelled ;
 angle of refraction labelled ; [2]

 [Total: 8]

6 **(a)** label to root hair cell ; [1]

 (b) water ;
 minerals / ions / named mineral ion ; [2]
 (allow two different mineral ions for 2 marks)

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

 (ii) **A** in central area of root ; [1]

 (d) **(i)**

structure	plant cells	animal cells
cell membrane	✓	✓
cell wall	✓	✗
nucleus	✓	✓
vacuole containing sap	✓	✗

 1 mark for any row correct ;;;; [4]

 (ii) no, as they do not get light / as they are underground ; [1]

 [Total: 10]

7 **(a)** **(i)** ammeter in series with lamp ;
voltmeter in parallel with lamp ;
variable resistor in series with lamp and all else correct ;

    (ii) to change, voltage across / current through, lamp / in circuit ;   [1]

(b) **(i)** positive and negative ;   [1]

    (ii) electrons ;   [1]

   (iii) metal / named metal / graphite ;   [1]

                                       [Total: 7]

8 **(a)** **(i)** nitrogen 78% oxygen 21% others 1% ;;   [2]
(all correct 2, two correct 1)

    (ii) carbon dioxide / water (vapour) / any noble gas ;   [1]

(b) **(i)** *elements*
all atoms have same proton number / are found in Periodic Table / cannot be
broken down into anything simpler ;
compounds
contain different types of atom / elements (bonded) ;   [2]

    (ii) covalent ;
bonded elements are both non-metals / compounds are gases ;   [2]

   (iii) pure water is neutral ;
rain water (generally) is (more) acidic (than pure water) ;
rainwater during thunderstorm is the most acidic / owtte ;
likely to be caused by nitrogen oxides ;
which have reacted with the rain to form an acid ;   [max 2]

                                       [Total: 9]

9 **(a)** nutrition
excretion
respiration
reproduction
growth
movement
(1 mark for **any two** correct) ;;   [max 2]

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

    (ii) increases pulse rate ;
increases blood pressure ;
increases glucose in blood ;   [max 2]

(c) in the blood / blood vessels ;   [1]

                                       [Total: 6]