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

0653/21 Paper 2 (Core Theory), maximum raw mark 80

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UNIVERSITY of CAMBRIDGE
International Examinations

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

(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 ; [max 2]

(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) ; [1]

(ii) *frequency* – number of waves produced / passing a point per second ;
wavelength – distance between consecutive, peaks / troughs ; [2]

(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 ; [3]

(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]