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

0653/31 Paper 3 (Extended 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.

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UNIVERSITY of CAMBRIDGE
International Examinations

1 **(a)** **(i)** (KE =) ½ mv^2 ;
= ½ × 30 000 × 0.5 × 0.5 = 3750 J ; [2]

(ii) work done = force × distance ;
= 1 000 000 × 1000 = 1 000 000 000 J; [2]

(iii) power = work ÷ time ;
= 1 000 000 000 ÷ 300 = 3 300 000 W / 3 333 333 W ; [2]

(b) metal / steel / track expands in summer / hot weather / when temperature increases ;
metal can expand into gap ;
prevents damage to tracks ; [max 2]

[Total: 8]

2 **(a)** hydrogen ; [1]

(b) **(i)** **P** Group 1, **Q** Group 0 (reject 8), **R** Group 7; (all required)
outer electrons determine group number / answer based on identifying the elements and looking up on Periodic Table ; [2]

(ii) (**Q**)
it is a noble / inert gas / reference to filled (electron) shells ; [1]

(iii) (**P**)
it is a <u>metal</u> ; (reject – it is sodium) [1]

(c) **(i)** limestone / calcium carbonate ;
forms slag / removes impurities / removes silicon dioxide ; [2]

(ii) iron oxide + carbon monoxide → iron + carbon dioxide ;; [2]
[LHS + RHS]

(d) **(i)** aluminium more reactive than carbon ;
so carbon unable to bond with oxygen / remove oxygen from aluminium oxide / break bond between aluminium and oxygen / so a displacement reaction does not occur ; [2]

(ii) electrolysis ; [1]

[Total: 12]

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

(b) **(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) poor conductor / conduction / good insulator / insulation ; [1]

(c) reference to build-up of carbon dioxide to the atmosphere ;
deforestation + explanation ;
addition of methane to the atmosphere ;
one named source of methane, e.g. paddy field, cattle ;
idea that (long wave) radiation is trapped by greenhouse gases ; [max 3]

(d) **(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 ; [max 1]

[Total: 10]

4 **(a)** temperature, surface area of magnesium ; [1]
(allow length, mass or size of magnesium (ribbon), do **not** allow amount of magnesium)

(b) **(i)** (**B**)
reference to high<u>er</u> rate / steep<u>er</u> graph ; [1]

(ii) (maximum volume of gas) 40 cm^3 and time of reaction 5 minutes / 300 s ;
average rate = 40 ÷ 5 = 8 / 40 ÷ 300 = 0.13 ;
units (mark separately) cm^3 / minute or cm^3 / s ; [max 3]

(c) **(i)** aqueous (solution) / dissolved in water / in solution ; [1]

(ii) same mass / length / size / amount of magnesium used in both ;
acid in excess / all magnesium used up in both ;
gas volume depends on amount of magnesium / owtte ; [max 2]

[Total: 8]

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 two peaks / troughs on consecutive waves ; [2]

(iii) (v =) f × λ ;
212 000 × 0.0016 = 339.2 m / s ; [2]

(iv) compression region of high pressure / lots of air particles ;
rarefaction region of low pressure / fewer air particles ; [2]

(b) **(i)** *sound* – longitudinal ;
light – transverse ; [2]

(ii) microwaves ; [1]

[Total: 10]

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

(b) **(i)** absorb, minerals / ions / salts / named ion ; [1]

(ii) large surface area ;
so more, water / ions, can be absorbed (at the same time) ;
contain, cell sap / cytoplasm, that is more concentrated than water ; [max 2]

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

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

(iii) idea that red dye has mixed with water, not combined with it ;
idea that water molecules and dye molecules behave separately / differently ;
(only) water evaporates / dye does not evaporate ;
other valid point ; [max 2]

[Total: 8]

7 **(a)** **(i)** ammeter in series with lamp ;
voltmeter in parallel with lamp ;
means of varying the potential difference across lamp ; [3]

(ii) (R =) V / I ;
= 3 / 0.3 = 10 Ω ; [2]

(b) **(i)** **D** its longer / resistance proportional to length ; [1]

(ii) **A** small cross-sectional area / owtte; [1]

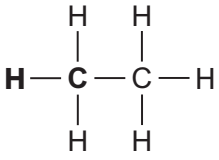
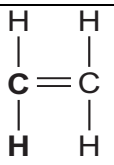
(c) **(i)** positive and negative ; [1]

(ii) electron ; [1]

[Total: 9]

8 **(a)** **(i)** at least one shared pair shown ;
four shared pairs with no extraneous outer shell electrons ; [2]

(ii)

ethane	
ethene	

;; [2]

(b) ethanol + oxygen → carbon dioxide + water ;;
[LHS RHS] [2]

[Total: 6]

9 **(a)** chemical / substance ;
produced by a gland / endocrine gland ;
carried by the blood ;
affects specific / target organs ;
destroyed by the liver ; [max 3]

(b) more, oxygen / glucose, delivered to muscles ;
more energy for muscles ;
higher respiration rate (in muscles) ;
muscles can work harder / faster ; [max 2]

(c) **(i)** (positive) phototropism ; [1]

(ii) auxin made in tip (of shoot) ;
accumulates on shady side ;
makes cells on this side get longer ;
so shady side grows faster than lit side ; [3 max]

[Total: 9]