CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2013 series

0653 COMBINED SCIENCE

0653/32 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.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

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1 (a) (i) Group 1 elements all metals and Group 7 elements all non-metals;
Group 4 elements non-metals at top and metals at bottom/contain both types of element;

(ii) melting point decreases down Group 1 so francium has lowest m. pt;
melting point increases down Group 7 so astatine has highest m. pt; [2]

(b) (i) cobalt chloride paper;
changes from blue to pink;
OR
anhydrous copper sulphate;
changes from white to blue; [2]

(ii) $PbO + H_2 \rightarrow Pb + H_2O$;; [2]

(iii) calcium has a high reactivity;
calcium reactivity greater than hydrogen;
calcium too strongly bonded to oxygen; [max 2]

[Total: 10]

2 (a) (i) W = F × D;
= 1400 × 10 = 14 000 J; [2]

(ii) KE = ½ mv^2;
= ½ × 5000 × 1.5 × 1.5 = 5625 J; [2]

(b) density = mass / volume;
= 5000 / 5 = 1000 kg/m^3; [2]

(c) (i) <u>below</u> 20 Hz;
human threshold is about 20 Hz; [2]

(ii) number of vibrations per second; [1]

(iii) sound waves with frequencies above human threshold/above 20 000 Hz; [1]

[Total: 10]

3 **(a)** **(i)** geotropism/gravitropism;

(ii) flowers held up;
where insects can reach them;
for pollination; [2]

(b) lower surface has grown more than upper surface;
use figures from 1st graph;

auxin concentrates on lower surface;
use of figures from 2nd graph/deduction that auxin has moved away from upper surface;

more auxin causes more growth; [max 3]

[Total: 6]

4 **(a)** **(i)** thermal;
thermal and conduction; [2]

(ii) communication; [1]

(b) total power = 1.8 kW;
energy = 1800 × 30 × 60;
= 3 240 000 J; [3]

(c) electricity could be produced by burning fossil fuels;
(fossil) fuels release CO_2 when burned;
reduced demand for (fossil) fuels/electricity reduces amount of CO_2 released; [max 2]

[Total: 8]

5 **(a)** sodium atom loses an electron/outer shell;
oxygen atom gains two electrons/fills outer shell;
idea that two electrons provided by two sodium atoms;
reference to ions formed;
attraction between positive and negative ions; [max 3]

(b) **(i)** glowing splint relights; [1]

(ii) 24 ÷ 400 = 0.06;
20 cm^3 per second; [2]

(iii) hydrogen ions gain electrons;
(each ion gains) one electron;
atoms join in pairs to form hydrogen molecules; [max 2]

(iv) the higher the current the higher the rate of production of hydrogen;
current is (rate of) flow of electrons/charge;
so if electrons arriving at cathode (per second) is higher then more H^+ ions discharging in given time; [max 2]

[Total: 10]

6 **(a)** photosynthesis;
changes light energy to chemical energy;
light energy absorbed by chlorophyll;
water combined with carbon dioxide;
carbohydrates produced;
carbohydrates contain chemical energy; [max 4]

(b) respiration;
energy lost as heat;
OR
not all organisms eaten/not all parts of organisms eaten;
e.g. sheep does not eat grass roots/human does not eat sheep's feet/other e.g;
idea that this energy goes into decomposer food chain;
OR
not all food digested;
so some not absorbed into organism's body/some lost in faeces;
idea that this energy goes into decomposer food chain; [max 2]

(c) **(i)** $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$
all formulae correct;
balanced; [2]

(ii) more heat lost in cold environment;
from skin/by radiation/by conduction;

so more heat needs to be produced within the body/in cells;
by respiration;
using food/glucose/carbohydrates (as fuel);

eating more increases fat deposits in the body;
for heat insulation; [max 3]

[Total: 11]

7 **(a)** correct series circuit;
all symbols correct; [2]

(b) non-renewable – coal/oil/gas/nuclear;
renewable – geothermal/wave/tidal/hydroelectric; [1]
(both required for mark)

(c) **(i)** $R = R_1 + R_2$;
$1200 + 2400 = 3600\,\Omega$; [2]

(ii) $800\,\Omega$;
combined resistance of parallel components is less than that of either resistance;
OR calculation [max 2]

[Total: 7]

8 **(a)** **T**;
P Q R;
R (**S**);
P; [

(b) **(i)** decreases slowly (at the start);
sudden steep fall;
decreases slowly (after the sudden fall); [max 2]

(ii) these are the volumes at pH 7/owtte; [1]

(iii) (**A**)
lower volume of **A** needed to neutralise the alkali; [1]

[Total: 8]