

MARK SCHEME for the October/November 2013 series

0653 COMBINED SCIENCE

0653/21

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

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Page 2	Mark Scheme	Syllabus	Paper
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- 1 (a) (i) reference to reactivity of elements / compound is more stable ; [1]
- (ii) element cannot be simplified / decomposed chemically ;
 element contains just one type of atom ;
 element is found in Periodic Table ; [max 1]
 (or corresponding answers for compound)
- (iii) heat / boil solution ;
 water evaporates leaving sodium chloride ;
 leave to evaporate ; [max 2]
- (b) idea that formula shows the ratio Ca:F particles is 1:2 ; [1]
- (c) (i) electrolysis ; [1]
- (ii) bromine is formed ;
 bromine (vapour) is orange ;
 bromine evaporates / boils off ; [max 2]
- [Total: 8]**

- 2 (a) arrow going downwards ; [1]
- (b) mass = density $\times$ volume ;
 $= 1.26 \times 0.15 = 0.19 \text{ kg}$; [2]
- (c) solid – all particles touching, regular arrangement particles of similar size ;
 liquid – most particles touching, irregular arrangement particles of similar size ; [2]

(d)

description	S, L or G
It cannot flow	S
It cannot transfer heat by convection	S
It contains particles which are widely separated	G
It expands the most when heated	G
It fills a closed container	G
It has a fixed volume but not a fixed shape	L

[2]

[Total: 7]

Page 3	Mark Scheme	Syllabus	Paper
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- 3 (a) (i) substance produced by a gland
carried in blood
affects activity of target organs
destroyed by liver ;; [max 2]
- (ii) increases heart rate / increases breathing rate / sweating / pupil dilation / increases pulse rate / faster reactions / increases rate of respiration / increase in oxygen to muscles/brain ; accept any correct answer [1]
- (b) (i) increased then decreased
increased more rapidly than it decreased
maximum 6.6 units /at 40 minutes
quote figures, e.g. returned to normal by 100 minutes ;;; [max 3]
- (ii) (blood glucose concentration) did not rise as high
maximum 4 units rather than 6.6 units
rose more slowly
fell more slowly
took longer to return to normal ;;; [max 3]
- (c) reduces, constipation / bowel cancer / risk of diabetes ; [1]
- [Total: 10]

- 4 (a) (i) Y and Z ;
non-metals ; [2]
- (ii) Z ;
it is a noble / inert gas / ref to filled shells in atoms ; [2]
- (b) (i) Group 1 ;
reference to at least one of the proton numbers plotted on graph ; [2]
- (ii) rubidium ; [1]
- (c) (i) insoluble substance dissolved / disappeared
colour change / coloured substance produced ; [max 1]
- (ii) (reactants→) copper sulfate ;
+ water ; [2]
- [Total: 10]

Page 4	Mark Scheme	Syllabus	Paper
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- 5 (a) speed = distance/time ;
= 3000/30 = 100 km/hr ; [2]
- (b) (i) 120 km/hr ; [1]
- (ii) changing speed / going faster / accelerating ; [1]
- (c) $1,000,000 \times 0.10 \times 0.70$;
= 70,000 J ; [2]
- (d) (i) geothermal/tides/hydroelectric/waves/wind/biomass ; [1]
- (ii) fossil fuels not wasted
no CO₂ produced ; [max 1]
- [Total: 8]**
- 6 (a) A (right) atrium ;
B (right) ventricle ; [2]
- (b) contracts ;
reduces volume of ventricle ;
increases pressure ; [max 2]
- (c) needs to produce less force ;
to push blood into ventricle ;
not out of the heart ; [max 2]
- (d) uses more energy ;
energy obtained by respiration ;
respiration uses oxygen ; [max 2]
- [Total: 8]**

Page 5	Mark Scheme	Syllabus	Paper
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- 7 (a) (i) petroleum / crude oil / natural gas ; [1]
- (ii) compound of hydrogen and carbon only ; [1]
- (iii) $C_2H_4 + Br_2 \rightarrow C_2H_4Br_2$; [2]
(allow Br_2 anywhere in product formula)

- (b) (i) the temperature (inside kiln) is high / is $950^\circ C$;
exothermic means the reaction releases heat (energy) ; [2]

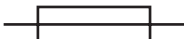
- (ii) carbon dioxide
carbon monoxide
water (vapour)
two of the above with
produced by combustion of propane / hydrocarbons ;;; [max 3]
(ignore refs to complete combustion)

[Total: 9]

- 8 (a) Correct symbol for
open switch 

resistor 

voltmeter 

fuse 

[2]

- (b) damaged insulation/bare wires ;
danger of electrocution ; [2]

- (c) (i) 0.5 A
0.5 A ; (need both) [1]

- (ii) $R = R_1 + R_2$;
 $= 10 \Omega$; [2]

[Total : 7]

Page 6	Mark Scheme	Syllabus	Paper
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9 (a) (i) controls what enters / leaves the cell ; [1]

(ii) cell wall ;
chloroplast ;
large permanent vacuole ;
vacuole membrane ; [max 2]

(iii) takes place in chloroplasts ;
chlorophyll absorbs / traps, sunlight / energy from sunlight ;
water combines with carbon dioxide ;
produces oxygen and glucose / sugar / carbohydrate ; [max3]

(b) extinction ;
soil erosion ;
flooding ;
build up of carbon dioxide ;
drought ;
increase in global warming ; [max 3]

[Total: 9]

10 (a) (i) infrared ; [1]

(ii) microwaves ; [1]

(b) 100 m ;
1.5 m ; [2]

[Total: 4]