

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2014 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.

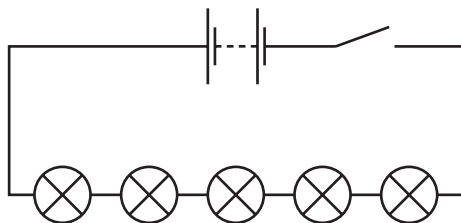
Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2014 series for most Cambridge IGCSE[®], Cambridge International A and AS Level components and some Cambridge O Level components.

® IGCSE is the registered trademark of Cambridge International Examinations.

1 (a)



circuit symbols correct ;

circuit connected correctly with 5 lamps (allow ± 1) ;

[2]

- (b) (i) gives p.d. required to light the lamp (for normal use)/what battery to use to make lamp work/to drive correct current ;
don't exceed stated p.d. or may blow lamp/too high current (owtte) ;

[2]

(ii) $R = 1.2/0.1 = 12 \text{ } (\Omega)$;

[1]

(iii) Total resistance = $5 \times 12 = 60 \text{ } (\Omega)$; *allow ecf*

[1]

(iv) ohm ;

[1]

[Total: 7]

- 2 (a) B C ;
(B C) D A ;

[2]

(b)

material	description
element	can be found in the Periodic Table
element	cannot be broken down into simpler substances
mixture	contains different types of molecules
compound	only contains molecules which are identical but each molecule contains more than one type of atom

;;;; [4]

- (c) (i) fuels ;

[1]

- (ii) flammable ;

[1]

- (d) (i) carbon dioxide ;
water ;

[2]

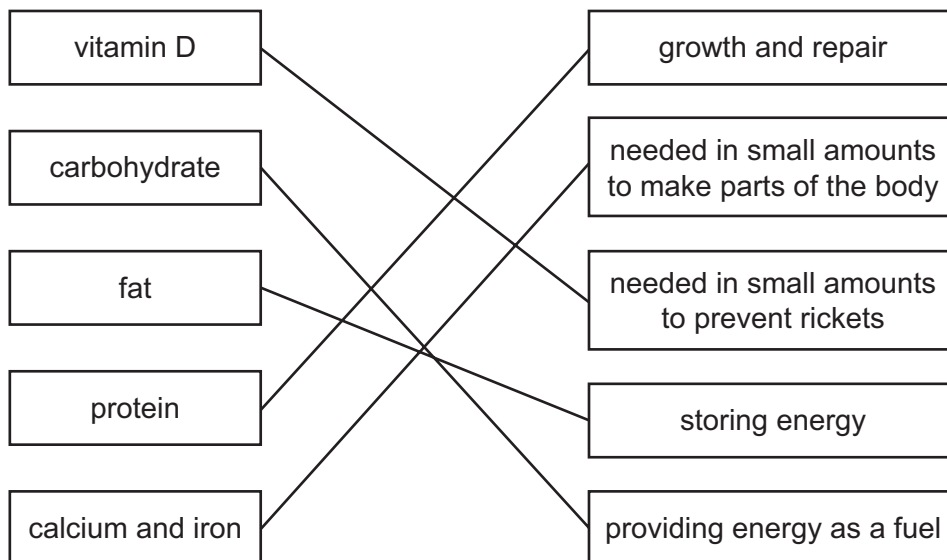
- (ii) C_3H_8 ;

[1]

[Total: 11]

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0653	21

3 (a) (i)



(all 4 correct = 3 marks, 3 correct = 2 marks, 2 or 1 correct = 1 mark)

[3]

(ii) prevents constipation ;

[1]

(b) (i) meal 2 is balanced / meal 1 is not balanced / not enough vitamin C/D / not enough fibre / not enough iron / calcium ;
meal 1 contains too much fat / carbohydrate / energy ;
Jill does not need so much energy in food because of her lifestyle ;

[max 2]

(ii) e.g. apple (no mark)
adds fibre / vitamins C/D ;
or
milk (no mark)
adds calcium / vitamins C/D ;
or
any food (no mark) and valid point that addresses the reasons mentioned in (b)(i) ;

[1]

[Total: 7]

4 (a) (i) initial any between 8 and 14
final 7 ;

[1]

(ii) initial violet / purple
final green ;

[1]

(iii) neither acid nor alkali in excess ;
(chemical) reaction / neutralisation ;
Ref. to acid has pH < 7 / low pH ;

[max 2]

(b) (i) repeat without indicator ;
using same volumes of solutions ;

[2]

(ii) evaporation / heating to remove water ;

[1]

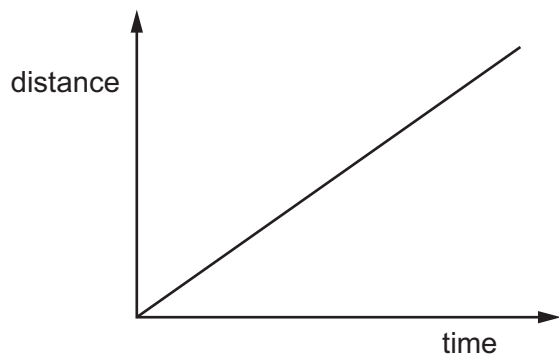
[Total: 7]

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0653	21

- 5 (a) (i) **A** cell membrane ;
B vacuole ; [2]
- (ii) **X** label line to green area and **Y** label line to white area ;
green color contained in chloroplasts ;
which are only present in cell X ;
or
white area does not contain chlorophyll/chloroplasts ;
which are absent from cell Y ; [3]
- (iii) black/blue black or shaded area matching green area of leaf and labelled black ; [1]
- (iv) chlorophyll/chloroplasts needed to make starch/for photosynthesis/to trap light ; [1]
- (b) (i) enzyme is denatured ;
not the optimum pH for the enzyme ; [2]
- (ii) pancreas/salivary glands/small intestine/stomach ; [1]
- [Total: 10]**

- 6 (a) (i) weight of the aircraft: **R** ;
thrust of the engines: **Q** and force of the brakes **S** (both needed, correct way round) ; [2]
- (ii) thrust and braking force equal and opposite ;
unbalanced forces needed to move/accelerate (the aircraft) ; [2]
- (b) (i) chemical (energy) [1]
- (ii) kinetic (energy) ;
gravitational/potential (energy) ; [2]
- (iii) heat/sound ; [1]

(c)



[1]

[Total: 9]

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0653	21

- 7 (a) (i) returns carbon/carbon dioxide back to air/produces carbon dioxide from sugar/glucose ; [1]
- (ii) sugar/glucose + oxygen → carbon dioxide + water [2]
LHS ; RHS ;
- (iii) grass → rabbit → fox/grass → rabbit → decomposer ;; [2]
(1 mark for correct organisms in right order, 1 mark for correct arrows)
- (iv) feed on dead/decaying bodies/waste ;
release carbon/carbon dioxide back to the air ;
during respiration ; [max 2]
- (b) (i) combustion/burning of fossil fuels (produces carbon dioxide) ;
reduces carbon dioxide removal by photosynthesis; [2]
- (ii) (increases) global warming/description of consequences ; [1]

[Total: 10]

- 8 (a) infra-red ;
evaporates ;
molecules ; [3]
- (b) mercury absorbs energy (from Sun)/mercury expands as temperature increases ;
mercury particles move faster/mercury particles get further apart ; [2]

(c)

higher frequency				lower frequency		
gamma radiation	X-rays	ultraviolet	visible	infra-red	microwave	radio waves

any one in its correct box ;
second one in correct box ;
third and fourth in correct boxes ; [3]

- (d) sound needs medium to travel through/can't travel through a vacuum/empty space ;
region between Sun and Earth is a vacuum ; [2]

[Total: 10]

Page 6	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0653	21

- 9 (a) (i) copper oxide + carbon $\rightarrow$ copper + carbon dioxide
LHS ; RHS ; [2]
- (ii) copper oxide (loses oxygen so) is reduced ;
carbon (gains oxygen so) is oxidised ; [2]
- (b) no reaction (between copper and dilute hydrochloric acid) ;
copper is below hydrogen in the reactivity series ; [2]
- (c) (sulfur dioxide) dissolves in rain / atmospheric water / forms acid rain ;
collects in lakes / rivers etc. ;
damages plants / animals ;
effect of gas on respiratory system ;
other correct ; [max 3]

[Total: 9]

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2014 series

0653 COMBINED SCIENCE

0653/22

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.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2014 series for most Cambridge IGCSE[®], Cambridge International A and AS Level components and some Cambridge O Level components.

® IGCSE is the registered trademark of Cambridge International Examinations.

Page 2	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0653	22

- 1 (a) copper oxide (loses oxygen so) is reduced / copper ions gain electrons ;
carbon (gains oxygen so) is oxidised ; [2]

- (b) (i) electrodes correctly labelled anode and cathode ;
electrolyte labelled ; [2]

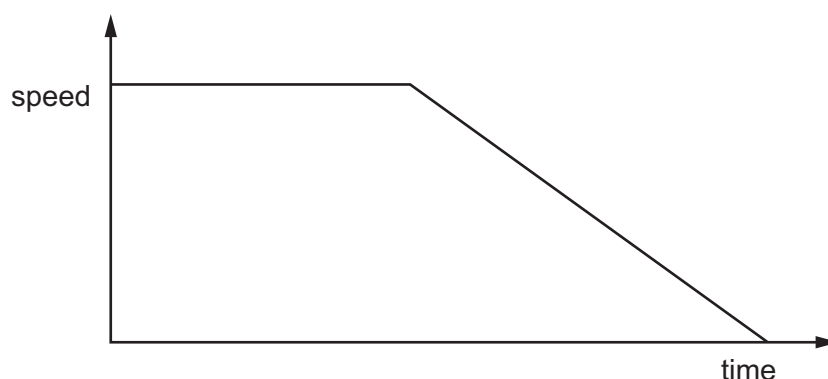
- (ii) at the positive electrode bromine and at the negative electrode lead ;
lead appears as a, grey / metallic, deposit / bead of molten metal ;
bromine, is a brown gas / causes a brown colouration of electrolyte ; [3]

[Total: 7]

- 2 (a) (i) speed = distance/time / (time =)distance / speed ;
 $200/40 = 5$ (s) ; [2]

- (ii) $40 \text{ m/s} = 40 \times 60 \times 60 \text{ m/h} (= 144\,000 \text{ m/h})$;
 $40 \times 60 \times 60 \text{ m/h} = 40 \times 60 \times 60 / 1000 \text{ km/h} = 144 \text{ (km/h)}$; [2]

(b)



- horizontal straight line ;
followed by descending line, straight or curved, to meet time axis ; [2]

- (c) (i) (400 N – no mark)
for constant speed, forces must be equal and opposite (owtte) ; [1]

- (ii) chemical energy in the rider ;
heat/thermal energy during braking ;
allow sound [2]

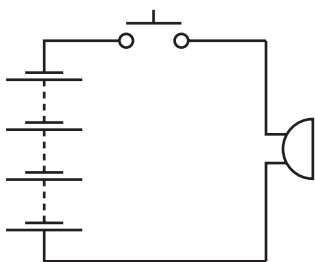
[Total: 9]

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0653	22

- 3 (a) **A** trachea ;
B bronchiole ; [2]
- (b) breathing rate increase ;
volume / depth (of breathing) increased ; [2]
- (c) (i) more carbon dioxide in exhaled air / less carbon dioxide in inhaled air ; [1]
- (ii) (after exercise) exhaled air contains more carbon dioxide / ora ;
use of numbers from data (e.g. exhaled air contains about four times
as much carbon dioxide) ; [2]
- (iii) no carbon dioxide present ;
not enough carbon dioxide in air to show a result ; [2]

[Total: 9]

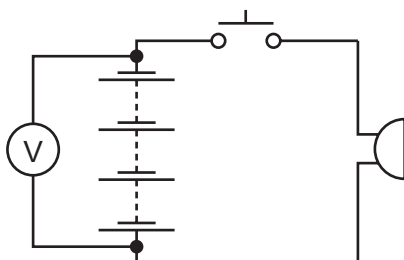
- 4 (a) (i)



complete series circuit ;
battery of 4 cells connected correctly ;

[2]

- (ii)



symbol with correct connections (both required)

[1]

- (b) (i) number of vibrations / waves per unit time ; [1]
- (ii) amplitude increased ;
frequency unchanged ; [2]

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0653	22

(c) (i) resistance = $6 / 2 = 3$;
(units) ohms / Ω ; [2]

(ii) current increased / doubled ;
in parallel circuits, the current from the source is larger than the current in each branch /
owtte) ;
resistance is lower ; [max 2]

[Total: 10]

5 (a) (i)

	in nucleus	outside nucleus
number of protons	6	0
number of neutrons	6	0
number of electrons	0	6

column correct ; column correct ; [2]

(ii) equal numbers of protons and electrons ;
equal numbers of positive and negative charges ;
protons are positive and electrons are negative ; [max 2]

(b) (i) natural gas / petroleum / refinery gas / rice fields / from biodegradation / digestive
activity of ruminants ; [1]

(ii) methane + oxygen $\rightarrow$ carbon dioxide + water
LHS ; RHS ; [2]

(c) (i) CH_4 ; [1]

(ii) covalent ; [1]

(iii) 2 ; [1]

[Total: 10]

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0653	22

6 (a) infra-red ; [1]

(b) molecules have more energy so more of them are moving faster (owtte) ;
more molecules have enough KE / moving fast enough to escape (from surface) ; [2]

(c) need a medium for conduction & convection / no medium in space (owtte) ; [1]

(d)

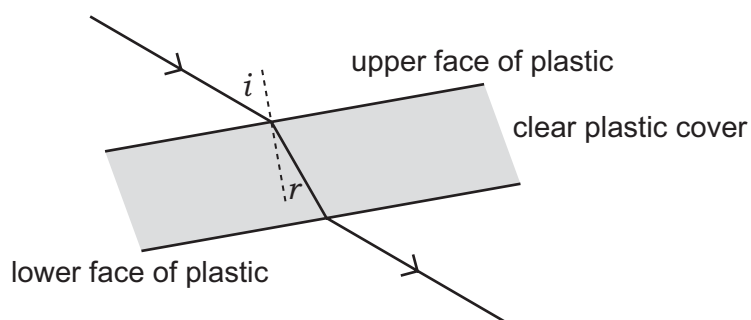


Fig 2.2

refracted ray in plastic bent towards normal ;
normal drawn at upper face with angles of incidence and refraction correctly marked ;
emergent ray parallel to incident ray ; [3]

[Total: 7]

7 (a) (i) phototropism ; [1]

(ii) more / better absorption of light ;
more / better photosynthesis ;
any statement about light hitting leaves at right angles / not at an angle ; [max 2]

(iii) sensitivity ;
movement ;
growth ; [max 2]

(b) (i) shoot **X** bends towards the light / responds ;
shoots **Y** and **Z** do not ; [2]

(ii) the tip of the shoot detects the light / controls the response ;
because no response occurs when tip is covered/removed ; [2]

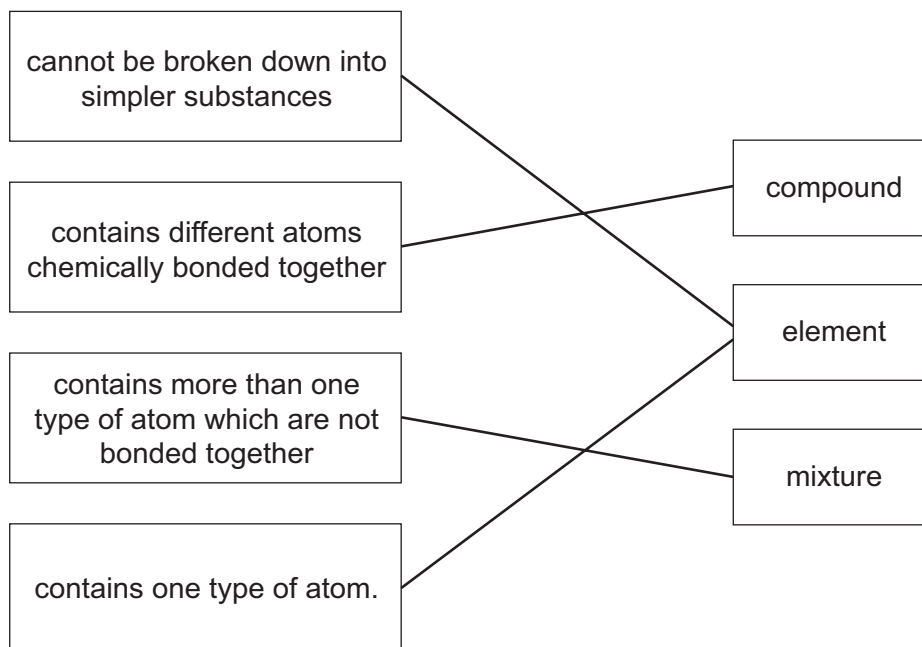
(c) gives more glucose into blood ;
increases pulse rate ;
makes more energy available from respiration / speeds up metabolism ; [max 2]

[Total: 11]

Page 6	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0653	22

- 8 (a) workable filtration equipment ;
collection of filtrate ;
evaporation ; [3]

(b)



[4]

- (c) (i) aluminium (atoms) lose electrons ;
sulfur (atoms) gain electrons ;
electrons are transferred from aluminium to sulfur (atoms) ;; [max 2]

- (ii) Al_2S_3 ; [1]

[Total: 10]

- 9 (a) (i) cervix correctly labelled ;
vagina correctly labelled ; [2]

- (ii) ovary correctly labelled ; [1]

- (b) (i) oviduct / fallopian tube ; [1]

- (ii) uterus ;
(embedded) in lining ; [2]

- (c) sharing needles / blood transfusions / avp ; [1]

[Total: 7]

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2014 series

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 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.

Cambridge is publishing the mark schemes for the October/November 2014 series for most Cambridge IGCSE[®], Cambridge International A and AS Level components and some Cambridge O Level components.

® IGCSE is the registered trademark of Cambridge International Examinations.

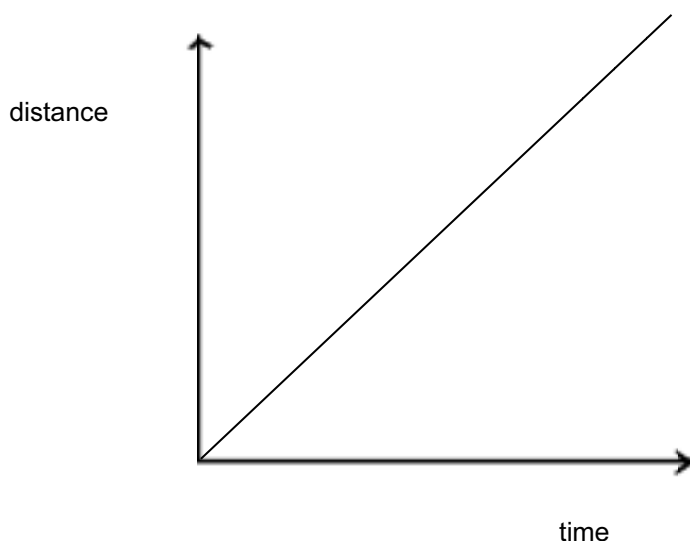
Page 2	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0653	23

- 1 (a) (i) Fe_2O_3 ; [1]
- (ii) iron has reacted with oxygen in the air/water rises to take the place of the oxygen ; [1]
- (iii) $79 \pm 1 \text{ cm}^3$;
allow higher value with explanation of allowance for volume
of iron and cotton wool [1]
- (iv) nitrogen ; [1]
- (b) no/less rusting and no/less movement of the liquid ;
rusting requires water (vapour)/less water (vapour) available ; [2]
(giving credit for appreciation that air initially contained some water vapour)
- (c) painting/oil/plating/more reactive metal ;
exclusion of water/oxygen/air ; [2]

[Total: 8]

- 2 (a) (i) the weight of the canoe and the man: **T** ;
the force propelling the canoe forward: **U** ;
the friction due to water resistance: **S** ;
3 correct 2 marks, 2 correct 1 mark [max 2]
- (ii) water current balances propulsion force (owtte) ;
unbalanced forces needed to move/accelerate (the canoe) ; [2]

(b)



straight line ;

[1]

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0653	23

- (c) (i) chemical (energy) ; [1]
- (ii) kinetic (energy) ; [1]
- (iii) heat/sound/kinetic energy of the water ; [1]

- (d) speed = distance/time *or* (time =) distance/speed ;
time = $2400/2 = 1200$ (s) ; [2]

[Total: 10]

- 3 (a) premolar/molar ; [1]

- (b) (i) decay had reached the pulp cavity/nerve ; [1]

- (ii) bacteria/plaque in the mouth ;
feed on sugar ;
secrete acids ;
acids attack the enamel ; [max 3]

- (c) small pieces make the food easier to swallow ;
increases surface area of food ;
speeds up enzyme action/gives better access to enzymes/
ref. to faster/more efficient digestion ; [max 2]

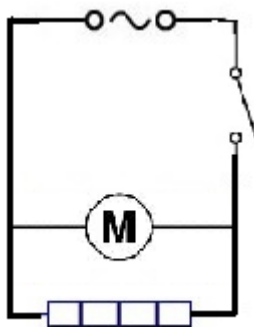
- (d) breaks down large molecules ;
into small (molecules) ;
that can be absorbed into the blood/by small intestine ; [3]

- (e) no (no mark)
enzymes are affected by pH ;
enzyme will not be at optimum/optimum is acidic pH ;
enzyme will be denatured ; [max 2]

[Total 12]

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0653	23

4 (a)



complete circuit ;
all components in correct positions (motor and heater either way round) ; [2]

(b) heating (the water) gives molecules more energy ;
more water molecules have enough energy to escape (from hair) ;
(allow any or all points in any equivalent wording, or showing deeper understanding of molecular motion) [2]

(c) convection ; [1]

(d) (i) volt ; [1]

(ii) $220/5 = 44$;
ohm/ Ω ; [2]

(e) (i) short circuit (accept other reasonable ideas which might lead to fuse melting) ; [1]

(ii) 10A (no mark)
2A and 5A fuses would blow ;
15A fuse gives less protection than 10A fuse ; [2]

[Total 11]

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0653	23

- 5** (a) (i) geotropism ; [1]
- (ii) makes sure roots grow downwards/does not matter which way up the seed is planted (the roots will always grow downwards) ;
to anchor plant ;
to absorb mineral ions/water/nutrients ; [max 2]
- (iii) radicle curves round 180° ; [1]
- (b) (i) no sex cells/no gametes involved/only one parent ; [1]
- (ii) seeds have resulted from fusion of gametes/sex cells/haploid nuclei/
involve two parents ; [1]
- (iii) plants from runners will be identical and from seeds will show variation ;
ref. to genetically ; [2]
- [Total 8]**
- 6** (a) flame ;
explosion/pop ; [2]
- (b) (i) (measurement of) mass ;
(measurement of) time ; [2]
- (ii) repeat at different temperatures under same conditions ; [1]
- (iii) increase in temperature causes increase in rate of reaction ; [1]
- (c) (i) Period 4/transition elements/metals/series ; [1]
- (ii) no reaction/no change in mass ;
copper less reactive than hydrogen/below hydrogen in reactivity series ; [2]
- [Total 9]**

Page 6	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0653	23

- 7 (a) (i) visible light ;
radio waves and ultra-violet (both required for mark) ; [2]

- (ii) reflection ; [1]

- (b) (i) number of vibrations/cycles/oscillations per unit time (accept per second) ; [1]

- (ii)

gamma radiation	X ;				microwaves	
-----------------	-----	--	--	--	------------	--

[1]

- (c) brighter ; [1]

[Total 6]

- 8 (a) (i) as the length increased, the time taken (for the acid to reach the centre) increased ;
increase is not linear/not proportional ; [2]

- (ii) 6.5 minutes (allow 0.5 minutes tolerance) ;
20 minutes (allow 0.5 minutes tolerance) ; [2]

- (iii) time taken for oxygen/food to reach all the parts/middle of
the cell would be (too) long ; [1]

- (b) large surface area/thin/biconcave disc ; [1]

[Total 6]

Page 7	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0653	23

- 9 (a) (i) anode ;
cathode ;
(in that order) [2]
- (ii) copper ;
pink/brown deposit ; [2]
- (iii) chlorine ;
bleaching of litmus paper ;
ignore reference to red or pink colouration [2]
- (b) compound
mixture
element
element
compound
5 or 4 correct for 2 marks, 3 or 2 correct for 1 mark ;; [max 2]
- (c) (i) an element consists of one type of atom and a compound contains different
atoms/elements (bonded together) ; [1]
- (ii) the composition of a mixture is variable and a compound contains a fixed proportion of
elements ;
a compound contains atoms/elements bonded together/which are difficult to separate
and a mixture is easier to separate ; [max 1]

[Total: 10]