

MARK SCHEME for the May/June 2015 series

0654 CO-ORDINATED SCIENCES

0654/23

Paper 2 (Core Theory), maximum raw mark 120

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)	element	group in Periodic Table	group name	reactive / unreactive	electrical conductor / insulator
	A	(1)	(alkali metals)	(reactive)	conductor
	B	(7)	(halogens)	reactive	insulator
	C	(0)	noble/inert gases	unreactive	(insulator)

(1 for each column) ; ; ; [3]

(b) proton number / protons in the nucleus ; [1]

(c) (i) (X)
number of neutrons in X is $10 - 5 = 5$ / or similar statement ; [1]

(ii) isotopes / nuclides ; [1]

(d) (i) hydrogen ; [1]

(ii) increases ;
an alkali / sodium hydroxide is produced ; [2]

(iii) slower evolution of gas / less exothermic / takes longer for lithium to react completely ;
because lithium is less reactive / higher up Group 1 ; [2]

[Total: 11]

2 (a) (i) all symbols correct ;
all in series ; [2]

(ii) (current) = voltage / resistance ;
 $= 4.5 / 5 = 0.9$;
A / ampere ; [3]

(iii) 10Ω ; [1]

(b) (i) (angle of) incidence ; [1]

(ii) (angle of) reflection ; [1]

(iii) angle C will double ; [1]

[Total: 9]

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – May/June 2015	0654	23

- 3 (a) (i) 2002 ; [1]
- (ii) not diagnosed / people not seeing a doctor ; [1]
- (b) sex ; exchange of sexual fluids
needle sharing
(contaminated) blood transfusions ; mother to baby [max 2]
- (c) (i) decreases ;
from 5800 to 3100 / by 2700 / to about half ; [2]
- (ii) better education ;
screening blood transfusions ;
use of condoms ;
free needles for drug addicts ;
AVP ; [max 2]
- [Total: 8]**
- 4 (a) (i) electrons ; [1]
- (ii) move apart / repel ;
because like charges repel each other ; [2]
- (b) (i) sound waves are reflected ; [1]
- (ii) 166 m ; [1]
- (iii) speed = distance / time ;
= 166 / 0.5 = 332 m / s ;
allow ecf [2]
- (c) gases contract when cooled ;
gas particles move more slowly when cooled / have less energy ;
particles exert less pressure on balloon walls / hit walls less frequently / energetically ;
particles are close(r) together ; [max 2]
- (d) (i) upward force is greater than downward force / resultant upward force ; [1]
- (ii) density = mass / volume ;
= 2660 / 2800 = 0.95 kg / m³ ; [2]
- [Total: 12]**

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – May/June 2015	0654	23

- 5 (a) heat ;
leave for rest of water to evaporate ; [2]
- (b) (i) so it has equal numbers of protons and electrons ;
so their charges are balanced / cancel out / protons have positive charge and electrons
have negative charge ;
because it has a larger number of protons than electrons ; [3]
- (ii) (sodium and chloride) ions have opposite electrical charges / opposite charges attract ; [1]
- (c) (i) electrolysis ; [1]
- (ii) oppositely charged / cathode is negative and anode is positive ; [1]
- (iii) hydrogen ; [1]
- [Total: 9]**
- 6 (a) (i) transpiration ; [1]
- (ii) arrow labelling the surface of a cell in contact with the air ; [1]
- (iii) stoma / stomata ; [1]
- (iv) high temperature ;
low humidity ; arid / dry
air movements / winds
light ; [max 2]
- (b) (i) palisade / mesophyll / cells Q ;
many chloroplasts ; [2]
- (ii) entry of CO₂ ; [1]
- [Total: 8]**
- 7 (a) (i) (K) no mark
(rusting requires) air / oxygen and water present (together) ;
correct ref. to O and H₂O
test-tube J contains no water ; [2]
- (ii) painted / (chrome) plating / enamelling / etc. ; [1]
- (iii) idea that paint (etc.) forms as a barrier to air / oxygen and water ; [1]

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – May/June 2015	0654	23

- (b) (i) L and M ;
the pH of water is 7 ; [2]
- (ii) (M) no mark
transition metals form coloured oxides / the oxide is red ; ; [1]
- (iii) (phosphorous oxide) no mark
forms an acidic oxide ;
is a non-metal oxide / phosphorus is a non-metal ; ; [2]
- (c) (i) magnesium + oxygen → magnesium oxide ; [1]
- (ii) thermal energy / heat given out / temperature increases (during reaction) ; [1]
- (iii) magnesium sulphate ; [1]

[Total: 12]

- 8 (a) water ;
turbine ; [2]
- (b) (i) chemical ; [1]
- (ii) sound or thermal / heat ; [1]
- (iii) some energy is lost / not all energy input changed into electrical energy ; [1]
- (c) geothermal and nuclear ; [1]
- (d) (i) radiation is ionising ;
ionising radiation causes cancer in humans, etc. ; [2]
- (ii) radiation cannot penetrate thick concrete ; [1]
- (e) carbon dioxide / water vapour ; [1]
- (f) (i) too dry / too wet / too warm / need to move to cooler habitat ; [1]
- (ii) flooding / loss of land ; [1]
- (g) cannot be replaced once used ; [1]

[Total: 13]

Page 6	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – May/June 2015	0654	23

- 9 (a) both increasing ;
Group 2 increasing faster ; [2]
- (b) (i) growth/repair ; [1]
- (ii) energy ; [1]
- (c) calcium ;
for bones ;
or
iron ;
for blood ; [2]
- (d) poor bone growth ; [1]
- (e) no other variables / fair test ; [1]
- (f) they grow more slowly, because no milk / vitamins ;
or
continue to grow for a while as Group 2 did / because no milk / vitamins ; [1]
- (g) movement ;
respiration ;
sensitivity ;
growth ;
reproduction ;
excretion ; [max 2]
- [Total: 11]**
- 10 (a) (i) fractional distillation / fractionation ; [1]
- (ii) heated / boiled ; [1]
- (iii) hydrocarbon / alkane ; [1]
- (iv) C₈ H₁₈ ; [1]
- (b) (i) sulfur dioxide ; [1]
- (ii) causes acid rain ;
harms animal / plant life ;
causes corrosion of metals / stonework ;
may cause breathing difficulties / asthma / irritate respiratory system ; [max 3]
- [Total: 8]**

Page 7	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – May/June 2015	0654	23

- 11 (a) chemical reactions ;
 breaking down nutrient molecules ;
 in cells ;
 releasing energy ; [1]
- (b) glucose + oxygen (on the left) ;
 water (on the right) ; [1]
- (c) (i) arrows on diagram – in on the left, out on the right ; [2]
- (ii) (flask 2) to show no CO₂ in incoming air ;
 (flask 3) to show CO₂ produced by animal ; [1]
- (iii) one clear, one milky ;
 flask 2 clear, flask 3 milky ; [1]
- [Total: 9]**
- 12 (a) (i) X at two minutes ; [1]
- (ii) A written anywhere on section from 1.5 min – 2 mins ; [1]
- (iii) K written anywhere on section from 0 mins – 1.5 mins ; [1]
- (b) (i) radio waves first box ;
 visible light fourth box ; [2]
- (ii) satellite TV/mobile phone communication ; [1]
- (iii) frequency or wavelength ; [1]
- (iv) B ;
 E ; [2]
- (c) use a magnet – steel will be attracted/ steel is magnetic and aluminium will not be
 attracted/ aluminium is not magnetic ; [1]
- [Total: 10]**