

CAMBRIDGE INTERNATIONAL EXAMINATIONS
Cambridge International General Certificate of Secondary Education

MARK SCHEME for the May/June 2015 series

0654 CO-ORDINATED SCIENCES

0654/23

Paper 2 (Core Theory), maximum raw mark 120

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Page 2	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – May/June 2015	0654	23

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) C_8H_{18} ; [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
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- 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]**