



---

**CO-ORDINATED SCIENCES**

**0654/23**

Paper 2 Core Theory

**May/June 2016**

MARK SCHEME

Maximum Mark: 120

---

**Published**

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 May/June 2016 series for most Cambridge IGCSE<sup>®</sup>, Cambridge International A and AS Level components and some Cambridge O Level components.

Page 2	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – May/June 2016	0654	23

- 1 (a) (i) malleability ; [1]  
(ii) unreactive (with acids) ; [1]
- (b) (i) alloy ; [1]  
(ii) alloy is stronger ;  
so can withstand the increased pressure inside the can ; [2]
- (c) (i) electrolysis ; [1]  
(ii) label line goes to any point on the back line showing the cathode ; [1]  
(iii) oxygen ; [1]
- (d) (i) reference to electron loss ; [1]  
(ii)  $Al_2O_3$  ; [1]
- [Total: 10]**

- 2 (a) (i) X = red blood cell ;  
Y = plasma ; [2]  
(ii) carries oxygen ; [1]  
(iii) (named type of) white blood cells ;  
platelets ; [2]
- (b) atrium ;  
artery ;  
pulmonary ;  
ventricle ;  
renal ; [5]
- [Total: 10]**

- 3 (a) oil is less dense than sea water ; [1]
- (b) (i) 0.50 (m) ; [1]  
(ii) 4 (m) ; [1]  
(iii) 0.1 (Hz) ; [1]
- (c) (i) coal and natural gas in non-renewable column ; [1]

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – May/June 2016	0654	23

(ii) geothermal, hydroelectricity, solar, waves, tidal  
any two in renewable column ; [1]

(d) (i) 20 000 (Hz) (allow 25 000 Hz) ; [1]

(ii) 20 (Hz) (allow 10 Hz) ; [1]

(iii) (distance =) speed  $\times$  time or  $1500 \times 1.2$  ;  
= 1800 m and then divide by 2 = 900 (m) ; [2]

**[Total: 10]**

4 (a) grass  $\rightarrow$  zebra  $\rightarrow$  lion  $\rightarrow$  flea  
four organisms in correct order ;  
correct arrows ; [2]

(b) (i) producers ; [1]

(ii) consumers ; [1]

(iii) herbivores/primary consumers ; [1]

(c) (i) carbon dioxide ; [1]

(ii) carbohydrate/sugar/protein/any correct organic compound ; [1]

(iii) carbon dioxide ; [1]

**[Total: 8]**

5 (a) lamps in parallel/all symbols correct ;  
all else correct ;; [2]

(b) visible placed between UV and IR ; [1]

(c) all droplets have opposite charge to panel and so are attracted ; [1]

(d) concrete road expands when hot ;  
rubber can be squashed to allow for expansion ;  
to prevent road from breaking when hot ; [max 2]

(e) laterally inverted ;  
upright ;  
virtual ; [max 2]

**[Total: 8]**

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – May/June 2016	0654	23

- 6 (a) (i) XX ; [1]  
(ii) X ; [1]  
(iii) XY ; [1]  
(iv) X/Y ; [1]
- (b) zygote ; [1]
- (c) (i) P on the oviduct ;  
Q on the uterus ; [2]  
(ii) R = oviduct ;  
S = ovary ; [2]  
(iii) produces/releases egg cells/hormones ; [1]
- [Total: 10]**
- 7 (a) oxygen ; [1]
- (b) (i) 2.5 ; [1]  
(ii) increase temperature / increase concentration of J /  
increase the surface area of manganese dioxide ; [1]  
(iii) 2.0 (g) ;  
catalysts are not consumed / permanently changed ; [2]  
(iv) forms a coloured compound ;  
reference to use as catalyst ; [2]
- [Total: 7]**
- 8 (a) (i) single arrow going down ; [1]  
(ii) convection ; [1]
- (b) (mass =) density  $\times$  volume or  $0.92 \times 300$  ;  
= 276 (g) ; [2]
- (c) A and all particles touching ;  
regularly arrangement ; [2]
- (d) (i) (R =)  $V/I$  ;  
 $220/0.04$  (= 5500  $\Omega$ ) ; [2]

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – May/June 2016	0654	23

(ii) 2750 ( $\Omega$ ) no mark  
combined resistance of resistors in parallel is less than the value of either resistor ; [1]

(e) (i) radiation that ionises atoms/removes electrons from atoms ; [1]

(ii) alpha/beta/gamma/X rays ; [1]

(iii) cancer, cell mutation etc. ; [1]

[Total: 12]

9 (a) (i) third/3 ; [1]

(ii) sodium ; [1]

(iii) a silicon atom/nucleus contains 14 protons ; [1]

(iv) 15 ; [1]

(v) equal numbers of protons as electrons/  
protons and electrons balance/cancel each other ;  
protons are positive and electrons are negative ; [2]

(vi) generally decrease (left to right) across the period ; [1]

(b) (i) noble/inert gases ; [1]

(ii) argon highly unreactive/does not react with caesium ;  
oxygen/water (from air) react easily with caesium ; [2]

(c) (i) iodine is produced ; [1]

(ii) chlorine sterilises/kills harmful microorganisms ;  
reference to removing risk of disease ; [2]

[Total: 13]

10 (a) growth/movement ;  
sensitivity ; [2]

(b) (i) phototropism ; [1]

(ii) stem would grow upwards anyway, with or without light/no control  
experiment ;  
growing against/responding to, gravity ; [2]

(iii) helps get light for photosynthesis ; [1]

[Total: 6]

Page 6	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – May/June 2016	0654	23

- 11 (a) (i) section from 0–20 s ;  
section from 20–40 s ;  
section from 40–45 s ; [3]
- (ii) chemical ;  
kinetic ; [2]
- (b) arrow labelled **E** going downwards ;  
arrow labelled **F** going to the left ; [2]
- (c) (i) angle of incidence correctly labelled ; [1]
- (ii) 45° ;  
angle of incidence = angle of reflection ; [2]
- [Total: 10]**

- 12 (a) (i) natural gas / coal / peat ; [1]

(ii)

X
✓
X
✓

(4 correct = 2, 2 or 3 correct = 1) [2]

- (b) (i) to separate the compounds in petroleum /  
to produce simpler mixtures ;  
(unrefined) petroleum is not useful / fractions are useful / owtte ; [2]
- (ii) (physical)  
the idea that only changes of state are involved ;  
new substances are not produced ; [2]
- (c) (i) (catalytic / thermal) cracking ; [1]
- (ii) (O)  
it is a hydrocarbon ;  
it is unsaturated / contains a double bond / fits  $C_nH_{2n}$  ; [2]

**[Total: 10]**

- 13 (a) for food / oxygen ; [1]

<b>Page 7</b>	<b>Mark Scheme</b>	<b>Syllabus</b>	<b>Paper</b>
	<b>Cambridge IGCSE – May/June 2016</b>	<b>0654</b>	<b>23</b>

- (b) (i) if closer then warmer / more light ; (ORA) [1]
- (ii) needed for photosynthesis / for turgor / as solvent ; [1]
- (iii) (yes – no mark) because needed for photosynthesis ; [1]
- (iv) more oxygen / less CO<sub>2</sub> ;  
due to photosynthesis ; [2]

**[Total: 6]**