



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CO-ORDINATED SCIENCES

0654/23

Paper 2 Core Theory

May/June 2016

MARK SCHEME

Maximum Mark: 120

Published

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- 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]

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(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 1500×1.2 ;
= 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]

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- 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 0.92×300 ;
= 276 (g) ; [2]
- (c) A and all particles touching ;
regularly arrangement ; [2]
- (d) (i) (R =) V/I ;
 $220/0.04$ (= 5500 Ω) ; [2]

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(ii) 2750 (Ω) 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]

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- 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]

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- (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 CO₂ ;
due to photosynthesis ; [2]

[Total: 6]