**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]

**(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 × time or 1500 × 1.2 ;
= 1800 m and then divide by 2 = 900 (m) ; [2]

**[Total: 10]**

**4 (a)** grass → zebra → lion → 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]**

**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 × 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]

**(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]**

**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) (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 $CO_2$ ;
due to photosynthesis ; [2]

**[Total: 6]**