

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

Cambridge International General Certificate of Secondary Education

**MARK SCHEME for the May/June 2015 series**

**0654 CO-ORDINATED SCIENCES**

**0654/22**

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.

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Page 2	Mark Scheme	Syllabus	Paper
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- 1 (a) mass is a measure of amount of matter in an object ;  
weight is the gravitational force pulling on the object ;  
mass will be the same throughout the universe but weight will depend on the gravitational field strength ;  
mass is measured in kg weight is measured in N ; [max 2]
- (b) (i) kinetic (energy) ; [1]  
(ii) (gravitational) potential energy ; [1]
- (c) (i) **B and D**, and **A and C** (either order) ;  
**B and D** ; [2]  
(ii) equal ; [2]  
opposite ; [2]
- (d) (i) **B–C** – horizontal line means constant speed ; [1]  
(ii) **A–B or C–D** – (diagonal line means) speed is changing ; [1]
- [Total: 10]**

- 2 (a) red  
blue ;  
colourless/white/is bleached ;  
(allow red then white but not blue then white)  
(red and blue correct = 1 chlorine result correct = 1) [2]
- (b) (i) increases ; [1]  
(ii) 7 ;  
mixture is neutral/the acid has been neutralised ; [2]
- (c) (i) limewater/calcium hydroxide/slaked lime ; [1]  
(ii) goes cloudy/milky/white precipitate ; [1]  
(iii) calcium chloride ;  
water ;  
in either order [2]  
(iv) increase acid concentration ;  
increase (acid) temperature ;  
increase surface area (of calcium carbonate)/smaller particle size ; [max 2]
- [Total: 11]**

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- 3 (a) (labels, from top left)  
photosynthesis ;  
respiration ;  
combustion ; [3]
- (b) arrow from plants to animals ;  
ignore arrow from died and decaying matter to animals [1]
- (c) more photosynthesis (than respiration and decay) in spring/summer ;  
more decay/respiration (than photosynthesis) in autumn ; [2]
- (d) (increase – no mark)  
plants remove less CO<sub>2</sub> from atmosphere ;  
by photosynthesis ;  
removed trees form dead matter ;  
and decay to produce more CO<sub>2</sub> ;  
burning wood/ combustion release CO<sub>2</sub> ; [max 2]

**[Total: 8]**

4 (a)

description	element symbol(s)
it is an unreactive gas	Ne
it oxidises to form rust	Fe
its atoms have the lowest proton number	H
they are good electrical conductors	Na K Fe Cu
they are transition metals	Fe Cu
they combine to form sodium chloride	Na Cl

1 mark for each completely filled box ; ; ; ; ; ; [6]

- (b) (i) 13 ; [1]
- (ii) Group 4 – silicon ;  
4<sup>th</sup> period – calcium ; [2]
- (c) (i) (KF)  
reference to metal combining with non-metal ; [1]
- (ii) reference to gain of electrons / outer shell is completed /  
outer shell electron number goes from 7 to 8 /  
the ion now has a single negative charge ; [1]

**[Total: 11]**

Page 4	Mark Scheme	Syllabus	Paper
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- 5 (a) (i) 1955 ; [1]
- (ii) 330 (g/m<sup>2</sup>) ; [1]
- (b) (i) identify/choose highest yielding plants ;  
use these for breeding/repeat over many generations/check for appearance of  
undesirable characteristics ; [2]
- (ii) more/better/use of fertiliser ;  
better pest control ;  
irrigation ;  
new varieties of wheat from outside ;  
better soil quality ;  
better weather ; [max 2]
- (c) disease/drought/flood/frost/AVP ; [1]
- (d) disease resistance/pest resistance/hardiness/taste/nutrient content/high germination  
rate ; [1]
- [Total: 8]**
- 6 (a) friction ;  
transfer of electrons/charged particles ; [2]
- (b) (i) symbols for lamp and switch correct in a working circuit ;  
lamps connected in parallel ;  
switch in correct position to control both lamps ; [3]
- (ii) still a complete circuit for the other lamp ; [1]
- (iii) current = voltage/resistance ;  
= 12/2 = 6 A ; [2]
- (c) (i) quieter ; [1]
- (ii) transverse waves oscillate at right angles to direction of wave/energy transfer ;  
longitudinal waves oscillate parallel to direction of wave/energy transfer ; [2]
- [Total: 11]**

Page 5	Mark Scheme	Syllabus	Paper
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- 7 (a) ovary ; [1]
- (b) (i) oviduct/fallopian tube ; [1]
- (ii) prevents egg reaching uterus/sperm cannot reach egg / prevents fertilisation/ sperm cannot enter fallopian tube ; [1]
- (c) (i) chemical substance produced by gland ;  
carried in the blood ;  
affects / alters activity of target organs ;  
destroyed in liver ; [max 3]
- (ii) ovary labelled on Fig. 7.1 ; [1]
- [Total: 7]**
- 8 (a) (i) 46.6% ; [1]
- (ii) nitrogen 78% ;  
oxygen 21% ; [2]
- (b) (i) reduction ; [1]
- (ii) compounds are broken down by electrical energy / by passing an electric current through them ;  
contains (mobile) ions/ a compound that conducts ;  
the negative electrode ; [max 3]
- (c) (i) malleability ; [1]
- (ii) unreactive / will not react with food / catch fire in oven  
high melting point / will not melt during cooking ;  
other science based ideas, e.g. reflects heat back into food ; [max 2]
- [Total: 10]**

Page 6	Mark Scheme	Syllabus	Paper
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- 9 (a) (i) (time) = distance/speed ;  
= 50/1500 = 0.03(3)(s) ; [2]
- (ii) cannot hear (no mark)  
max human audible frequency is 20000 Hz ; [1]
- (b) ray from head bends at surface ;  
enters eye ; [2]
- (c) (i) temperature at which a liquid boils and turns into a vapour ; [1]
- (ii) thermal energy transferred to (water) particles (from surroundings)/ particles gain KE/move faster when heated ;  
water changes from liquid to vapour/gas ;  
ref. to attraction between particles in the liquid ;  
fastest moving particles escape ;  
(escape) at surface/ref to process happening at temperature below boiling point ;  
average energy of the rest of the particles reduced/thermal energy removed from liquid ; [max 3]
- (d) (i) B because most particles are touching and randomly arranged ; [1]
- (ii) C because particles are widely spaced and randomly arranged ; [1]
- [Total: 11]**
- 10 (a) (i) root hair (cell) ; [1]
- (ii) cell wall ;  
nucleus ; [2]
- (b) absorbs mineral ions/nitrate/magnesium (ions)/other named mineral ion ; [1]
- (c) (i) transpiration ; [1]
- (ii) leaves/stomata/mesophyll ; [1]
- (d) for photosynthesis ;  
as part of cytoplasm/for growth ;  
support/turgor ;  
for transport (of ions/sugars) ; [max 1]
- [Total: 7]**

Page 7	Mark Scheme	Syllabus	Paper
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- 11 (a) (i) cracking ; [1]
- (ii) (alkene)  
ref. to double bond / conforms to general formula  $C_nH_{2n}$  ; [1]
- (iii) orange ;  
to colourless ; [2]
- (b) (i) (addition) polymerisation ; [1]
- (ii) several G symbols linked into a chain (minimum 4) ; [1]
- (iii) (white solid is hydrocarbon)  
made of the elements hydrogen and carbon ;  
only ;
- OR
- G** is a hydrocarbon and so **Gs** linked must be hydrocarbon ;  
because no other elements are included ; [2]
- [Total: 8]**

- 12 (a) incisor ; [1]
- (b) (structure) larger ;  
two roots ;  
flatter ;  
[max 2 for structure]  
(function) grinding / crushing ;  
T1 for biting ; [max 3]
- (c) breaks into small pieces ;  
(so) easier to swallow ;  
more surface area for enzyme action ; [max 2]
- (d) removes plaque / bacteria ;  
removes sugar / food remnants ;  
which encourage bacteria ;  
removes / neutralises acid ; [max 2]
- (e) flossing ;  
avoiding sugary / sticky foods ;  
avoiding snacks between meals ;  
mouthwash ;  
fluoride ;  
regular dental checks / professional cleaning / sealing ; [max 2]

**[Total: 10]**

Page 8	Mark Scheme	Syllabus	Paper
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- 13 (a) (i) removes electrons from atoms/turns atoms to ions ; [1]
- (ii) repeated exposure to X-rays is harmful ;  
X-rays are harmful to humans/cause cancer, etc. ;  
metal screen stops X-rays penetrating ; [max 2]
- (iii) X-rays in 6<sup>th</sup> box ;  
 $\gamma$  rays in 7<sup>th</sup> box ; [2]
- (b) (i) reflection continues through fibre with angle approx. correct ; [1]
- (ii) total internal reflection ;  
angle of incidence always exceeds critical angle ; [max 1]
- (c) it can pass through the human body **and** it is safer than  $\alpha$  or  $\beta$  radiation ;  
(both required for 1 mark) [1]

**[Total: 8]**