

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

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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]**

Page 3	Mark Scheme	Syllabus	Paper
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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 CO₂ from atmosphere ;
 by photosynthesis ;
 removed trees form dead matter ;
 and decay to produce more CO₂ ;
 burning wood/ combustion release CO₂ ; [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 ;
 4th 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) $330 \text{ (g/m}^2\text{)}$; [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 ;
 $= 12/2 = 6 \text{ A}$; [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 6th box ;
 γ rays in 7th 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 α or β radiation ;
(both required for 1 mark) [1]

[Total: 8]