

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2015 series

0654 CO-ORDINATED SCIENCES

0654/33

Paper 3 (Extended 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.

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 October/November 2015 series for most Cambridge IGCSE[®], Cambridge International A and AS Level components and some Cambridge O Level components.

© IGCSE is the registered trademark of Cambridge International Examinations.

Page 2	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2015	0654	33

1 (a) (i) fat ;
vitamin D ; [2]

(ii) $\frac{825}{275}$;
 $\times 100 = 300$; [2]

(b) may not be absorbed as efficiently ;
may be more than the baby needs ;
some nutrients destroyed during preparation/storage ; [max 1]

(c) contains antibodies ;
cheaper ;
no need for sterilisation/etc. ;
always available ;
helps in forming mother-baby bond ;
at the right temperature ;
reduced chance of the mother developing breast/ovarian cancer ; [max 2]

[Total: 7]

2 (a) (i) neutralisation ; [1]

(ii) idea of greater precision/accuracy ; [1]

(b) (i) evidence of moles = concentration \times volume ;
use of volume in dm^3 ;
(e.g. $0.1 \times 20.0/1000 = \underline{0.002}$ (moles))
OR
(conversion of cm^3 to dm^3) $20.0 \div 1000$;
(moles = concentration \times volume) 0.1×0.02 or 0.002 moles ; [max 2]

(ii) 40 cm^3 ;
this is volume required for neutrality/pH 7 ; [2]

(iii) any idea that amounts of acid and alkali are the same at the neutral point ;
so if twice the volume of acid then acid concentration is half of alkali
 $= 0.1 \div 2 = \underline{0.05}$ (mol/dm^3) ;
OR
no. of moles HCl = no. of moles NaOH/0.002 ;
concentration of HCl = $\frac{\text{moles}}{\text{volume}} = \frac{0.002}{40 \times 10^{-3}} = 0.05$; [max 2]

[Total: 8]

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2015	0654	33

3 (a)

(gamma)	X-ray	ultraviolet	(visible)	infra-red	(micro-waves)	radio
---------	-------	-------------	-----------	-----------	---------------	-------

[1]

(b) black surfaces are better (radiation) absorbers than white surfaces ; [1]

(c) (i) label line where both rays meet ; [1]

(ii) real image can be formed on screen/virtual image cannot ; [1]

(d) (i) (pressure =) $\frac{\text{force}}{\text{area}}$;
evidence of multiplication by 2/use of area of 24 cm² ;
 $= \frac{20}{24} = 0.83 \text{ (N/cm}^2\text{)} ;$ [3]

(ii) 8300 (Pa) ; [1]

(e) (i) collide with walls of container ;
force of collisions exerts a pressure ; [2]

(ii) $P_1V_1 = P_2V_2$ etc. ;
 $P_2 = 20\,000 \times \frac{0.015}{0.065} = 4615 \text{ (kPa)} ;$ [2]

[Total: 12]

4 (a) $2\text{Mg(s)} + \text{CO}_2\text{(g)} \rightarrow 2\text{MgO(s)} + \text{C(s)}$
1 mark: correct formulae ; 1 mark: balanced ; 1 mark: state symbols ; [3]

(b) (i) Mg ion moves/is attracted to the negative electrode/cathode ;
Mg ion moves because of the attractive force between opposite charges ;
Mg ion is discharged/gains 2 electrons ; [3]

(ii) magnesium is reactive/too reactive/aqueous solution produces hydrogen
and not magnesium ; [1]

(iii) chlorine ;
 Cl_2 ; [2]

[Total: 9]

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2015	0654	33

5 (a) meiosis ;
different ;
halved ;
haploid ; [4]

(b) repair/replacement ;
growth ;
asexual reproduction ; [3]

[Total: 7]

6 (a) distance = area under graph **or** working ;
 $= (\frac{1}{2} \times 30 \times 20) + (30 \times 20) + (\frac{1}{2} \times 20 \times 20) = 1100 \text{ (m)} ;$ [2]

(b) (work done =) force \times distance ;
 $800 \times 1500 = 1200000 \text{ (J)} ;$ [2]

(c) (i) (power =) $V \times I ;$
 $= 12 \times 4.5 = 54 \text{ (W)} ;$ [2]

(ii) (resistance =) $\frac{V}{I} ;$
 $= \frac{12}{4.5} = 2.7 \text{ (}\Omega\text{)} ;$ [2]

(iii) use of $\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} ;$
 $= \frac{1}{2.7} + \frac{1}{24}$ so $R_T = 2.43 \text{ (}\Omega\text{)} ;$ [2]

[Total: 10]

7 (a) xylem ; [1]

(b) water evaporates by transpiration ;
which causes a tension/pull from above ;
water moves down water potential gradient ;
cohesion/cohesive (forces) between water molecules ; [4]

(c) (i) (coloured) water does not move as far ; [1]

(ii) (coloured) water does not move as far ; [1]

[Total: 7]

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2015	0654	33

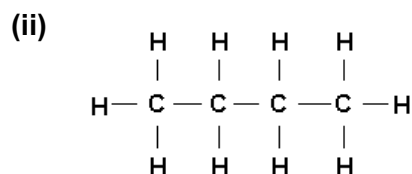
8 (a) petroleum/crude oil ;
fractional distillation ; [2]

(b) (i) nitrogen combines with oxygen ;
both these gases are contained in air/high temperature facilitates combination ; [2]

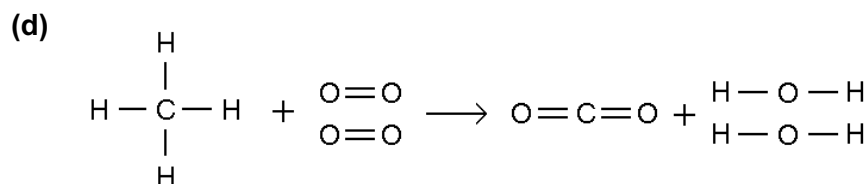
(ii) reference to formation of acidic rain or its effects ;
reference to harmful effects on respiratory systems ; [max 1]

(iii) (waste gases pass over) catalytic converter/a catalyst ; [1]

(c) (i) hydrocarbon/general formula C_nH_{2n+2} ;
containing only single bonds/which is saturated ; [2]



four carbon atoms in chain ;
 $2n+2$ hydrogen atoms and no other element ;
only C-H single bonds ; [3]



1 mark for correct diagrams for **oxygen** and **water** ; 1 mark: balanced ; [2]

[Total: 13]

9 (a) (i) aluminium/lead/concrete ; [1]

(ii) 3 half-lives ;
900 (years) ; [2]

(b) wires cut magnetic field/changing magnetic field ;
induces current/emf ;
direction of relative movement changes every half turn ;
current changes direction every half turn ;
slip rings maintain continuous connection ; [max 3]

Page 6	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2015	0654	33

(c) easier/quicker to magnetise iron ;
easier/quicker for iron to lose its magnetism/ steel forms permanent magnet ; [max 1]

(d) (charge =) current \times time ;
= $24 \times 60 = 1440$;
C ; [3]

[Total: 10]

10 (a) (i) nowhere for the animal to live ;
loss of food sources ; [2]

(ii) logging ;
building of roads/towns/factories ;
farming ;
fuel ; [max 2]

(iii) loss of soil/flooding/build-up of carbon dioxide/global warming ; [1]

(b) control of hunting/nature reserve/conservation area ;
(captive) breeding programmes ;
alternatives to timber/control of deforestation/replanting ;
AVP ; [max 2]

(c) part of the food chain/AW ; [1]

[Total: 8]

11 (a) (i) increases (from Li) to C/positive in Groups I to IV ;
decreases from N (to Ne)/negative in Groups V to VIII ;
maximum occurs at carbon ; [max 2]

(ii) silicon/Si ; [1]

(b) reference. to allotropes/two allotropes correctly named/reference to different
structures/correct detail of structures, e.g. reasonable diagrams/idea that atoms
have different spacing ; [max 1]

(c) 16 electrons ;
arranged 2,8,6 ; [2]

Page 7	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2015	0654	33

(d) (i) ionic/electrovalent ; [1]

(ii) LiF ;
 then [max 2] from:
 reference to complete outer shells ;
 detail of electron transfer, e.g. Li atom lose one electron and F atom gains one ;
 detail of ionic charges, i.e. Li⁺ and F⁻ ; [max 3]

[Total: 10]

12 (a) 70 (kg) ;
 mass does not depend on/ change with gravitational field strength ; [2]

(b) (KE =) $\frac{1}{2}mv^2$;
 $= \frac{1}{2} \times 1\,500\,000 \times 2\,500 \times 2\,500 = 4.7 \times 10^{12}$ (J) ;
 $= 4.7 \times 10^9$ (kJ) ; [3]

(c) (i) sound waves cannot travel through space/vacuum **or** sound waves
 need a medium ; [1]

(ii) ((speed =) $\frac{\text{distance}}{\text{time}} =$) $\frac{2.25 \times 10^{11}}{750}$ **or** $2.25 \times 10^8 \times \frac{1000}{750}$
 $= (3 \times 10^8 \text{ m/s})$; [1]

(iii) 3×10^8 (m/s) ; [1]

[Total: 8]

13 (a) release of energy ;
 inside cells/by breaking down food substances ;
 using oxygen ; [3]

(b) (i) does not use oxygen ; [1]

(ii) releases less energy ; [1]

(c) (i) kills (unwanted) microorganisms ;
 prevents spoilage/production of toxins ; [2]

(ii) respire anaerobically ;
 produces alcohol ;
 produces carbon dioxide ; [3]

(iii) poisoned by alcohol/no sugar/glucose left/AVP ; [1]

[Total: 11]