

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2014 series

0654 CO-ORDINATED SCIENCES

0654/21

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) (i) potassium chloride ; [1]
- (ii) potassium (atom) loses (an) electron/becomes positively charged ;
chlorine atom gains (one) electron/becomes negatively charged ;
the ions become bonded together/form a compound ;
the ions become bonded together/form a compound ; [max 2]
- (b) (i) electrolysis ; [1]
- (ii) label line to negative electrode (**not** the connecting wire) ;
label line into the liquid shown in the container ; [2]
- (iii) damp litmus/indicator paper ;
is bleached ; [2]
- (c) (i) anode suffered no change in mass and cathode gained (0.3g) mass ; [1]
- (ii) copper deposited on the cathode (adding mass) ; [1]
- [Total: 10]**
- 2 (a) (i) 46 ; [1]
- (ii) Y-chromosome correctly circled ; [1]
- (b) units of heredity/can be passed on to the next generation ;
code for (specific) proteins/code for control of a particular cell activity ;
are regions/part of DNA ; [max 2]

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(c)

parents

phenotypes

female

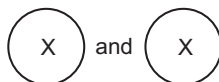
male

sex chromosomes

XX

XY

gametes



and



chromosomes and phenotypes of offspring

		male gametes	
female gametes		XX (female)	XY (male)
		XX (female)	XY (male)

ratio

..... 1 : 1

gametes correctly shown X, (X), X, Y ;
 parents gametes correctly placed in table ;
 offspring genotypes correctly shown ;
 1:1, 2:2 or 50/50 ;

[4]

(d) (i) as temperature increases percentage of females increases;

[1]

(ii) 29(°C);

[1]

(iii) more females would hatch/ORAs ;
reduced fertility of the population/owtte ;

[2]

[Total: 12]

3 (a) (i) 12(m/s) ;

[1]

(ii) no – speed never drops to x-axis (0);

[1]

(b) becomes louder – amplitude increases ;
lower pitch – frequency decreases ;

[2]

(c) (R) = $\frac{V}{I}$;
 = $\frac{12}{4}$ = 3 ;
 Ω ;

[3]

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(d) (as temperature increases) **kinetic** energy/velocity of molecules increases ;
 increased force/energy of collisions ;
 increased frequency of collisions ;
 collisions with walls of tyre ; [max 3]

(e) (i) opposite charges attract ; [1]

(ii) like charges repel ; [1]

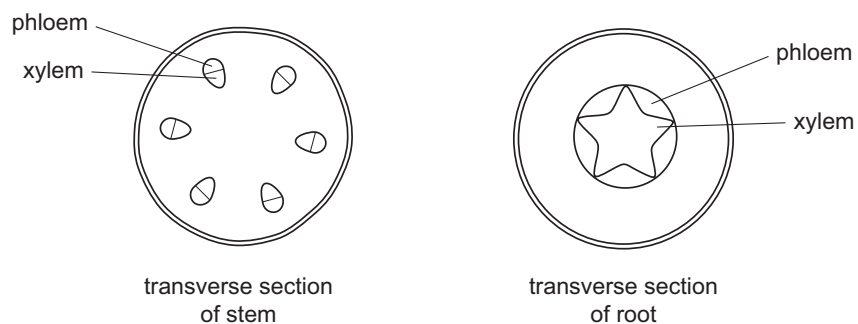
[Total: 12]

4 (a) evaporation of water ;
 from (surfaces of) mesophyll/palisade cells ;
 (followed by) loss of water (vapour) through stomata ; [max 2]

(b) (i) arrow drawn going upwards ; [1]

(ii) nitrate/magnesium/named mineral ion ; [1]

(c) (i) star-shaped (cross shaped) xylem tissue in middle, phloem in the angles ;
 xylem correctly labelled ;
 phloem correctly labelled ;



[3]

(ii) translocation/transport of sugar/sucrose/amino acids ; [1]

(d) root hair cells ; [1]

[Total: 9]

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- 5 (a) (i) hydrogen ; [1]
- (ii) lighted splint causes 'pop' ; [1]
- (iii) greater than 2 but less than 7 ;
some of the acid has reacted / been used up / concentration of acid reduced ;
so acid concentration is lower / lower concentration means higher pH ; [max 2]
- (b) (i) 18(°C) ; [1]
- (ii) copper does not react with dilute acid / there is no reaction ; [1]
- (iii) (E) – no mark
the temperature decreases ; [1]
- (c) in tube **A** the metal has higher surface area / greater degree of division ;
(metal in) tube **A** magnesium is more reactive than zinc / or could just say metal
in **A** more reactive ;
reaction in **A** is more exothermic so higher temperature produces higher rate of
reaction / reacts faster ; [max 2]
- [Total: 9]**
- 6 (a) straight lines drawn (bouncing off fibre walls) which reach the end of the optical
fibre ;
angles approximately correct ; [2]
- (b) (i) energy ; [1]
- (ii) γ more ionising / γ higher frequency / lower wavelength / higher energy ; [1]
- (c) (i) 13(°C) ; [1]
- (ii) cork mat is insulator / prevents conduction ; [1]
- (iii) **B** – rises more than **A** / gets hotter than **A** ; [1]
- (iv) idea of different surfaces ;
dark / dull absorb more heat etc. ; [2]
- [Total: 9]**

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- 7 (a) (i) respiration ; [1]
- (ii) glucose + oxygen ;
water ; [2]
- (b) 3.2 to 3.3 minutes ; [1]
- (c) more oxygen ;
more glucose ;
for (muscle) respiration ;
more CO₂ removed ; [max 2]
- (d) blood carries more oxygen ;
better oxygen supply to muscles/for respiration/have more aerobic
respiration/have less anaerobic respiration ; [2]
- [Total: 8]**
- 8 (a) (i) *background radiation* – (ionising) radiation constantly present in the natural
environment of the Earth (which is emitted by natural and artificial sources) ; [1]
- (ii) 800 (cpm) ; [1]
- (iii) background radiation from nuclear power generation very small percentage etc. ; [1]
- (b) *advantage* – no decommissioning costs/no radiation problems ;
disadvantage – uses up valuable fossil fuels/uses non-renewable fuels (if
explained)/atmospheric pollution/CO₂ produced/contributes to global warming ; [2]
- (c) (i) diagram showing a series circuit ;
diagram showing a parallel circuit ; [2]
- (ii) if one lamp does not work it will not affect the other lamps ;
lamps can be switched on and off independently ;
each lamp gets full mains voltage/full brightness ; [max 2]
- [Total: 9]**

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- 9 (a) (i) ethane and ethene ;
contain only hydrogen and carbon ; [2]
- (ii) (ethene)
contains (C to C) double bond / does **not** contain maximum possible
hydrogen ; [1]
- (b) (i) solvent / fuel / in drinks / other correct ; [1]
- (ii) steam ; (allow water vapour and water)
label line into the liquid shown in the container ; [1]
- (iii) substance that speeds up a reaction ;
remains (chemically) unchanged / is not used up ; [2]
- (c) (i) ethene molecules join together / double bond breaks ;
to form a long chain molecule (at least 3 molecules) ; [2]
- (ii) addition ;
polymerisation ; [2]
- [Total: 11]**

- 10 (a) (i) distance between two identical points on two successive waves ; [1]
- (ii) 0.2 waves are produced per second / pass a fixed point per second ;
the ions become bonded together / form a compound ; [1]
- (iii) vibrations in different directions ;
longitudinal vibrations move in same direction as wave / energy moves ;
transverse vibrations move at right angles to direction that wave / energy
moves ; [max 2]
- (b) (i) (time) = $\frac{\text{distance}}{\text{speed}}$;
 $= \frac{33600}{5.6} = 6000(\text{s})$; [2]
- (ii) random arrangement (at least 10 particles shown) ;
most touching ;
label line into the liquid shown in the container ; [max 2]
- (iii) (density) = $\frac{\text{mass}}{\text{volume}}$;
 $= \frac{32000}{4} = 8000(\text{kg/m}^3)$; [2]

[Total: 10]

Page 8	Mark Scheme	Syllabus	Paper
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- 11 (a) **A** = cell membrane ;
B = nucleus ; [2]
- (b) produces bile ;
stores glycogen ;
controls blood glucose ;
breaks down poisons/toxins/alcohol ;
destroys hormones ;
removes products of red blood cell breakdown ;
produces urea ; [max 2]
- (c) cell wall ;
chloroplasts ;
vacuole ;
elongated / more regular shape ;
no centrioles ; [max 3]
- (d) $\frac{45}{0.03}$;
= (x) 1500 ; [2]
- (e) vessel – hepatic artery
function – transport of oxygen for reactions that take place;
vessel – (hepatic) portal vein
function – transport absorbed food / nutrients;
vessel – hepatic vein
function – removing waste products / deoxygenated blood; [max 2]
- [Total: 11]**
- 12 (a) (i) number of protons in atom/nucleus ;
total of protons and neutrons in atom/nucleus ;

total of protons and neutrons in atom/nucleus ;
contain only hydrogen and carbon ; [2]
- (ii) (higher)
N is a metal / solid **P** is a gas ;
the ions become bonded together / form a compound; [1]
- (iii) **L** ;
idea that **L** and **O** in same group / properties similar within groups / same
number of outer shell electrons ; [2]
- (b) covalent ;
reference to two non-metals / gas at room temperature ; [2]

Page 9	Mark Scheme	Syllabus	Paper
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(c) (i) $526.2 - 524.0 = 2.2(\text{g})$; [1]

(ii) 1.0 dm^3 is 1000 cm^3 ;
so mass dissolved is $2 \times 2.2 = 4.4(\text{g})$;

OR

$500\text{ cm}^3 = 0.5\text{ dm}^3$;

$\frac{2.2}{0.5} = 4.4(\text{g})$;

[max 2]

[Total: 10]