

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

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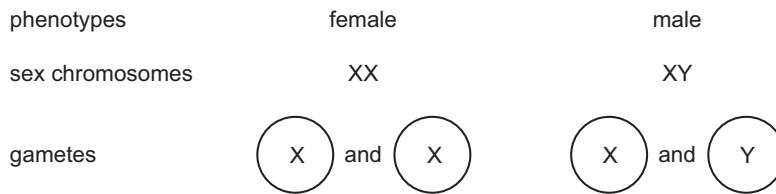
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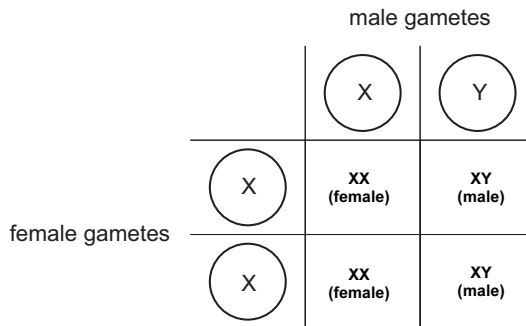
- 1 (a) (i) potassium chloride ; [1]
- (ii) potassium (atom) loses (an) electron/becomes positively charged ;
chlorine atom gains (one) electron/becomes negatively charged ;
the ions become bonded together/form a compound ;
the ions become bonded together/form a compound ; [max 2]
- (b) (i) electrolysis ; [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]

(c)

parents



chromosomes and phenotypes of offspring



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]

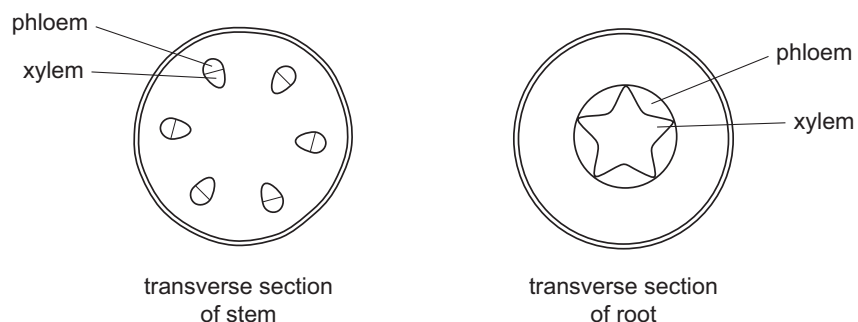
[Total: 12]

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]

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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]

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(c) (i) $526.2 - 524.0 = 2.2$ (g); [1]

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

OR

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

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

[max 2]

[Total: 10]