CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2014 series

0654 CO-ORDINATED SCIENCES

0654/23 Paper 2 (Core Theory), maximum raw mark 120

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CAMBRIDGE
International Examinations

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 (0.3 g) 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

phenotypes	female	male
sex chromosomes	XX	XY
gametes	X and X	X and Y

chromosomes and phenotypes of offspring

female gametes \ male gametes	X	Y
X	**XX (female)**	**XY (male)**
X	**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 / ORA ;
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]

(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 <u>charges</u> attract ; [1]

(ii) like charges repel ; [1]

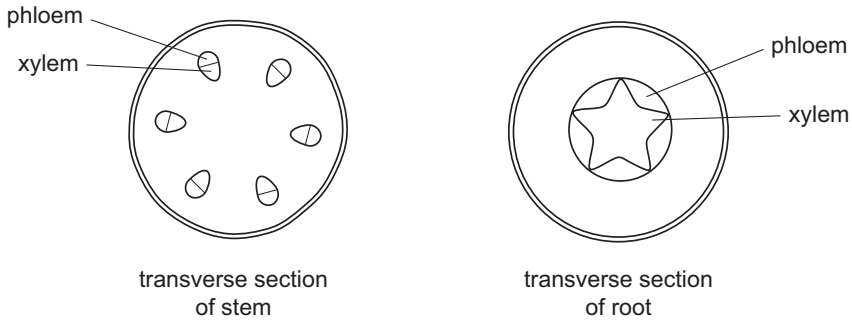
[Total: 12]

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]

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]

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 CO_2 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 / CO_2 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]

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) $(\text{time}) = \frac{\text{distance}}{\text{speed}}$;

$= \frac{33600}{5.6} = 6000\,(\text{s})$; [2]

(ii) random arrangement (at least 10 particles shown) ;
most touching ;
label line into the liquid shown in the container ; [max 2]

(iii) $(\text{density}) = \frac{\text{mass}}{\text{volume}}$;

$= \frac{32000}{4} = 8000\,(\text{kg/m}^3)$; [2]

[Total: 10]

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]

(c) (i) 526.2 – 524.0 = 2.2 (g); [1]

(ii) 1.0 dm^3 is 1000 cm^3 ;
so mass dissolved is 2 × 2.2 = 4.4 (g) ;
OR
500 cm^3 = 0.5 dm^3;
$\frac{2.2}{0.5}$ = 4.4 (g); [max 2]

[Total: 10]