Index Number	Class	Name

CHIJ ST JOSEPH'S CONVENT
SEMESTRAL ASSESSMENT 2

O O

SCIENCE (CHEMISTRY)

Secondary 1 Express

Monday, 10 October 2016
50 minutes

Candidates answer on the Question Paper.
Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write your index number, class and name on all the work you hand in.
Write in dark blue or black pen.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A
There are **ten** questions. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C**, and **D**.
Choose the **one** you consider correct and record your choice in soft pencil on the separate answer sheet.
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Section B
Answer **all** questions in the spaces provided.

The number of marks is given in brackets [ ] at the end of each question or part question.
Show all your working on the same page as the rest of the answer.
Omission of essential working will result in loss of marks.
Electronic calculator may be used in this paper.
The total of the marks for this paper is **40**.

A copy of the Periodic Table is printed on page 14.

FOR EXAMINER'S USE	
A	
B	
Total	40

This document consists of 14 printed pages.

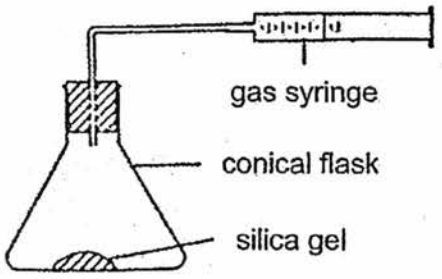
Setter(s) : Mrs Tang Hui Sun and Ms Ho Yan Yi

Section A (10 marks)

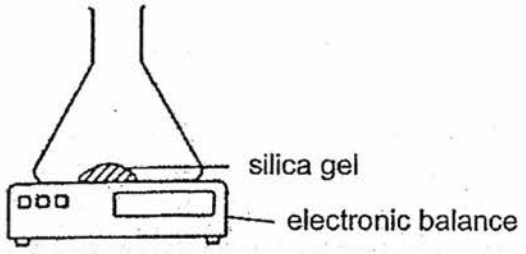
Answer **all** questions.

1 Silica gel can be used to limit the growth of mould on leather goods and electronic equipment by absorbing water vapour from the air.
Which of the following methods can be used to study the rate of absorption of water vapour in silica gel in 15 minutes?

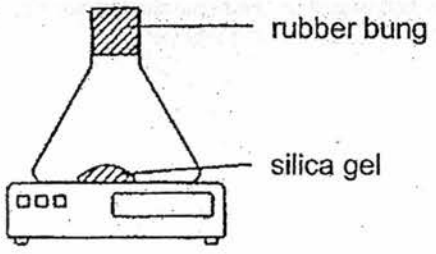
A



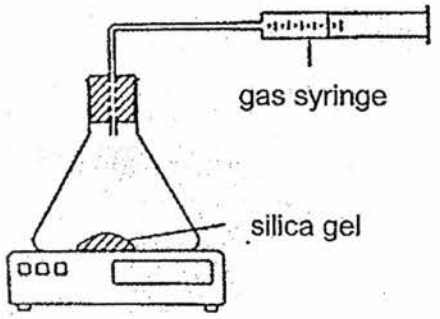
B



C



D



2 An element is found to have the following properties:
- good electrical conductivity,
- shiny in appearance,
- solid at room temperature.

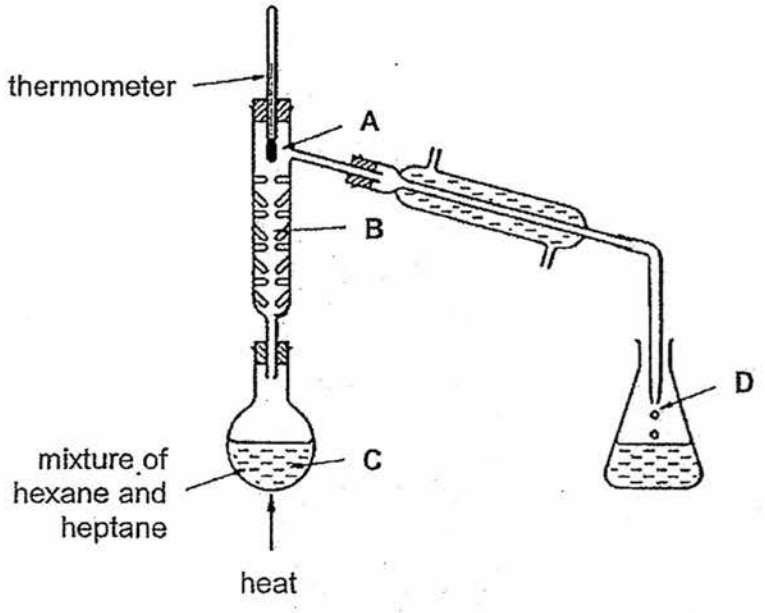
What is the element most likely to be?

A aluminium
B carbon
C nitrogen
D silicon

3 Urea is a compound with the chemical formula, $CO(NH_2)_2$.
Which of the following shows the correct information about one molecule of urea?

	number of elements	number of atoms
A	3	6
B	3	7
C	4	7
D	4	8

4 A mixture of hexane (boiling point, 70°C) and heptane (boiling point, 98°C) was separated by fractional distillation.
When the thermometer shows 70°C, at which point will there be the highest proportion of hexane?



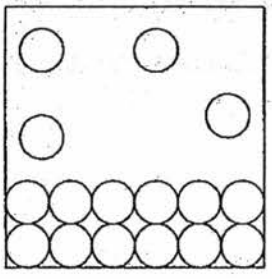
5 Octane and water are immiscible liquids.
Which method could be used to separate a mixture of octane and water and how is the purity of separated octane checked?

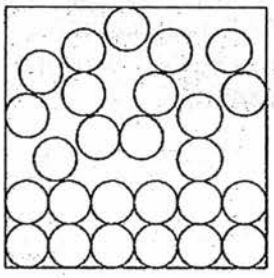
	method of separation	purity check
A	filtration	find the boiling point
B	filtration	obtain a chromatogram
C	using separating funnel	find the boiling point
D	using separating funnel	obtain a chromatogram

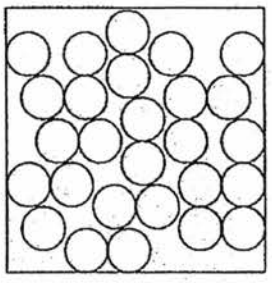
6 Which of the following remains constant when a liquid undergoes freezing?

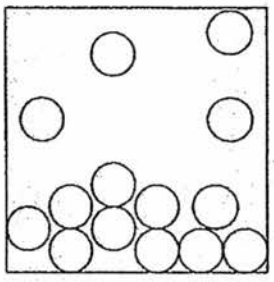
A energy level of particles
B size of particles
C distance between particles
D attractive forces between particles

7 Which of the following best represents the change in arrangement of the particles when ammonium chloride undergoes heating?

A 

B 

C 

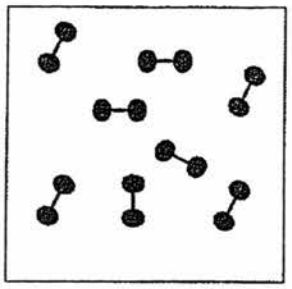
D 

8 Isotopes of the same element contain

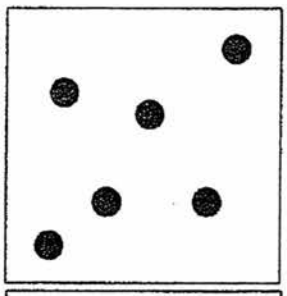
A equal numbers of electrons, protons and neutrons.
B different numbers of electrons, protons and neutrons.
C the same numbers of protons and electrons but a different number of neutrons.
D the same numbers of electrons and neutrons but a different number of protons.

9 Which of the following diagrams represents molecules of methane?

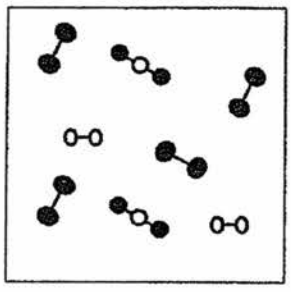
A



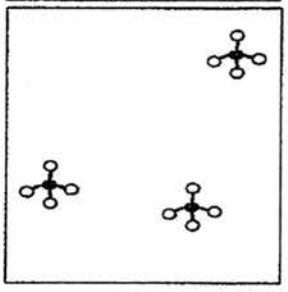
B



C



D



10 Which of the following sub-atomic particles determines the chemical properties of an atom?

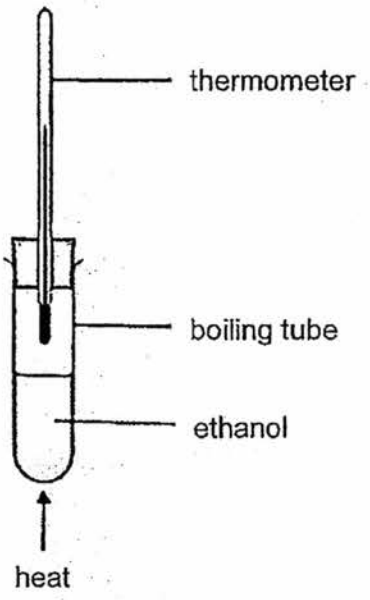
A proton
B neutron
C electron
D nucleus

Section B (30 marks)

Answer **all** questions.

For Examiner's Use

1 The diagram shows the apparatus setup by a student to find the boiling point of ethanol.



Identify a mistake in the setup. Explain your answer and state how you can modify the setup to correct the mistake.

mistake.....

explanation.....

.....

modification.....

..... [2]

For Examiner's Use

2 Information about four substances, **P**, **Q**, **R** and **S** is given below.

Substance **P**: It is a white solid. Only some parts dissolve in an excess of water.
Substance **Q**: It is a white solid formed by burning magnesium in oxygen.
Substance **R**: It is a grey solid which cannot be decomposed into anything simpler.
Substance **S**: It is a blue liquid. When it is distilled, a colourless liquid is collected.

(a) Classify each of the substances as either an element, a compound or a mixture. Complete the table below by placing a tick (✓) in the correct box in each row.

substance	element	compound	mixture
P			
Q			
R			
S			

[4]

(b) State two differences in properties between substances **P** and **Q**.

difference 1.....

.....

difference 2.....

..... [2]

[Turn Over

3 The solubility of three solids in two different solvents, **P** and **Q**, are shown in the table below.

For Examiner's Use

solid	solubility	
	solvent **P**	solvent **Q**
sand	insoluble	insoluble
sulfur	soluble	insoluble
salt	insoluble	soluble

You have a mixture of sand, sulfur and salt.
Describe the steps you would carry out to obtain dry sample of each solid from the mixture.

.....

.....

.....

.....

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.....

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.....

.....

..... [4]

4 Upon reaching home from school, a student realised that someone is baking in the kitchen even though she was just at the doorstep.

For Examiner's Use

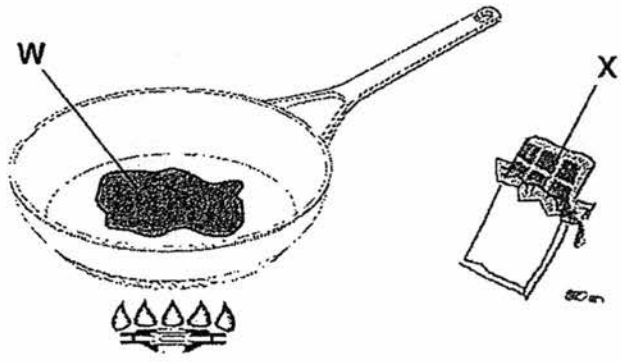
(a) Explain the student's observation.

.....

.....

..... [2]

(b) The student walked to the kitchen and saw her mother heating some chocolate in a pan and there is a bar of chocolate on the table. The diagram below shows what the student saw.



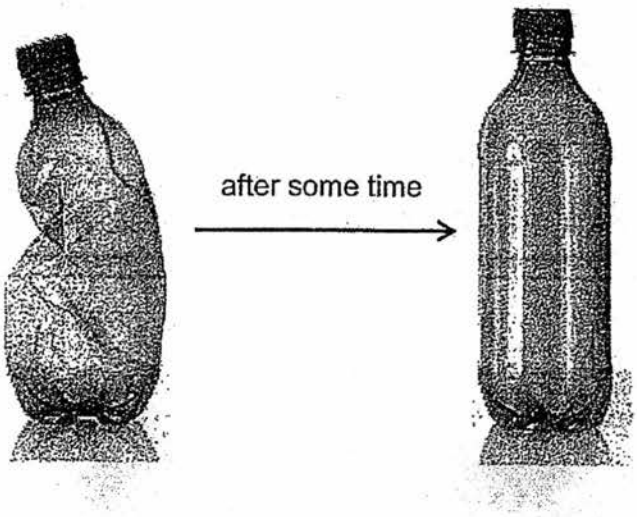
Complete the table below about the characteristics of particles in **W** and **X**.

	W	X
arrangement		
movement		

[2]

(c) The student helps her mother by putting some of the ingredients back in the refrigerator. While doing so, she found a crushed empty plastic bottle in the refrigerator, which was still capped at its opening. She placed the crushed bottle on the kitchen table and the diagram below shows her observation after some time.

For Examiner's Use



(i) Using Kinetic Particle Theory, explain her observation.

.....

.....

.....

.....

.....

.....

(ii) Explain why there was no change in the mass of the bottle and its content.

.....

..... [4]

5 The table below shows some information about the atoms of elements, **Q** and **R**. The letters do not represent the chemical symbols of the elements.

For Examiner's Use

element	atomic number	number of neutrons	mass number
Q	7		14
R	14	14	

(a) **(i)** Complete the table above.

(ii) Draw the full electronic structure of **R** in the space below.

[2]

(b) Explain why the mass number of an atom does not include the number of electrons.

.....

..... [1]

(c) Atoms of element **Q** can form diatomic molecules.
What is a diatomic molecule?

.....

..... [1]

(d) Both elements **Q** and **R** can react with hydrogen to form QH_3 and RH_4. State a similarity and a difference between molecules of QH_3 and RH_4.

For Examiner's Use

similarity.....

.....

.....

difference.....

.....

..... [2]

6 A student found a bottle of an unknown substance in the lab. She realised that the label has fallen off. She found the following information on the bottle.

For Examiner's Use

information:
- melting point = 650°C
- boiling point: 1107°C
- element found in Group II, Period 3

(a) Based on the information above, write the chemical symbol, with proton and nucleon numbers, of the unknown substance in the box below.

[2]

(b) The student did some research online and learnt that atoms of the unknown substance can form ions by losing 2 electrons.

(i) Suggest the charge of the ion formed.

.....

(ii) Explain your answer in **(b)(i)**.

.....

.....

..... [2]

– End of paper –

The Periodic Table of the Elements

Group I	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group 0
							1 H hydrogen 1										4 He helium 2
7 Li lithium 3	9 Be beryllium 4											11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10
23 Na sodium 11	24 Mg magnesium 12											27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	64 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	– Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54
133 Cs caesium 55	137 Ba barium 56	139 La lanthanum 57 *	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	– Po polonium 84	– At astatine 85	– Rn radon 86
– Fr francium 87	– Ra radium 88	– Ac actinium 89 †															

*58-71 Lanthanoid series
†90-103 Actinoid series

140 Ce cerium 58	141 Pr praseodymium 59	144 Nd neodymium 60	– Pm promethium 61	150 Sm samarium 62	152 Eu europium 63	157 Gd gadolinium 64	159 Tb terbium 65	162 Dy dysprosium 66	165 Ho holmium 67	167 Er erbium 68	169 Tm thulium 69	173 Yb ytterbium 70	175 Lu lutetium 71
232 Th thorium 90	– Pa protactinium 91	238 U uranium 92	– Np neptunium 93	– Pu plutonium 94	– Am americium 95	– Cm curium 96	– Bk berkelium 97	– Cf californium 98	– Es einsteinium 99	– Fm fermium 100	– Md mendelevium 101	– No nobelium 102	– Lr lawrencium 103

Key: a = relative atomic mass; X = atomic symbol; b = proton (atomic) number

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).

Sec 1 EXP SA2 Chemistry Answer Key

Section A (10 marks)

1 B	2 A	3 D	4 D	5 C
6 B	7 A	8 C	9 D	10 C

Section B (30 marks)

No.	Marking points	Marks
1	mistake: should not be heated in naked flame explanation: ethanol is flammable modification: heat in water bath **OR** mistake: should not be stoppered explanation: pressure will build up and the boiling tube may break modification: remove the stopper *1m for mistake & explanation ; 1m for modification	1 1
2a	<table><tr><th>substance</th><th>element</th><th>compound</th><th>mixture</th></tr><tr><td>P</td><td></td><td></td><td>✓</td></tr><tr><td>Q</td><td></td><td>✓</td><td></td></tr><tr><td>R</td><td>✓</td><td></td><td></td></tr><tr><td>S</td><td></td><td></td><td>✓</td></tr></table>	1 1 1 1
2b	P melts and boils over a range of temperature but **Q** has fixed melting and boiling points. P has variable composition by mass but **Q** has fixed composition by mass. ** or any correct property*	1 1
3	Add solvent P to dissolve sulfur Filter the mixture to remove sand and salt as residue Evaporate the filtrate to dryness to obtain sulfur Add solvent Q to sand and salt to dissolve salt Filter the mixture to obtain sand as residue Wash sand with a little cold distilled water Dry sand with two sheets of filter paper Evaporate the filtrate to dryness to obtain salt **OR** Add solvent Q to dissolve salt Filter the mixture to remove sulfur and sand as residue Evaporate the filtrate to dryness to obtain salt Add solvent P to sulfur and sand to dissolve sulfur Filter the mixture to obtain sand as residue Wash sand with a little cold distilled water Dry sand with two sheets of filter paper Evaporate the filtrate to dryness to obtain sulfur *1m for 2 correct steps	4

4a

Diffusion has occurred. — 1

Particles of the aroma/ food/ cake moved out randomly in all directions / spread throughout the house. — 1

4b

	W	X
Arrangement	particles are closely packed in disorderly manner	particles are very closely packed in an orderly manner
Movement	particles slide over one another	particles vibrate about fixed positions.

1 1

** deduct 1m if no mention of 'particles'*
*1m for 2 correct points

4ci

When the temperature increases, air particles in the bottle gain heat, they move faster and further apart from one another.
This causes the volume of the air to increase
therefore push the bottle back to its original shape.

*1m for 2 correct points — 3

4cii

no change in the number of air particles in the bottle — 1

5ai

element	atomic number	neutron number	mass number
Q	7	7	14
R	14	14	28

1

5aii

draw 2.8.4, with R or Si written in the center — 1

5b

Electrons have negligible mass compared to protons and neutrons. — 1

5c

A molecule made up of two atoms chemically combined. — 1

5d

Similarities — 1
- Both QH_3 and RH_4 contain hydrogen atoms.
- Both contain two different types of atoms.

Differences — 1
- QH_3 contains 3 hydrogen atoms while RH_4 contains 4 hydrogen atoms.
- QH_3 contains atoms of Q and hydrogen while RH_4 contains atoms of R and hydrogens.
- QH_3 is made up of 4 atoms in total but RH_4 is made up of 5 atoms.

**or any correct similarity or difference*
*1m for 1 correct point

6a

$^{24}_{12}Mg$ — 2

*1m for correct symbol ; 1m for correct proton and nucleon numbers

6bi

+2 — 1
* do not accept "positive charge"

6bii

2 more protons than electrons *or equivalent* — 1

Index Number	Class	Name

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SEMESTRAL ASSESSMENT 2

O **O**

SCIENCE (BIOLOGY)

Secondary 1 EXPRESS

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FOR EXAMINER'S USE	
Total	40

This document consists of 10 printed pages.

Setter(s) : Ms Koh PL and Ms Vera Yuen

[Turn over

Section A (10 marks)

Answer **all** the questions.

1 Which of the following have both cytoplasm and chloroplasts?

A root hair cells

B xylem vessels

C red blood cells

D mesophyll cells

2 Red blood cells have a relatively large surface area.

How does this help the red blood cell carry out its function?

A It can contain more haemoglobin.

B It can absorb oxygen at a faster rate.

C It can move more quickly through the blood.

D It can pass through narrow blood vessels easily.

3 The pancreas is a human organ that secretes proteins involved in digestion.

Which of the following organelles is **not** likely to make up a large part of a pancreatic cell?

A golgi apparatus

B ribosomes

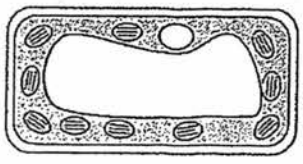
C rough endoplasmic reticulum

D smooth endoplasmic reticulum

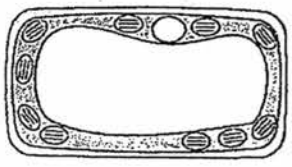
4 Which of following best describes the process of diffusion?

	type of molecules	direction of movement	presence of partially permeable membrane
A	solute	high to low solute concentration	no
B	solute	low to high solute concentration	yes
C	water	high to low water potential	no
D	water	low to high water potential	yes

5 The diagram shows the results of an experiment, where two plant cells were placed in solutions X and Y respectively for 30 minutes.



solution X



solution Y

Which process took place in the experiment and what was the relative water potentials of solutions X and Y?

	process	water potential
A	osmosis	solution X has higher water potential than solution Y
B	diffusion	solution X has lower water potential than solution Y
C	osmosis	solution X has lower water potential than solution Y
D	diffusion	solution X has higher water potential than solution Y

6 Which processes can take place in a muscle cell when oxygen is not available?

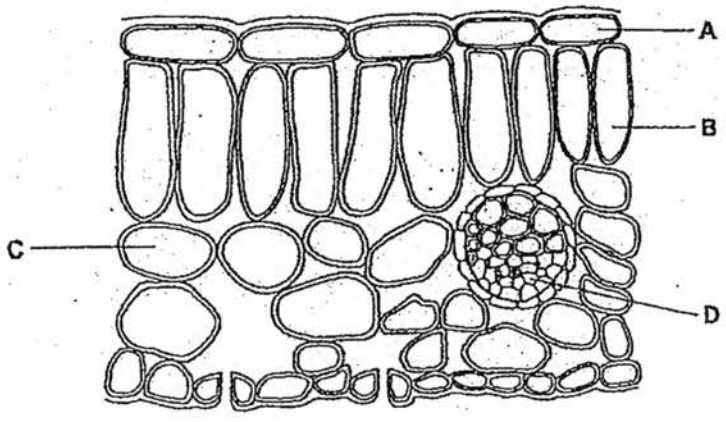
I osmosis
II diffusion
III active transport
IV aerobic respiration

A I and II only
B III and IV only
C I, II and IV only
D II, III and IV only

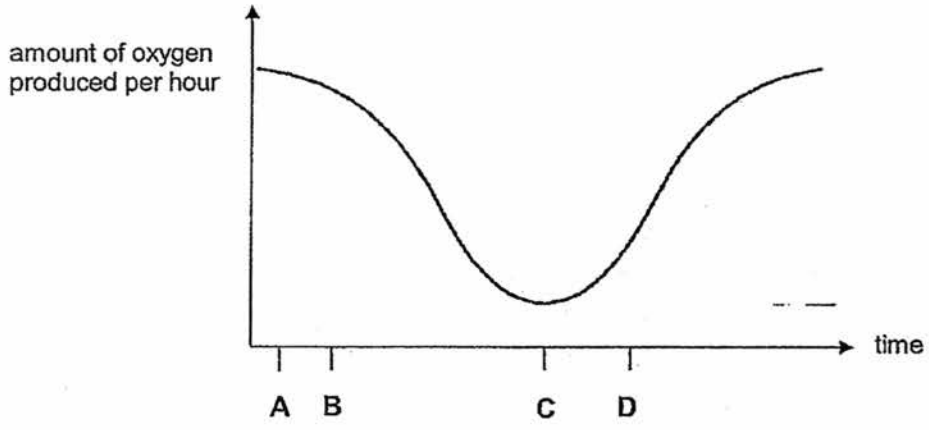
7 A human red blood cell is placed in hypotonic solution. What is the net movement of the water molecules and the effect on the cell?

	net movement of water	effect on cell
A	out of the cell	cell is plamolysed
B	out of the cell	cell crenates
C	into the cell	cell is turgid
D	into the cell	cell bursts

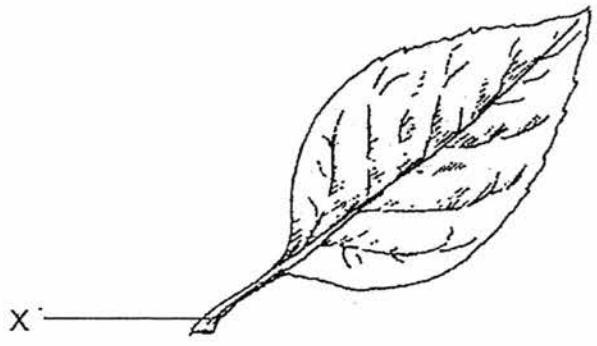
8 The diagram shows a section of a leaf of a green plant.
During exposure to bright light, which cell contains the most starch?



9 The graph below shows the amount of oxygen produced by a green plant over a 24-hour period, on a warm, sunny day. Which letter represents a point in the day where light intensity is the highest?



10 The diagram below shows a leaf.



Which of the following statements explains how feature X helps the leaf to optimise its function?

A ensures that carbon dioxide rapidly reaches the inner cells of the leaf

B carries manufactured food away from lamina to other cells of the plant

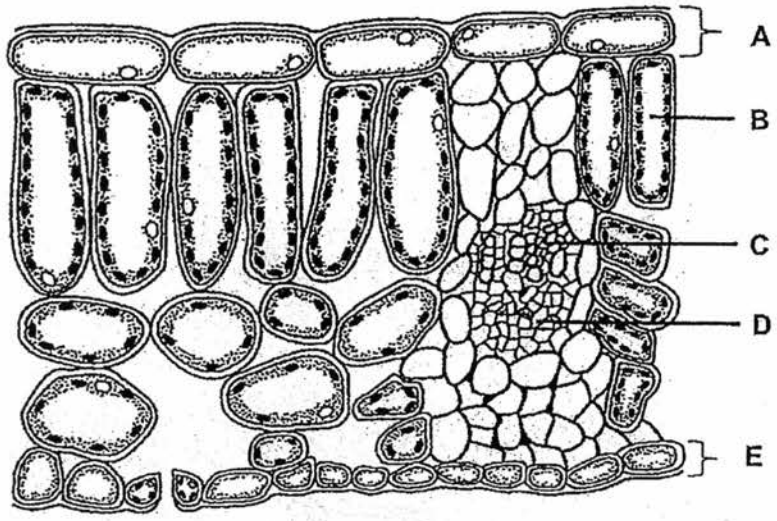
C increases surface area to volume ratio to maximise light absorption

D holds the leaf lamina away from the stem so that it receives optimum light

Section B (30 marks)
Answer all questions.

For examiner's use

B1 The diagram shows the internal structure of a leaf.



(a) Identify cells **B** to **D**.

B: .....

C: .....

D: ..... [3]

(b) State the function of **D**.

..... [1]

(c) State two differences between **A** and **E**.

.....

.....

.....

..... [2]

For examiner's use

B2 *Elodea* is a water plant that grows fully submerged in water. Its leaves are thin and narrow.

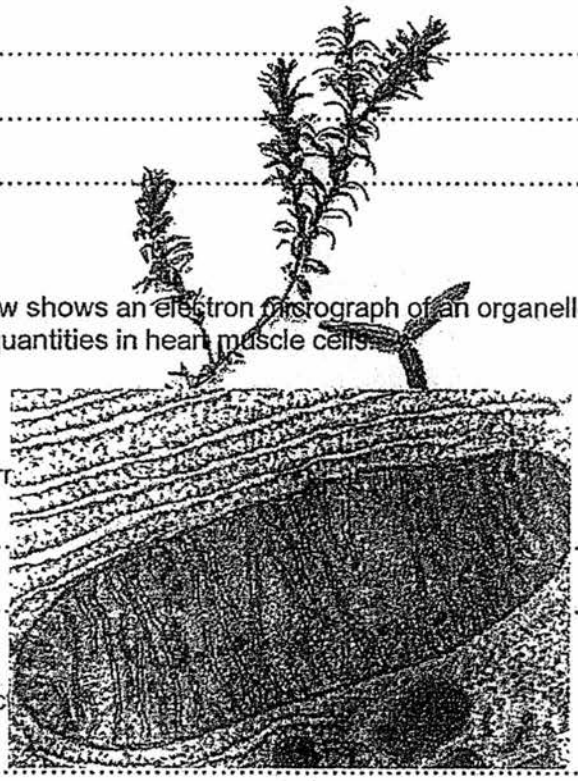
Suggest and explain one way to reduce the survival of *Elodea* in an infested pond.

.....

.....

..... [2]

B3 The diagram below shows an electron micrograph of an organelle. The organelle is found in large quantities in heart muscle cells.



(a) (i) Define the term

.....

..... [1]

(ii) State the function

.....

(a) (i) State the name of the organelle.

..... [1]

..... [1]

(iii) Predict and explain whether *Elodea* contains xylem tissue.

(ii) State the function of the organelle.

.....

..... [1]

(b) Explain why the organelle is found in large quantities in heart muscle cells.

..... [2]

(b) Explain how the thin and narrow shape of *Elodea* leaves enables the plant to make food more efficiently.

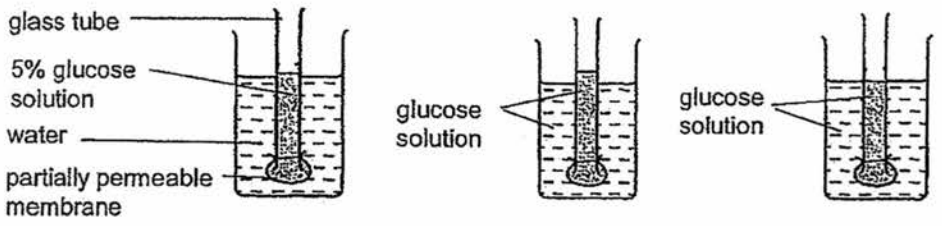
..... [2]

.....

..... [2]

B4 The diagram below shows the apparatus used during an experiment.

For examiner's use



time: 0 minutes time: 10 minutes time: 30 minutes

(a) With reference to the diagram, identify the process that describes the movement of glucose and water molecules respectively in the experiment.

molecule	process involved
glucose	
water	

[1]

(b) A change in solution level of the glass tube is observed after 10 minutes. Explain how this change occurs.

.....

.....

.....

.....

..... [3]

(c) State the concentration of glucose in glass tube and the beaker after 30 minutes.

	concentration of glucose
glass tube	
beaker	

[1]

For examiner's use

B5 Four identical strips of potato, each weighing 4 g with dimensions 1×1×3 cm, were placed in four sugar solutions of different concentrations (**A-C**) for one hour. They were subsequently removed and weighed. The weight of each potato strip was recorded.

sugar solution	weight of potato strip/ g
A	4.5
B	4.1
C	4.2
D	4.7

(a) Rank the four sugar solutions in increasing water potential.

	lowest water potential ⟶ highest water potential			
sugar solution				

[1]

(b) Explain your answer in **(a)**.

.....

.....

.....

.....

..... [3]

(c) A second identical experiment was conducted. However, the potato strips, each weighing 4 g, were cut into strips of dimensions 1×2×1.5 cm. To obtain the same experiment results, suggest and explain a change that can be made to the experimental procedure.

.....

.....

.....

.....

..... [3]

End of Paper

Answers for Sec1 Exp Bio SA2 2016

1	2	3	4	5	6	7	8	9	10
D	B	D	A	C	A	D	B	A	D

B1			
a	B: Palisade mesophyll cell (accept palisade mesophyll); C: Xylem; D: Phloem;		1 1 1
b	Transport **manufactured food** (sucrose and amino acids) **from leaves to all/other parts of the plant**		1
c	E has a **thinner cuticle** than A E has **stomata** unlike A E has **guard cells** unlike A (accept any 2 out the 3 – comparison must be made)		2
B2			
ai	A **group of cells** with **similar structure** that work together to perform a **common/specific function**		1
aii	Transport **water and mineral salts** from roots to other parts of plant / leaves (must state direction) (Accept: mechanical support)		1
aiii	Does not contain xylem tissue; Does not need a water and mineral salt transport system as these can directly **diffuse / be absorbed into all parts of the plant** (since it is fully submerged in water); (If student says it contains xylem tissue, no mark awarded even if explanation is correct)		1 1
b	(Thin and narrow) for greater SA to vol ratio for more efficient diffusion of CO2 / exposure to sunlight; OR (Thin) for CO2/sunlight to enter inner cells of leaves quickly; CO2/sunlight is used in photosynthesis;		1 1
c	Shade pond from sunlight (e.g. by planting trees beside it) / reduce carbon dioxide level in pond water; (Accept: any measure that reduces availability to CO2 / sunlight) So as to reduce photosynthetic rate; (Must state how measure affects photosynthesis)		1 1
B3			
ai	Mitochondrion (Accept: mitochondria)		1
aii	Site of **aerobic respiration** (to release energy for cell)		1

b	Heart muscle cells **require a lot of energy** (to pump blood); Hence more mitochondria are needed to **release more energy** for the cell through aerobic respiration		1 1
B4			
a	Diffusion; Osmosis;		1
b	**Net movement** of water molecules from **water to glucose solution** as water has a **higher water potential**; **Net movement** of glucose molecules from **glucose solution to water** as glucose solution has a **higher glucose concentration**; Water molecules enter glass tube **more rapidly** than glucose molecules exiting		1 1 1
c	2.5%, 2.5%		1
B5			
a	B,C,A,D		1
b	Water molecules **enter the cytoplasm of potato cells** as the solutions have **higher water potentials**. The **greater the difference in water potential**, the more weight gained (r/s between water potential and weight gained has to clearly stated for mark to be awarded)		1 1 1
c	Time taken for experiment can be **reduced**. The potato strip in the second experiment has a **higher surface to volume ratio**, allowing a **faster rate of osmosis.** (If students provide values for SA/V, values be to be accurate for mark to be awarded)		1 1 1

Name : ..... ( ) Class : .....

ST JOSEPH'S INSTITUTION

END OF YEAR EXAMINATION
(SECONDARY 1)

LOWER SECONDARY SCIENCE

PAPER 1

5 October 2016

45 minutes

(1100 – 1145 hrs)

Additional Materials: NIL

READ THESE INSTRUCTIONS FIRST

1. Answer all the questions in the spaces provided on the question paper.
2. Write in dark blue or black pen. You may use a soft pencil for any diagrams, graphs or rough working.
3. Use pi (π) value preprogrammed in calculator.
4. Express your final answer in 3 significant figures where appropriate, show all working, and include units in all your working.
5. Do not use staples, paper clips, highlighters, glue or correction fluid/tape.

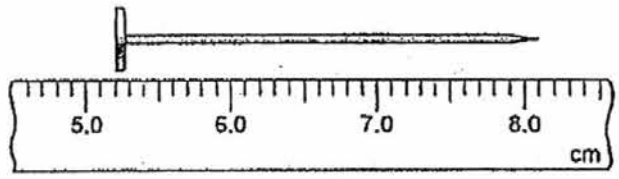
This document consists of 10 printed pages.

[Turn over]

Section A (30 marks)

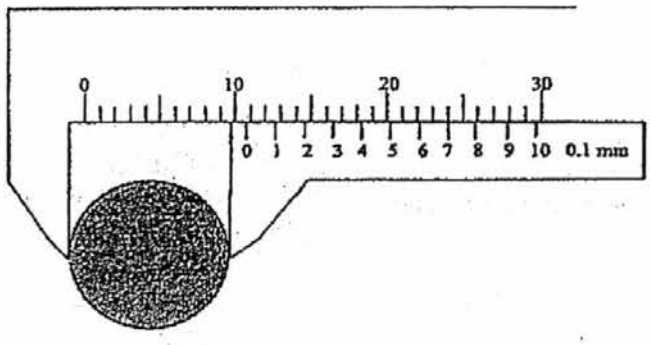
There are 30 multiple-choice questions in this section. For every question, select the most suitable option and shade in the appropriate circle in the OTAS provided.

1. What is the length of the nail as shown below?



A 2.9 cm B 3.0 cm C 5.2 cm D 8.1 cm

2. The figure below shows an electrical wire placed between the jaws of a pair of vernier callipers.



The **radius** of the electrical wire is _____ cm.

A 0.49 B 0.54 C 0.97 D 1.07

3. A plant specimen is viewed under the microscope installed with an eyepiece of magnification 10× and objective lens of magnification 25×.

When viewed under the microscope, the specimen has a length of 60 mm. What is the **actual** length of the specimen?

A 0.24 mm B 1.7 mm C 2.4 mm D 6.0 mm

4. Sarah has been asked to calculate the volume of a piece of wire, which is about 0.17 cm in diameter and about 0.700 m long. Which are the most suitable measuring instruments she should use?

	Length	Diameter
A	Metre rule	Vernier callipers
B	Metre rule	Measuring tape
C	Measuring tape	Metre rule
D	Measuring tape	Measuring tape

5. Timothy placed a sample of an unknown solid in liquids of different densities. The table below shows the results of his observations.

Liquid	Density of liquid (kg/m^3)	Observation
V	1000	Floats
W	12 300	Floats
X	700	Sinks
Y	450	Sinks

What is the approximate density of the sample?

A 700 kg/m^3
B 1000 kg/m^3
C Between 700 kg/m^3 and 1000 kg/m^3
D Between 1000 kg/m^3 and 12 300 kg/m^3

6. On Earth, the gravitational field strength is about 10 N/kg. On Mars, the gravitational field strength is about 3.7 N/kg.

If an object has a weight of 50 N on Earth, what is its weight on Mars?

A 1.4 N B 5.0 N C 18.5 N D 135 N

7. Two forces 5 N and 7 N are acting on an object. Which one of the following is not a possible resultant force acting on the object?

A 2 N B 6 N C 10 N D 14 N

8. If metal X scratches metal Y and a scratch mark is left on metal Y, a tick (✓) is put in the box. Otherwise, a cross (×) is put in the box.

X \ Y	brass	gold	steel	titanium
brass		✓	×	×
gold	×		×	×
steel	✓	✓		×
titanium	✓	✓	✓	

Which one of the following **correctly** shows the metals arranged in **increasing** hardness?

A brass, gold, steel, titanium
B gold, brass, steel, titanium
C steel, titanium, brass, gold
D titanium, steel, brass, gold

9. Which of the following statements about diffusion is **correct**?

A Diffusion can only take place in gases and liquids.
B Diffusion shows that all particles are made up of molecules.
C The greater the mass of the particle, the slower the rate of diffusion.
D The speed of diffusion is not affected by temperature.

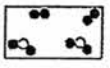
10. Which of the following statements about a compound is **false**?

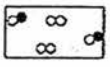
A A compound has a fixed melting point.
B A compound is made up of at least 2 different types of atoms.
C A compound has properties that is different from that of its constituent elements.
D A compound can be separated into its constituent elements by separating techniques such as filtration, distillation, etc.

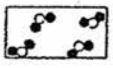
11. Which of the following ways can be used to distinguish between pure water and seawater?
I) Adding sodium chloride (table salt)
II) Adding distilled water
III) Checking the boiling point
IV) Using filtration

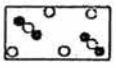
A I only
B III only
C I, III and IV only
D II, III and IV only

12. Which of the following diagrams describe a mixture of water vapour and chlorine gas?

A 

B 

C 

D 

13. Which of the following substances A, B, C or D (at room temperature) will contain particles that vibrate about fixed positions?

Substance	Melting point /°C	Boiling point /°C
A	-28	67
B	11	52
C	98	890
D	-101	-35

14. Which of the following mixtures can filtration be used to obtain the underlined substance?

A Iron fillings and sand
B Oxygen and carbon dioxide
C Salt and sugar
D Oil and sand

15. Which of the following compounds contain exactly three elements?

A Potassium oxide
B Lead chloride
C Sodium hydroxide
D Carbon dioxide

16. A solid is thought to be pure iron fillings. Which of the following is the best way to test its purity?

A Measure its melting point.
B Pass a magnet over the solid and test whether it is attracted.
C React it with dilute hydrochloric acid.
D React it with aqueous sodium hydroxide.

17. A flask contains the liquids chloroform and water. They are separated using a separating funnel. Which conclusion can be made from this observation alone?

A Chloroform is very poisonous and must be handled carefully.
B Chloroform and water have different boiling points.
C Chloroform and water are immiscible liquids.
D Chloroform has a higher density than water.

18. A filter tip of a cigarette acts as both a filter and a condenser. Which of the following cannot be removed, assuming that the filter tip is 100% effective?

	Substance	Boiling point / °C
A	Carbon monoxide	−191
B	Water	100
C	Nicotine	247
D	Tar	350 to 400

19. Which of the following is an inference and **not** an observation?

A Water evaporates quicker at higher temperatures
B All matter is made up of tiny particles.
C Dogs and cats are both covered in fur.
D Water drains quicker in sandy soil than clay soil.

20. Which of the apparatus below is most suitable for measuring exactly 28.7 cm^3 of a liquid?

A Burette
B Displacement can
C Measuring cylinder
D Electronic balance

21. The table shows some characteristics of four types of cells. Which cell could be a red blood cell? Key: √ = present X = absent

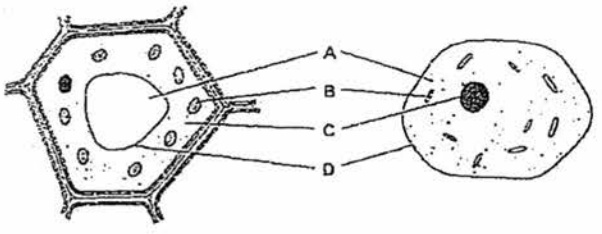
	Nucleus	Chloroplast
A	√	√
B	√	X
C	X	√
D	X	X

22. Which line in the table correctly identifies these body components?

1 brain, spinal cord and nerves
2 blood
3 xylem
4 stomach

	cell	tissue	organ	system
A	2	3	1	4
B	2	4	3	1
C	3	2	4	1
D	3	2	1	4

23. The diagram shows two cells as seen using a light microscope.



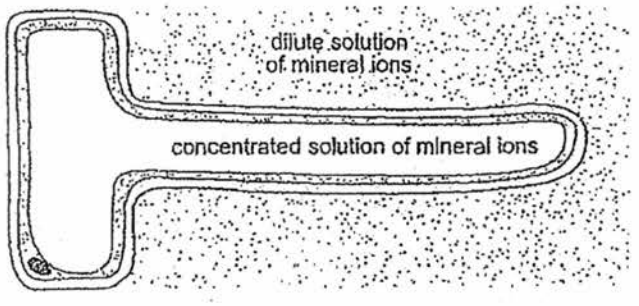
Which label is correct for **both** cells?

A cell sap
B chloroplast
C cytoplasm
D membrane

24. Four different foods were tested as shown below and the test results were recorded as positive (+) or negative (–). Which food contained both glucose and oil?

	Benedict's test	Biuret's test	Ethanol emulsion test	Iodine test
A	+	+	–	–
B	+	–	+	–
C	–	+	–	+
D	–	–	+	+

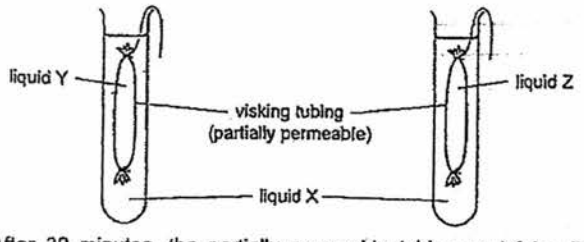
25. The diagram shows a root hair cell, surrounded by a dilute solution of mineral ions.



Which statement is **correct**?

A Water molecules move into the root hair because the water potential is lower outside.
B Water molecules move into the root hair because the water potential is higher outside.
C Water molecules move out of the root hair because the water potential is lower outside.
D Water molecules move out of the root hair because the water potential is higher outside.

26. The apparatus was set up as shown in the diagram.

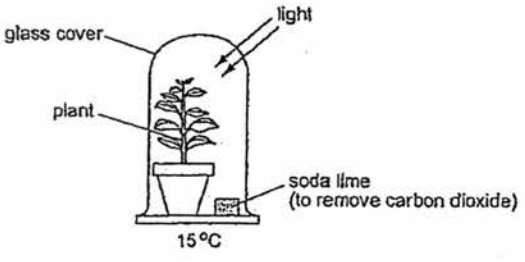


After 30 minutes, the partially permeable tubing containing liquid **Y** had collapsed while the tubing containing liquid **Z** was firm. Which could be a correct description of the liquids at the start of the experiment?

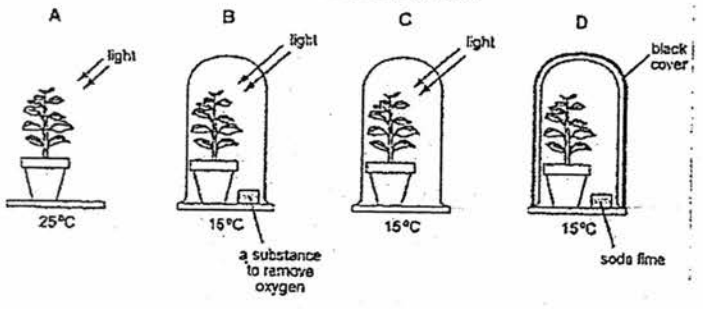
	Liquid X	Liquid Y	Liquid Z
A	10% sucrose solution	25% sucrose solution	water
B	25% sucrose solution	10% sucrose solution	water
C	water	25% sucrose solution	10% sucrose solution
D	10% sucrose solution	water	25% sucrose solution

Commented [A1]:

27. The diagram shows an experiment to find out whether carbon dioxide is needed for photosynthesis.



What is the most suitable control for this experiment?



28. What is a result of the action of stomata?

	Action of stomata	Result
A	open	Carbon dioxide diffuses in during daytime
B	open	Oxygen diffuses out during night-time
C	closed	Water vapour is not taken in by plant
D	closed	Photosynthesis stops

29. What do phloem and xylem vessels transport in a plant?

	xylem	phloem
A	water	sucrose
B	water	starch
C	sucrose	water
D	sucrose	amino acids

30. Which of the following environmental conditions would cause rapid transpiration?

	air	light	temperature
A	damp	bright	cold
B	damp	dim	warm
C	dry	bright	warm
D	dry	dim	cold

End of Paper

Answers to LSS Sec 1 – Paper 1

End of Year Examination 2016

1	A
2	B
3	A
4	A
5	C
6	C
7	D
8	B
9	C
10	D

11	B
12	A
13	C
14	D
15	C
16	A
17	C
18	A
19	B
20	A

21	D
22	C
23	D
24	B
25	B
26	D
27	C
28	A
29	A
30	C

Name : ..... ( ) Class : .....

ST JOSEPH'S INSTITUTION

END OF YEAR EXAMINATION
(SECONDARY 1)

LOWER SECONDARY SCIENCE **5 October 2016**

PAPER 2 **1 hour 45 minutes**

Additional Materials: NIL

READ THESE INSTRUCTIONS FIRST

1. Answer all the questions in the spaces provided on the question paper.
2. Write in dark blue or black pen. You may use a soft pencil for any diagrams, graphs or rough working.
3. Use pi (π) value preprogrammed in calculator.
4. Express your final answer in 3 significant figures where appropriate, show all working, and include units in all your working.
5. Do not use staples, paper clips, highlighters, glue or correction fluid/tape.
6. A copy of the Periodic Table is found overleaf.

This document consists of 18 printed pages.

[Turn over]

Section A (40 marks)

*Answer **all** questions in the spaces provided.*

A1 **Fig. 1.1** shows the setup of a pendulum experiment, while **Fig. 1.2** shows the angle of release. The experiment was performed four times, each with a different length (L).

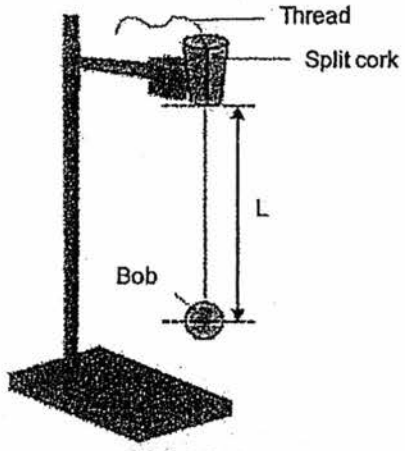


Fig. 1.1

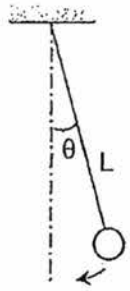


Fig. 1.2

The following results are obtained and tabulated below.

Experiment	Length L / m	Period T / s	Mass of bob M / kg	Angle of release θ / °
1	0.10	0.638	0.250	10.0
2	0.15	0.775	0.250	10.0
3	0.20	0.901	0.250	10.0
4	0.25	1.003	0.250	10.0

Period is the time taken for one complete oscillation. The same type of thread is used for the experiments.

(a) Suggest a possible hypothesis for the experiment. **[2]**

.....

.....

(b) Identify the following variables for this experiment:

(i) Independent variable ..... **[1]**

(ii) Dependent variable ..... **[1]**

(iii) Controlled variables (list two) **[2]**

.....

.....

A2 (a) **Fig. 2.1** shows how the volume of 10 g of water changes as the temperature rises from −10 °C to +10 °C. The water melts at 0 °C.

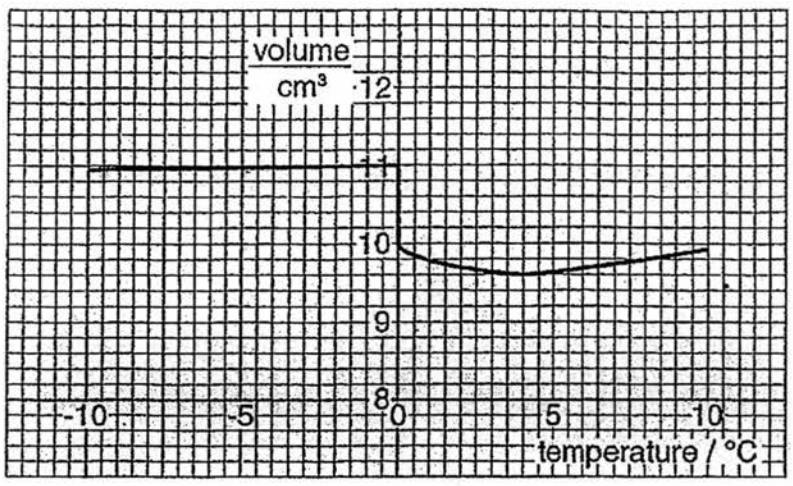


Fig. 2.1

Calculate the density of **unmelted** ice at 0 °C.

Density = ... **[1]**

(b) State how the density of water changes as the temperature rises from −10 °C to +10 °C.

You should refer to the **density changes,** if any, when water is in solid state, as it is melting and when it is in liquid state. No further calculation is necessary. **[2]**

−10 °C to 0 °C: .....

.....

Melting at 0 °C: .....

.....

0 °C to 4 °C: .....

.....

4 °C to +10 °C: .....

.....

(c) The Plimsoll line is a reference mark located on the external surface of a ship's hull. This indicates the maximum depth to which the ship may be safely immersed when loaded with cargo. Hence when a merchant ship is loaded in a port, it should not be allowed to sink below the level marked on the Plimsoll line.

Fig. 2.2 shows the safe load levels indicated on the side of a ship.

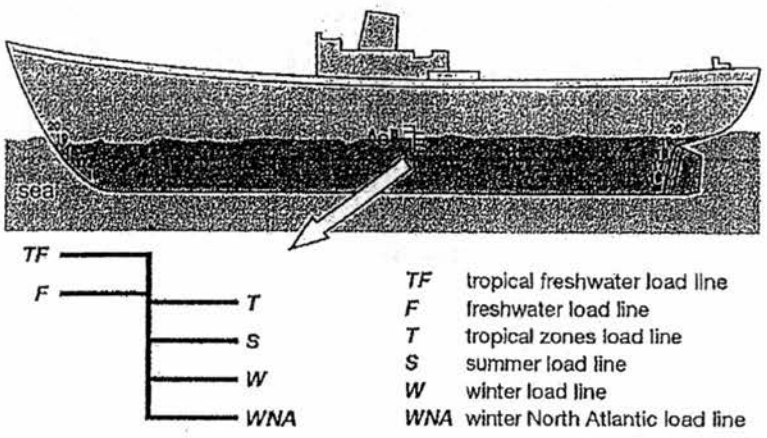


Fig. 2.2

(i) Why is the safety load line higher in freshwater? **[1]**

.....

.....

(ii) Why does a ship float higher in winter than in summer? **[1]**

.....

.....

A3 (a) **Fig. 3.1** shows the side view of a dam used to store water.

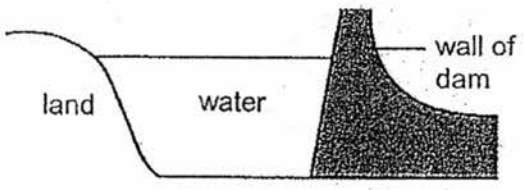


Fig. 3.1

Explain briefly, in terms of pressure, why the thickness of the wall of the dam is greater at the base than at the top. [2]

.....

.....

.....

(b) **Fig. 3.2** shows a simple type of hydraulic braking systems used in a light vehicle.

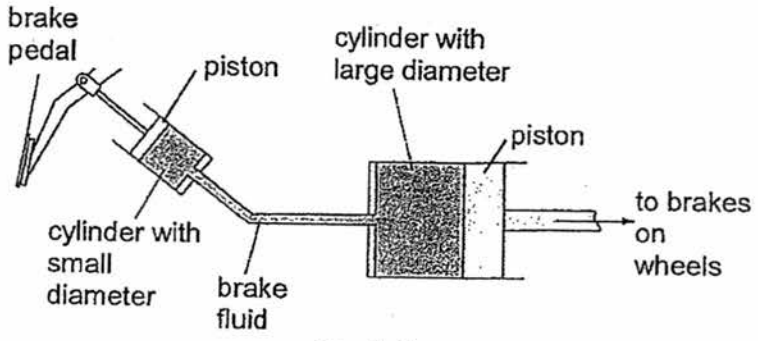


Fig. 3.2

The cross-sectional areas of the small cylinder and large cylinder are 0.0004 m^2 and 0.0024 m^2 respectively.

(i) The brake pedal is pushed against the piston in the small cylinder with a force of 90 N. Calculate the pressure exerted on the brake fluid in the **small** cylinder.

Pressure = ... [1]

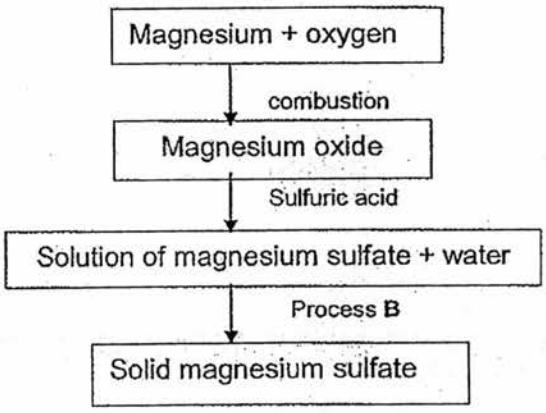
(ii) State the amount of pressure exerted by the brake fluid on the piston in the **large** cylinder. [1]

.....

(iii) Determine the force exerted by the brake fluid on the piston in the **large** cylinder.

Force = ... [1]

A4 The diagram shows some reactions of magnesium.



(a) A mixture of magnesium and oxygen, when not ignited, remains unchanged as a mixture of magnesium and oxygen. When ignited, the magnesium burns with a blinding white light.

State two reasons why the magnesium oxide formed is a compound and not a mixture. [2]

.....

.....

.....

.....

(b) Name the Process **B** to obtain solid pure magnesium sulfate from magnesium sulfate solution. [1]

.....

(c) Write down the chemical symbols for all the elements present in magnesium sulfate. [1]

.....

(d) A sample of magnesium was found to be contaminated with iron fillings and sodium chloride solution. Select (by circling) suitable techniques to obtain pure magnesium.

Step 1:

distillation / separating funnel / filtration [1]

Step 2:

crystallization / magnetic attraction / evaporation to dryness [1]

(e) A bottle of concentrated sulfuric acid was accidentally spilled in the laboratory. Fumes of sulfuric acid are choking and pupils present in the laboratory must be quickly evacuated for safety reasons.

(i) State and define the process in which fumes of sulfuric acid spreads from the area of spillage to the rest of the laboratory. [2]

.....

.....

.....

.....

(ii) State a factor that can cause the process stated in **(i)** above to occur in a shorter period of time. [1]

.....

.....

A5 You are given different sets of three substances each. In each set, circle the odd one out and provide a reason for your answer.

(a) **Sodium / lead / sulfur** *(circle odd one out)* [2]

Reason:

.....

(b) **Air / brass / water** *(circle odd one out)* [2]

Reason :

.....

A6 (a) Write down what the acronym DNA stands for. [1]

.....

(b) Outline the relationship between DNA, genes and chromosomes. [2]

.....

.....

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A7 In an investigation, the volume of samples of 20 dried raisins was measured. Each sample was then placed in water or sugar solutions of different concentrations. After 12 hours, the raisins were blotted dry and the volume of each sample of raisins was measured again. **Fig. 7** shows the results.

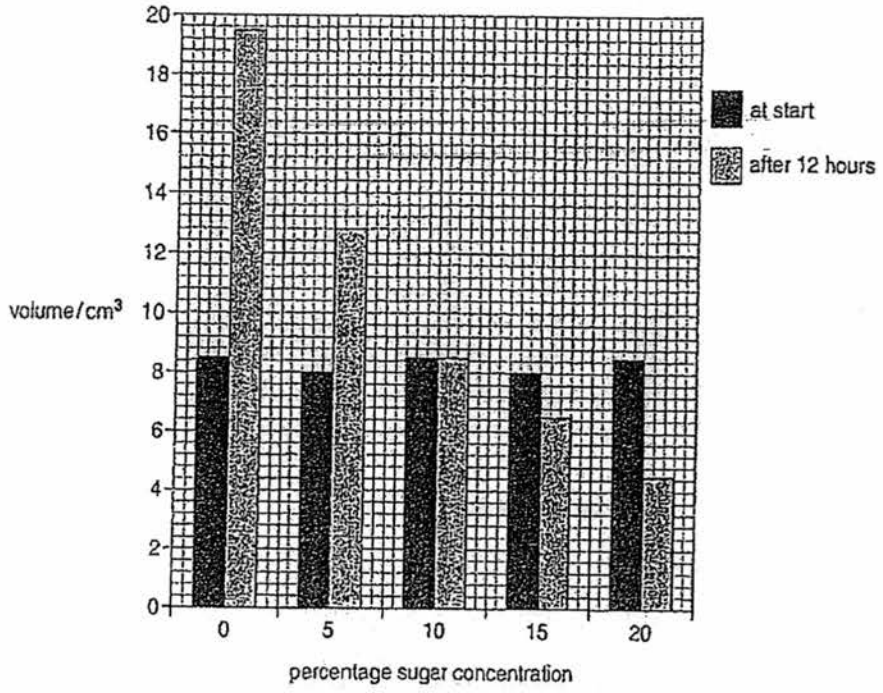

Fig. 7

(a) Calculate the percentage change in the volume of the sample of raisins in 5% sugar solution.

Percentage change = ... **[2]**

(b) Explain the results in the 10% sugar solution. **[2]**

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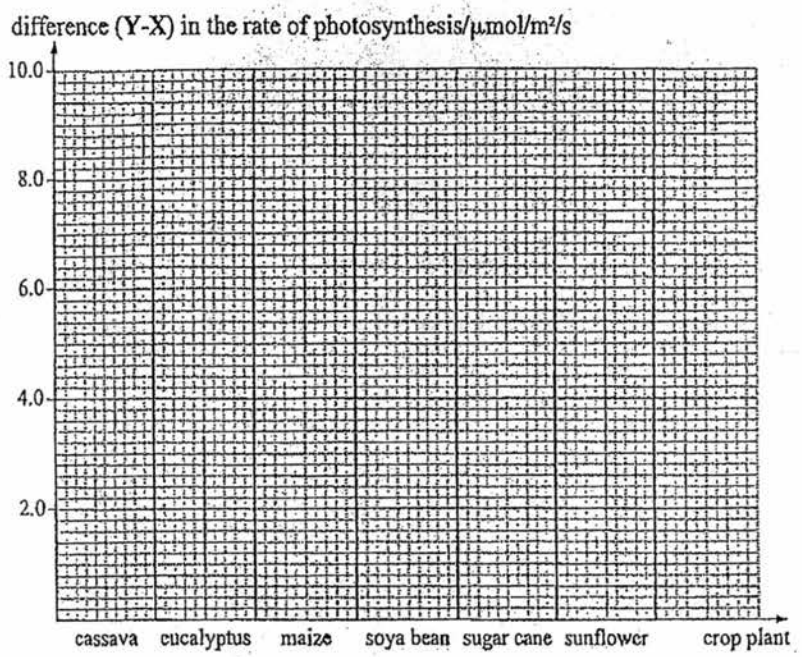
A8 The rate of photosynthesis in six tropical crop plants was measured when the plants were growing outside under normal conditions (rate **X**). The measurements were repeated when the plants were grown under controlled optimum conditions in a glasshouse (rate **Y**). The results are shown in the table and bar chart below.

Crop plant	Rate of photosynthesis (X) / µmol/m²/s	Rate of photosynthesis (Y) / µmol/m²/s	Difference in rate of photosynthesis (Y – X) / µmol/m²/s
Cassava	13.7	23.1	9.4
Eucalyptus	18.4	26.0	7.6
Maize	23.4	26.0	2.6
Soya bean	18.3	25.1	6.8
Sugar cane	24.0	26.8	2.8
Sunflower	24.3	31.7	7.4



(a) Which two crops show the greatest difference between the rate of photosynthesis? [1]

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(b) The measurements of the rate of photosynthesis (**X**) of the plants are means of 10 readings. Suggest a reason why mean measurements were used. **[1]**

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(c) Suggest two factors that were changed when the plants were grown in controlled optimum conditions. **[2]**

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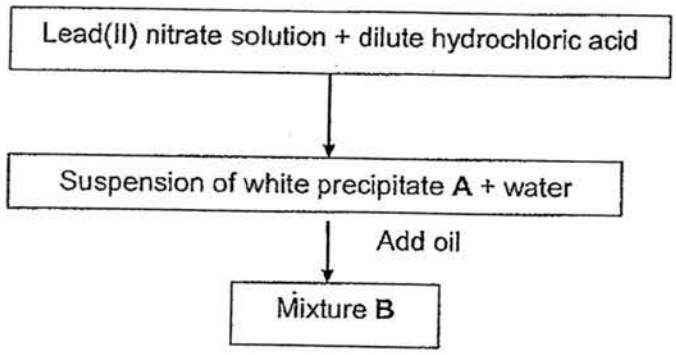
Section B (30 marks)

*Answer **all** questions in the spaces provided.*

B1 Study the flowchart given and answer the following questions.



(a) State whether the reaction between lead(II) nitrate and hydrochloric acid is a physical or chemical change. **[1]**

.....

(b) State one physical property of **A**. **[1]**

.....

Mixture **B**, upon standing for several minutes, separate out into three layers. The top layer looks like oil while the bottom layer is a chalky white substance.

(c) Select, by circling, which of the following apparatus/technique can be used to check if mixture **B** is a solution or a suspension. [1]

Separating funnel / distillation / filtration / crystallization

(d) Describe, in steps, how you would obtain a <u>dry</u> sample of substance **A** from mixture **B**. [3]

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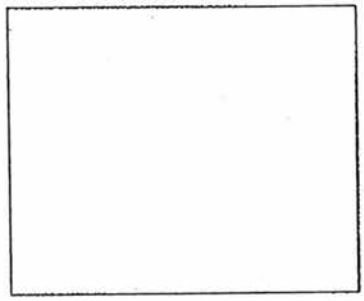
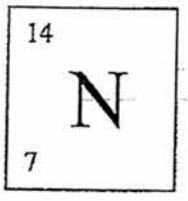
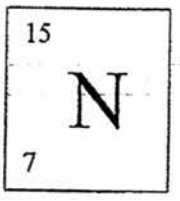
(e) The melting point of nitrogen is −210 °C while its boiling point is −195 °C.

Using one circle O to represent a diatomic molecule of nitrogen, draw some nitrogen molecules to show their arrangement at room temperature and pressure (25 °C, 1 atm). [1]

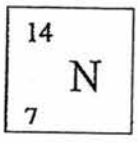
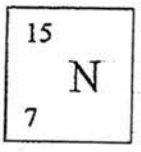


(f) The element nitrogen is found in all nitrate salts, as in the case with lead(II) nitrate. Several types of nitrogen atoms (known as "isotopes") have been discovered, differing only in the number of neutrons. The two most common nitrogen atoms can be depicted as follows:





Using information about these two isotopes of nitrogen, complete the table below: [3]

isotope	No. of protons	No. of electrons	No. of neutrons
			
			

B2 (a) Define the term *transpiration*. [1]

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(b) Explain how each of the following factors can affect the rate of transpiration:

(i) High humidity of the air. [2]

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(ii) Increase in temperature of the air. [2]

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(b) **Fig. B2** below shows a potometer.

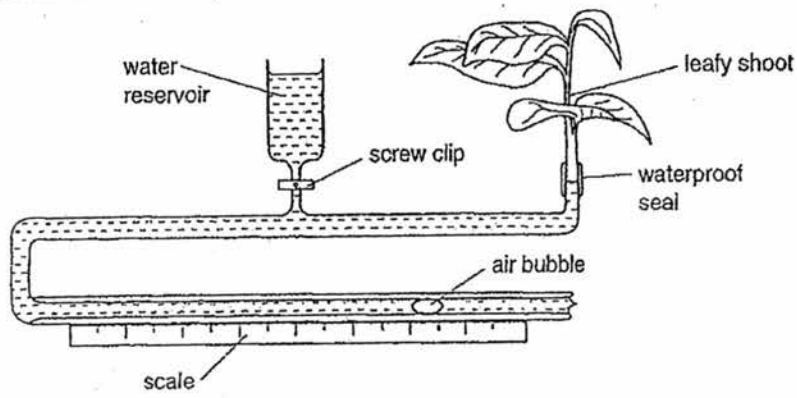

Fig. B2

(i) Describe how you think the potometer can be used to measure the rate of water loss from the leafy shoot.
(Hint: position of air bubble) [2]

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(ii) Hence, describe how the leafy shoot absorbs more water. [1]

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(iii) The table shows the results of an investigation, using a potometer similar to that in **(b)**, to measure the rate of water loss from a leafy shoot of a plant kept in different conditions.

Distance moved by bubble (mm)	
Still air	Moving air
8	16

State and explain the effect of moving air on the water loss from the leafy shoot. [2]

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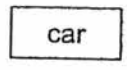
B3 (a) The engine of a car exerts a forward, horizontal force of 15 000 N to cause it to move along a rough road. The car moves at a constant speed of 50 km/h.

(i) Complete the free body diagram of the car moving in the horizontal direction. Draw and label the **horizontal** forces acting on the car. [1]



(ii) State the amount of friction acting on the car. [1]

.....

(iii) Suggest a modification that can be made to the car to reduce the amount of air resistance acting on it when it moves. [1]

.....

.....

(b) When a head strikes another object, like the ground, two collisions occur. The first collision is between the skull and the ground, the second between the brain and the skull. It is important to wear a helmet in any activity with a risk of head collisions.

During a collision with a tree or the ground, a helmet crushes to absorb some of the impact of the collision. By slowing down over a longer period of time, the collision between the brain and the skull is reduced or avoided.

Fig. B3 shows modern cars designed to crumple on impact.

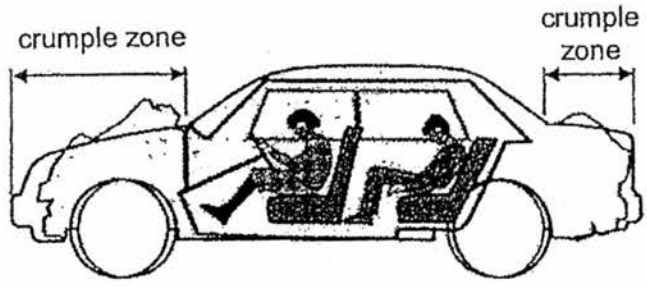


Fig. B3

Use the information about helmets above, to explain why it is important for cars to be designed with crumple zones. **[2]**

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B4 **Fig. B4** shows the properties of some materials used in the manufacturing and building industries.

When choosing a material for a particular function or job, you need to consider the stiffness, strength and density of the material. You will also need to be aware of the cost involved too.

Material	Relative stiffness	Relative strength*	Density (kg/m^3)	$\frac{\text{Stiffness}}{\text{Density}}$	$\frac{\text{Strength}}{\text{Density}}$	Cost per tonne (USD)
Aluminium	7300	27 000	2700	2.7	10	1646
Brick	2100	5500	3000	0.7	1.8	30
CFRP	20 000	100 000	2000	10	50	3000
Concrete	1500	4000	2500	0.6	1.6	20
GRP	2000	50 000	2000	1	25	210
Steel	21 000	40 000	7800	2.7	5.1	300
Wood	1400	2700	500	2.8	5.4	100

* These strengths are for the materials under compression.
1 tonne = 1000 kg.
GRP: Glass reinforced plastic CFRP: Carbon fibre reinforced plastic

Fig. B4

(a) The relative stiffness and relative strengths of concrete, brick and wood are lower than the rest of the materials.

Why are they still often used for building houses? **[1]**

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(b) **(i)** Explain what is meant by **strength** of a material. **[1]**

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(ii) Stiffness measures the rigidity of a material — the extent to which it resists deformation when a force is applied on it. The stiffer a material is, the less flexible it is.

Explain the importance of calculating the ratios $\frac{\textbf{stiffness}}{\textbf{density}}$ and $\frac{\textbf{strength}}{\textbf{density}}$ of each material. [1]

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.....

(c) GRP can be used to build small boats and even small minesweepers for the Navy. A minesweeper is a small naval warship designed to remove threats posed by naval mines. This ensures that waterways are safe for ships to travel in.

With the help of **Fig. B4**, suggest

(i) Why is it useful to make minesweepers from GRP? [1]

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(ii) Why large naval ships, used for warfare, should not be made from GRP. [1]

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End of paper

SUGGESTED MARK SCHEME

Section A (40 marks)

1. **(a)** If the length of thread increases, then the time of one complete swing increases. [2]

1 mark: correctly identifies dependent (0.5 mark) and independent (0.5 mark) variables
1 mark: hypothesis worded with directionality effect

(b) (i) Length of thread [1]

(ii) Period [1]

(iii) mass of bob, angle of release, type of thread [2]
[*any two answers, 1/2 mark for each answer*]

2. **(a)** Density = mass / volume
= 10 / 11 [½]
= 0.909 g/cm^3 [½]

(b) −10 °C to 0 °C: density of water **remains constant** at about 0.91 g/cm^3. [½]
Melting at 0 °C: density **increases** to 1 g/cm^3. [½]
0 °C to 4 °C: density **increases further** to a maximum of 1.04 g/cm^3. [½]
4 °C to +10 °C: density **decreases** to 1 g/cm^3. [½]

(c) **(i)** Freshwater is **less dense**. [½]
With the same amount of load, the ship will be **floating higher**. [½]

(ii) In winter, volume of water in the sea **decreases**. [½]
This causes the density of the water to **increase**. [½]

3. **(a)** As the depth of water increases, the water pressure exerted on the wall of the dam **increases**. [1]
To **prevent the wall from cracking**, the wall is thicker at the base [1]

(b) Deduct ½ mark if wrong units or no formula.
Award zero if no working shown.

(i) Pressure = Force/ Area
= 90 / 0.0004
= 225 000 Pa (accept N/m^2) [1]

(ii) 225 000 Pa (accept N/m^2) [1]

(iii) Force = Pressure × Area
= 225 000 × 0.0024
= 540 N [1]

4 (a) (1) It has a fixed melting / boiling point. [2]
(2) It has properties different from its constituent elements.
[any other reasons that is correct also can be accepted]

(b) crystallization [1]

(c) Mg / S / O [1]

(d) Step 1: filtration [1]
Step 2: magnetic attraction [1]

(e) (i) Diffusion [1] [1]
The process by which particles move down the concentration gradient [0.5] until equilibrium is reached [0.5]. [1]

(ii) Any: raise temperature / greater spillage / etc [1]
No mark if just state "temperature"/ "spillage" i.e must include direction of change

5 (a) Circle : sulfur [1]
Reason: it is non-metal whereas the other 2 are metals [1]

(b) Circle: water [1]
Reason: it is compound whereas the other 2 are mixtures [1]

6 (a) Deoxyribonucleic acid [1]

(b) A gene is a small section of DNA [1], located at a particular locus on a chromosome [1], which stores hereditary information. [2]

7 (a) % change = [(12.8 – 8)/8] x 100% [1] = 60% [1] [2]

(b) There is no change in the volume of the raisins. There is no net movement of water. [1] [2]
The water potential of the raisins is the same as that of the 10% sugar solution.[1]

8 (a) Cassava and eucalyptus [1]

(b) To reduce <u>random error</u> / offset any anomaly in the readings, obtaining a more accurate result. [1]

(c) Any 2 of the following: [2]
Temperature / amount of light / amount of carbon dioxide

Section B (30 marks)

1. (a) Physical change [1]

(b) Any logical answer eg: it is insoluble in water; it is insoluble in oil, etc. [1]

(c) Filtration [1]

(d) Step 1: Use a separating funnel to remove the oil layer (it remains in the separating funnel). [1]

Step 2: Filter the mixture obtained from step 1. The residue will be substance A. [1]

Step 3: Rinse residue A with distilled water and pat dry between pieces of filter paper. [1]

(e) [arrangement of particles in gaseous state] [1]

(f) Nitrogen-14: 7 protons, 7 electrons, 7 neutrons
Nitrogen-15: 7 protons, 7 electrons, 8 neutrons
[0.5 mark for each correct sub-atomic particle] [3]

2. (a) Transpiration is the loss of water vapour through the aerial parts of the plant, mainly through the stomata in the leaves [1]

(b) (i) The leafy shoot loses water in the form of water vapour during transpiration and absorbs water to replace the water loss. The air bubble moves. [1] The distance moved by the air bubble (final position – initial position) can be used to measure the rate of water loss by considering the time taken. [2]

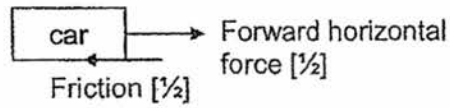
(ii) Loss of water vapour via the stomata [1] creates a suction force (transpiration pull) which draws water up the xylem vessels in the stem and roots. [1] [2]

(b) (i) Moving air results in more water loss from the leafy shoot as it removes the water vapour lost through stomata faster than still air. [1] The leafy shoot absorbs more water to replace the water lost and the bubble moves a longer distance. [1] [2]

(ii) High humidity means high amount of water vapour in the air. This decreases the water vapour concentration gradient between the air and inside the leaves. [1] The plant loses less water vapour via the stomata and the rate of transpiration is reduced. [1] [2]

(iii) A higher outside temperature means that the water vapour lost by the plant evaporates / diffuses faster. [1] There is a greater water vapour concentration gradient between the air and inside the leaves. The plant loses more water vapour faster and the rate of transpiration increases. [1] [2]

3. (a) (i) [1]



(ii) 15 000 N [1]

(iii) Adopt a more streamline shape for the car body. [1]

(b) During a collision, the front and back parts of the car will **crush / crumple to absorb some impact.** [½]

Slows down the **collision** over a **longer time period.** [½]

This **reduces** the risk of the passengers getting severely / fatally injured. [1]

4. **(a)** Cheap / the costs per tonne are the lowest. [1]

(b) (i) Ability to withstand a heavy load without breaking. [1]
(ii) Materials are being compared according to the **same density base value** [0.5]. Allows **fair** (or **accurate**) comparison to be made [0.5] [1]

(c) (i) Less dense than metals. Cheaper than aluminium or steel. [1]
(ii) $\frac{\textbf{Stiffness}}{\textbf{Density}}$ value might not be high enough. [0.5] [1]

Large naval ships can deform easily when a large force (e.g. due to bomb explosion) is exerted on them. [0.5]