

Secondary Two Express

Science

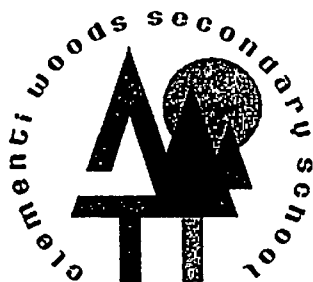
2012

1	Clementi Woods Secondary School	SA1
2	First Toa Payoh Secondary School	SA1
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Name: _____ Reg. No: _____ Class: Sec 2/1

**CLEMENTI WOODS SECONDARY SCHOOL
MID-YEAR EXAMINATION 2012**



GENERAL SCIENCE

Secondary 2 Express

2 Hours

9 May 2012

READ THESE INSTRUCTIONS FIRST

Write your name, register number and class 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.

1. This paper consists of Sections A, B and C.
2. Section A: Answer all questions. For each question, there are four possible answers, A, B, C and D. Choose the **one** you consider correct and shade your choice with a soft pencil on the answer sheet.
3. Sections B and C: Answer all questions in the spaces provided.
4. Hand in the answers to Sections A, B and C separately.

The number of marks is given in brackets [] at the end of each question or part question.

Section A – 30 marks**Answer all questions.**

- 1 Mercury is a silver liquid at room temperature. It is a good heat conductor.

Which of the following correctly describes the particles of mercury at room temperature?

- A The particles of mercury are silver in colour.
- B The particles of mercury are good heat conductor.
- C There is a lot of space between the particles of mercury.
- D The particles of mercury can slide past each other.

- 2 A substance consists of particles that are close together. The average speed of the particles gradually increases and the space between particles increases slightly.

Which of the following best describes the substance?

- A a solid expands on heating
- B a solid being melted
- C a liquid expands on heating
- D a liquid being heated

- 3 One molecule of ammonia consists of one atom of nitrogen and three atoms of hydrogen.

Which of the following gives the correct representation for 3 molecules of ammonia?

- A NH_3
- B 3HN_3
- C 3NH_3
- D 3NH_3

- 4 Which of the following is **not** made up of molecules of a compound?

- A phosphorus
- B ammonia
- C dry ice
- D water

- 5 Which substance is a ductile element that conducts heat?

- A Cu
- B Ca
- C C
- D K

- 6 A material can only be used as a filament in a light bulb if it remains solid at extremely high temperatures and conducts electricity.

Which element has properties that make it suitable for this use?

- A mercury
- B argon
- C tungsten
- D copper

- 7 When sodium reacts with water, a solution and a gas are produced.



What is the name of the gas that is produced?

- A hydrogen
 - B sodium chloride
 - C sodium hydroxide
 - D carbon dioxide
- 8 Which of the following is an example of combustion?
- A calcium carbonate \rightarrow calcium oxide + carbon dioxide
 - B carbon + water \rightarrow carbon dioxide
 - C sugar \rightarrow carbon + water
 - D magnesium + oxygen \rightarrow magnesium oxide

- 9 Consider the solubility of three salts at 20 °C :

salt	solubility/ g per 100 g of water
copper chloride	73
sodium chloride	36
potassium chloride	34

At 20 °C, which of the following gives a saturated solution?

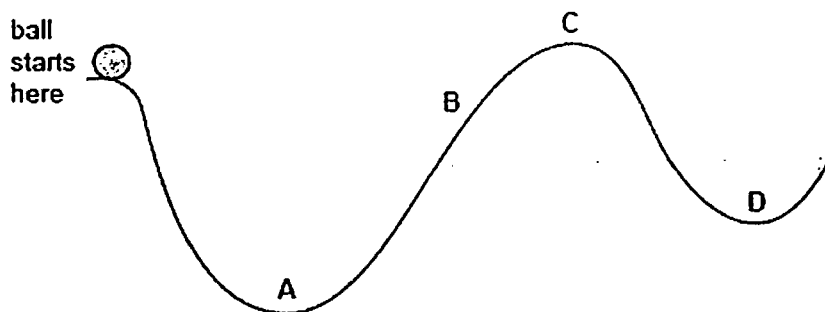
- A 34 g of potassium chloride in 50 g of water
- B 36 g of sodium chloride in 100 g of water
- C 17 g of potassium chloride in 50 g of water
- D 37 g of copper chloride in 100 g of water

- 10 The **Singapore Sling** is a cocktail that was developed sometime before 1915 by Ngiam Tong Boon, a bartender working at the Long Bar in Raffles Hotel Singapore. The original recipe used gin, Cherry Heering, Bénédictine and fresh pineapple juice, primarily from Sarawak pineapples which enhances the flavour and creates a foamy top.

http://en.wikipedia.org/wiki/Singapore_Sling

Which one of the following statements is true about the Singapore Sling?

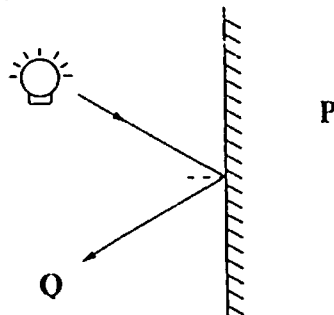
- A It is a compound made up of different elements.
 - B It is a mixture made up of different compounds.
 - C It is a mixture that does not have the properties of pineapple juice.
 - D It is an element that cannot be broken down by physical method.
- 11 A ball is released from rest and rolls down a track from the position shown.



At which labelled point, A, B, C or D, does the ball have the most kinetic energy?

- 12 What is the energy conversion when a handphone battery is being charged?
- A chemical potential energy \rightarrow electrical energy
 - B sound energy \rightarrow chemical potential energy
 - C electrical energy \rightarrow chemical potential energy
 - D electrical energy \rightarrow sound energy

- 13 A light ray from the lighted lamp is incident on a plane mirror as shown.

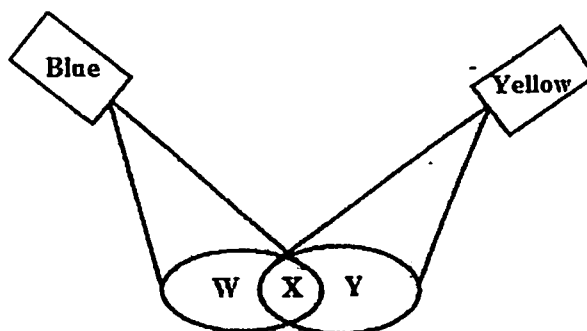


Which of the following is / are correct?

- (1) The image is formed at P and is virtual.
- (2) The image is formed at Q and is upright.
- (3) The light ray at Q appears to come from point P.

- A (1) only
- B (2) only
- C (1) and (3) only
- D (1) and (2) only

- 14 Two different lights, blue and yellow, are mixed as shown.



What are the colours at regions W, X and Y?

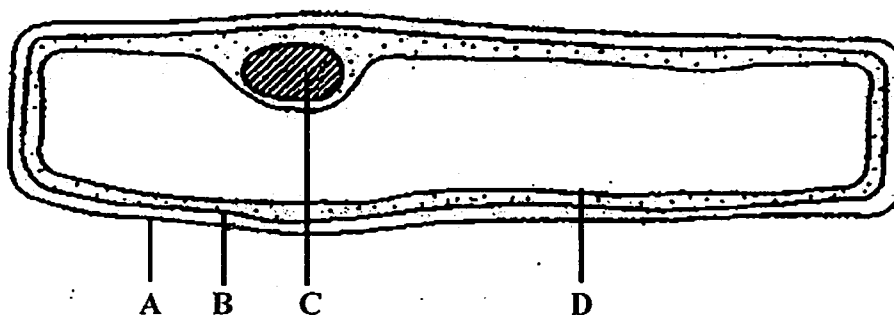
- | | W | X | Y |
|---|--------|-------|--------|
| A | blue | green | yellow |
| B | yellow | white | blue |
| C | blue | white | yellow |
| D | yellow | black | blue |

- 15 A length of copper wire, coiled around a core, is used as an electromagnet.

Which combination produces the strongest electromagnet?

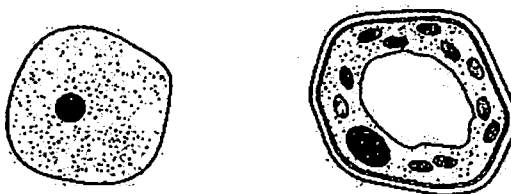
	number of turns	core
A	many	steel
B	many	soft-iron
C	few	copper
D	few	soft-iron

- 16 The diagram shows a cell from the epidermis of an onion.



Which labelled structure controls the transfer of substances into and out of the cell?

- 17 The diagram shows an animal cell and a plant cell.



Which parts are found in both cells?

- A cell membrane and cell wall
 B cell wall and sap vacuole
 C sap vacuole and nucleus
 D nucleus and cell membrane

- 18 The table shows some characteristics of four types of cell.

Which cell could be a root hair cell?

	nucleus	chloroplast
A	✓	✓
B	✓	x
C	x	✓

key
 ✓ = present
 x = absent

D	x	x
---	---	---

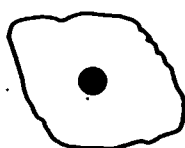
- 19 Cells are known as the building blocks of organisms.

Which of the following correctly shows this statement?

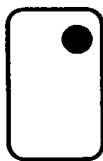
- A cell → tissue → organ → system → organism
- B cell → tissue → system → organ → organism
- C cell → organ → system → tissue → organism
- D cell → system → tissue → organ → organism

- 20 The diagrams show four cells, each having the same volume.

Which cell is adapted to absorb nutrients from its surrounding most rapidly?



A



B



C



D

- 21 The table shows the concentrations of mineral salts inside and outside a root hair cell.

Which will cause mineral salts to move into the cell by active transport?

	mineral salt concentration inside cell (%)	mineral salt concentration outside cell (%)
A	30	40
B	60	60
C	20	60
D	50	30

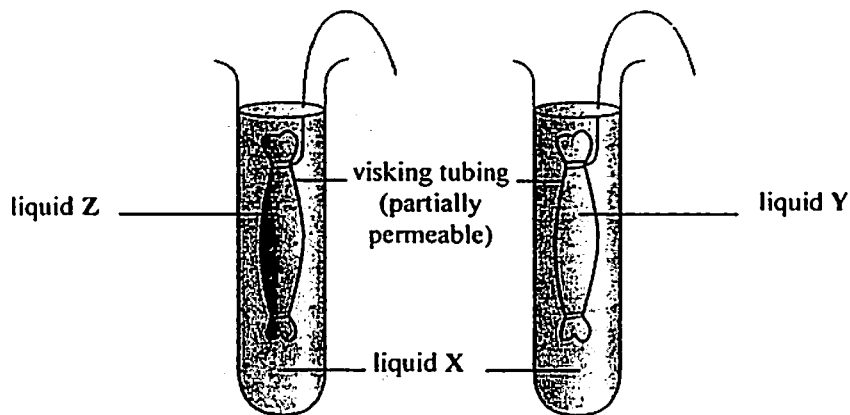
- 22 Glucose produced from the digestion of starch is taken up by the cells lining the small intestine.

How does the glucose move?

high concentration of glucose	outside the cell
low concentration of glucose	inside the cell

- A by active transport up a concentration gradient
- B by active transport down a concentration gradient
- C by diffusion up a concentration gradient
- D by diffusion down a concentration gradient

- 23 An apparatus was set up as shown.



After some time had elapsed, the visking tubing containing liquid Y collapsed while the tubing containing liquid Z was firm and hard.

Which one of the following could be a correct description of the liquids at the start of the experiment?

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

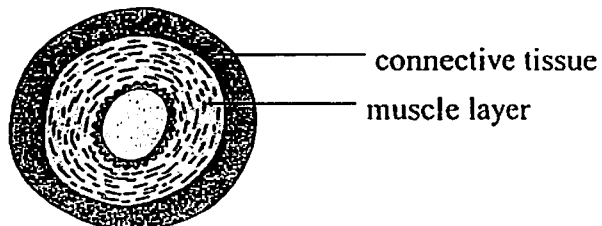
- 24 Which of the following is the correct function of blood platelets?

- A It is needed for blood to clot.
- B It destroys damaged body cells.
- C It transports oxygen.
- D It destroys bacteria.

- 25 What substance does phloem transport?

- A carbon dioxide
- B oxygen
- C sugar
- D water

- 26 The diagram shows a cross-section through a human blood vessel.



What could the blood vessel be?

- A an artery
 - B a capillary
 - C a vein
 - D a xylem vessel
- 27 The table shows the enzymes and products of four different types of food.

What of the following is incorrect?

	food type	digestive enzyme	product
A	amylase	maltase	glucose
B	protein	protease	peptides
C	starch	amylase	maltose
D	maltose	maltase	glucose

- 28 Both starch and protein consist of large molecules made from smaller basic units.

Which basic units form these molecules?

	starch	protein
A	glucose	fatty acids
B	fatty acids	maltose
C	glucose	amino acids
D	maltose	amino acids

- 29 The table shows the results of food tests carried out on a fruit.

test	Benedict's	biuret	ethanol	iodine
result	positive	positive	negative	negative

What did the fruit contain?

- A fat and reducing sugar
 - B fat and starch
 - C protein and starch
 - D protein and reducing sugar
- 30 Four drops of cooking oil were added to 2 cm³ of ethanol in a clean, dry test-tube. The tube was shaken for a few seconds and 2 cm³ of water were added.

What would be observed?

- A a brick-red precipitate
- B a cloudy white emulsion
- C a clear solution
- D a pink colour

End of Section A

Name: _____ ()

Class: Sec 2/1

CLEMENTI WOODS SECONDARY SCHOOL
MID-YEAR EXAMINATION 2012

GENERAL SCIENCE
Secondary 2 Express

Section A	Section B	Section C	Total marks
/ 30	/ 50	/ 20	/ 100

Section B - 50 marks

Chemistry and Physics

Answer all questions. Write the answers in the spaces provided.

- 31 (a) Fig. 31.1 represents the particles in substances I, II, III and IV.

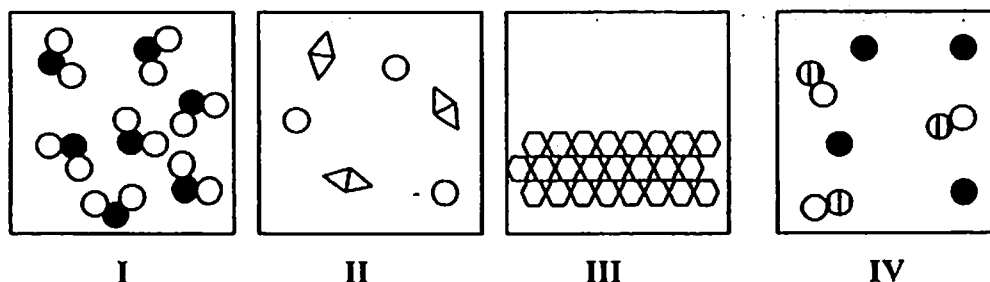


Fig. 31.1

Write down the substance that contains

- (i) an element only,
- (ii) a mixture of an element and a compound,
- (iii) a compound of two elements only, [3]

- (b) (i) Name a diatomic molecule. [1]

.....

- (ii) State the chemical symbol of the element in the diatomic molecule named in (b)(i). [1]

.....

- 32 At room temperature, substance X is a grey solid and substance Y is a yellow powder. When mixed together, X and Y can be separated using a magnet. However, when heated, the resulting substance Z is no longer attracted to a magnet.

(a) What are substances X, and Y?

[2]

.....
.....

(b) Which substance, X or Y, is attracted by the magnet? Explain why.

[1]

.....
.....

(c) Which substances X, Y or Z, is a compound? Explain your answer.

[1]

.....
.....

(d) Write down one difference between X and Z.

[1]

.....
.....

- 33 Fig. 33.1 represents the arrangement of particles in a solid

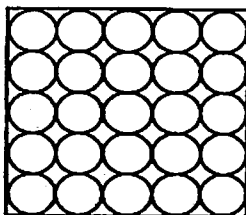


Fig. 33.1

(a) Describe the movement of the particles in the solid.

[1]

.....
.....

- (b) How does this movement of the particles change as the solid is heated until its melting point?

[2]

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.....

- (c) Equal masses of steam and of water contain the same number of molecules. Explain why the volume of the steam is much greater than that of the water.

[2]

.....

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.....

- 34 Lead nitrate and sodium bromide are colourless solution. When lead nitrate is added to sodium bromide, the resulting mixture is a colourless solution of sodium nitrate with yellow precipitate of lead bromide. The mixture is filtered.

- (a) What is the name given to the mixture formed?

[1]

.....

- (b) Write a word equation to represent the above reaction.

[2]

.....

- (c) Name the substances collected as residue and filtrate.

[2]

.....

.....

- 35 Fig. 35.1 shows an electricity generating station.

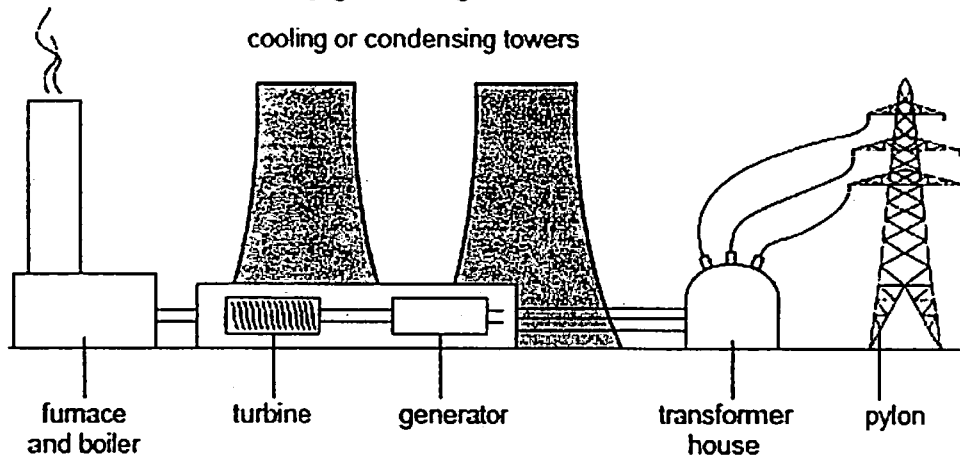


Fig. 35.1

- (a) Name two fossil fuels which could be burned in the furnace to heat water in the boiler.

1.

2.

[2]

- (b) Complete the energy transfer statements below.

In the furnace..... energy is converted into heat energy. In the turbine, the energy in the steam is converted into the energy of the turbine.

The generator converts energy into energy.

[3]

- 36 In this question, drawing should be done carefully using a pencil.

Fig. 36.1 shows a ray of light striking mirror 1 at point X.

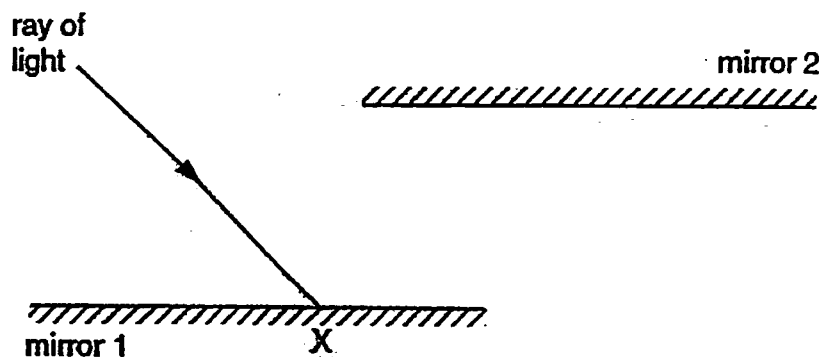


Fig. 36.1

- (a) On Fig. 36.1,
- draw the normal at X,
 - draw the ray reflected from mirror 1,
 - mark the angle of incidence and label it m ,
 - mark the angle of reflection and label it f .

[4]

- (b) Mirror 2 is parallel to mirror 1. The reflected ray from mirror 1 strikes mirror 2. Compare the direction of the ray reflected from mirror 2 with the incident ray at X. You may do a further construction if you wish. Complete the sentence below.

[1]

The reflected ray from mirror 2 is

.....

- 37 Fig. 37.1 shows a children's playground. A child of mass 30 kg climbs up a concrete slide of height 2.3 m. He slides down the slope that has a length of 5 m. At the end of the slope, which is 0.3 m above the ground, his velocity is 4 m/s.

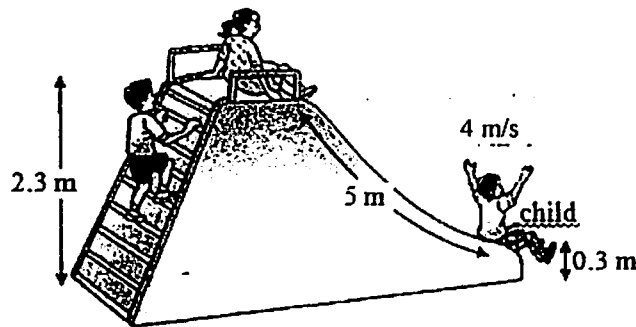


Fig. 37.1

- (a) Calculate his potential energy (PE)
- at the top of the slide, and
 - at the end of the slide.

[3]

PE at the top = J

PE at the end = J

(b) Find his kinetic energy (KE) at the end of the slope.

[2]

KE = J

(c) (i) State the principle of conservation of energy.

[2]

.....

.....

.....

(ii) Write down the conversion of energy as the child slides from the top to the bottom of the slide.

[2]

.....

(iii) Find the amount of energy that is converted to other forms of energy as the child slides from the top to the bottom of the slide.

[1]

amount of energy = J

- 38 In an experiment to observe the refraction of light in glass, a student shone a ray of red light on a thick rectangular glass block as shown in Fig. 38.1. He marked, on a sheet of white paper placed underneath the block, the path of the incident ray and the emergent ray.

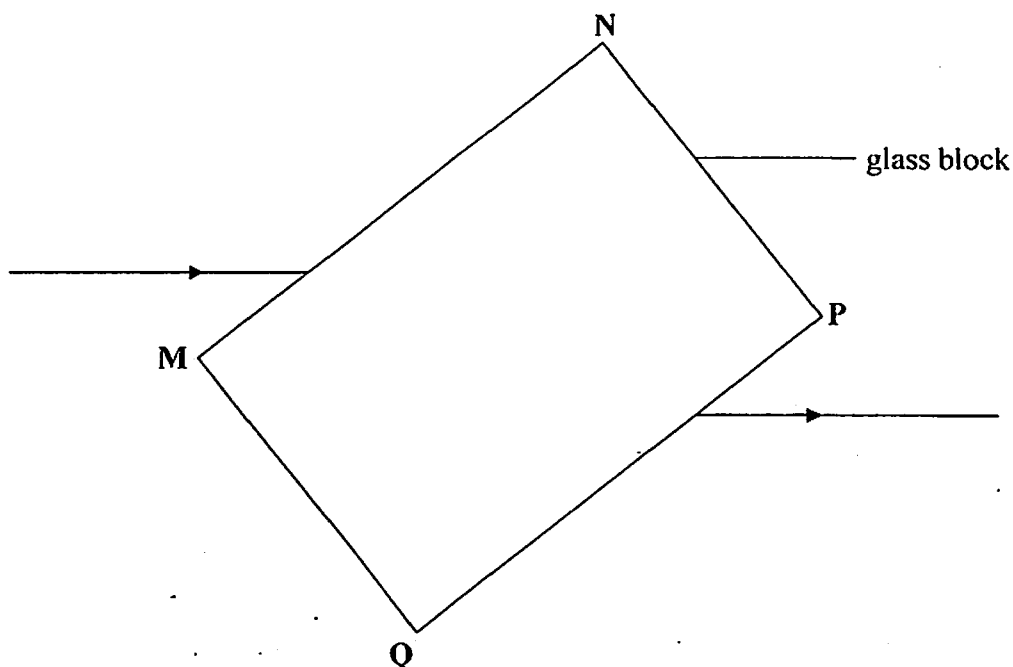


Fig. 38.1

- (a) Complete Fig. 38.1 to show the normal for the incident ray on side MN and the path of the refracted ray. [2]
- (b) (i) On Fig. 38.1 indicate the angle of incidence with letter d and angle of refraction with letter f . [2]
- (ii) Measure and record the values of the angles. [2]
- $d = \dots\dots\dots$
- $f = \dots\dots\dots$
- (c) Some of the incident rays are also reflected. On Fig. 38.1, draw accurately the path of the reflected light. [2]
- (d) State the size of the angle of reflection and the angle of emergence. [2]

angle of reflection = $\dots\dots\dots$

angle of emergence = $\dots\dots\dots$

End of Section B

Name : _____ ()

Class: Sec 2/1

CLEMENTI WOODS SECONDARY SCHOOL
MID-YEAR EXAMINATION 2012

GENERAL SCIENCE
Secondary 2 Express

Section A	Section B	Section C	Total marks
/ 30	/ 50	/ 20	/ 100

Section C - 20 marks

Biology

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

- 39 Fig. 39.1 shows the structure of a plant cell as seen through a light microscope.

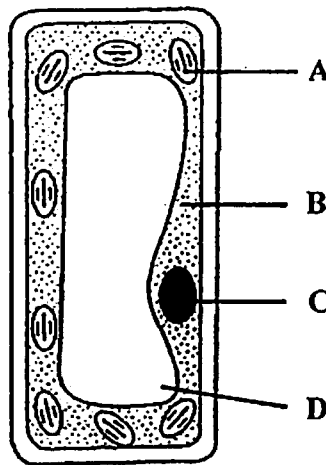


Fig. 39.1

- (a) (i) Identify the structures labelled A and B.

[2]

A.....

B.....

- (ii) Identify structure C and state its function.

[2]

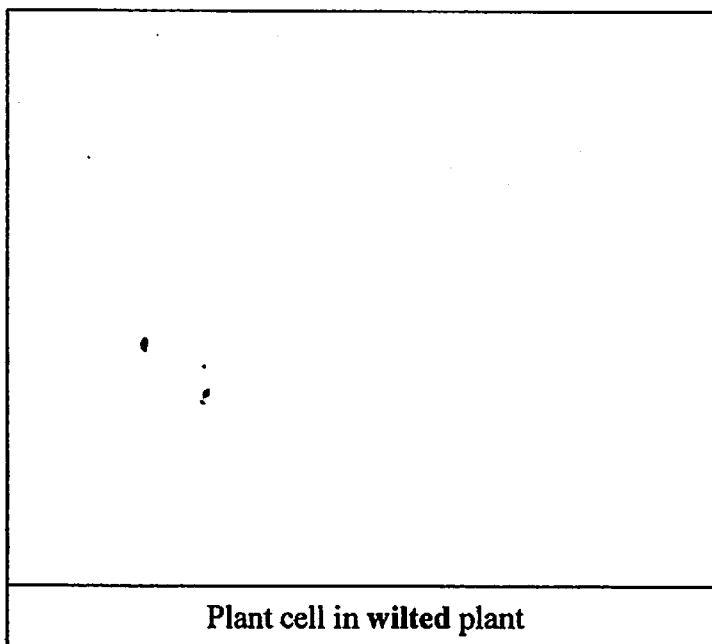
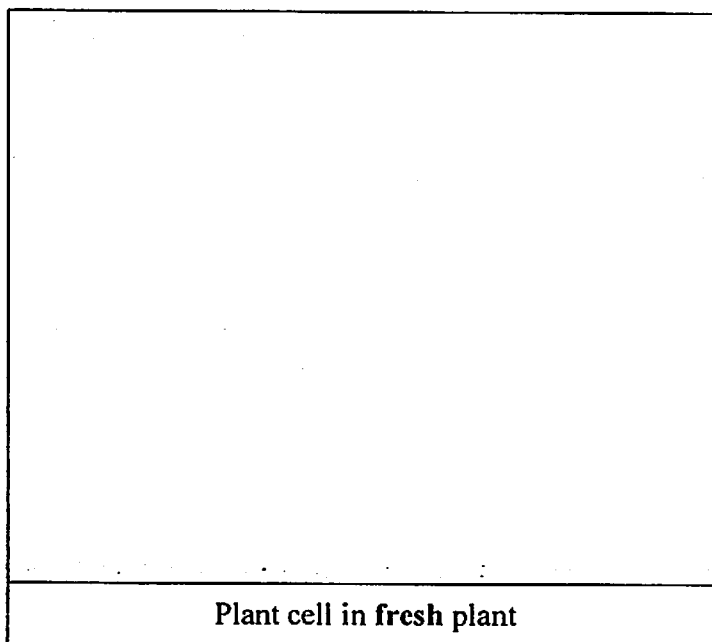
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- (b) Two plants have been kept out on a windowsill. One looks fresh and is kept in a vase full of water. The other is wilted and kept in an empty dry vase.

Draw a cell from each of the plants to show their conditions. You **must** label the cell membrane and cell wall in both diagrams.

[3]



40 Fig. 40.1 shows information taken from a carton of milk.

Whole Milk	
Serving Size 8 fl oz (240mL)	
Servings Per Container 2	
Amount Per Serving	
Calories 150	Calories from Fat 70
% Daily Value*	
Total Fat 8g	12%
Saturated Fat 5g	25%
Cholesterol 35mg	12%
Sodium 125mg	5%
Total Carbohydrate 12g	4%
Dietary Fiber 0g	0%
Sugars 11g	
Protein 8g	

Fig. 40.1

- (a) Which nutrient will provide the most energy per gram?

[1]

In September 2008, and in recent times, several companies in China were implicated in a scandal involving milk and infant formula which had been contaminated with melamine.

- (b) Melamine has high nitrogen content, and when added to milk can cause the amount of nutrient X to appear higher than the actual amount.

What is nutrient X?

[1]

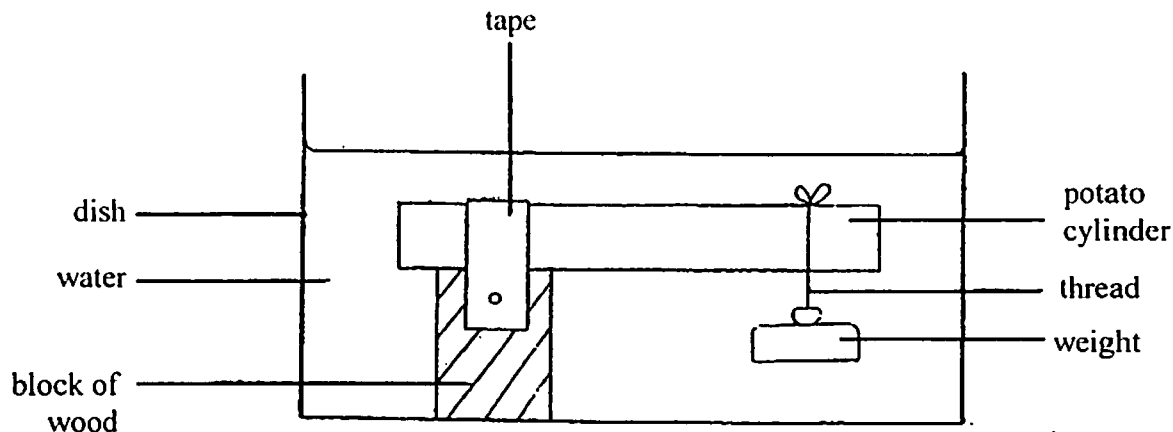
- (c) Two samples of white powder have been brought to your lab. One is pure melamine. The other is milk powder contaminated with melamine.

Which food test would you use to differentiate the two powders?

[1]

- 41 An experiment was carried out to investigate the effect of concentrated salt solution on potato tissue.

A cylinder was cut from a potato and one end was attached with a tape to a block of wood. This was then fixed to the base of a dish and a weight was tied to the other end of the cylinder. The dish was filled with tap water (dish A). The apparatus is shown in Fig. 41.1.

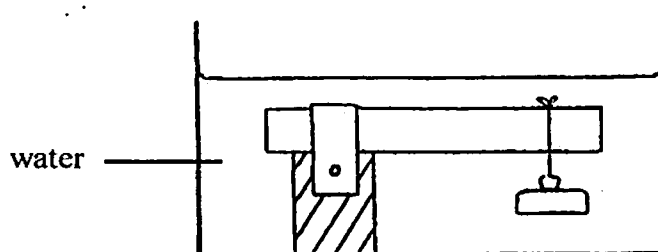


Dish A at start

Fig. 41.1

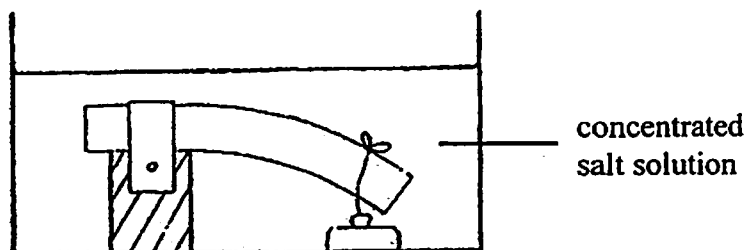
A second cylinder of the same size was cut from the potato, and the apparatus was set up in the same way, except that the dish was filled with concentrated salt solution (dish B).

Both dishes were left for one hour. The appearance of each cylinder after one hour is shown in Fig. 41.2 and Fig. 41.3.



Dish A after one hour

Fig. 41.2



Dish B after one hour

Fig. 41.3

- (a) Explain the difference between the appearances of the potato cylinder in dish A and the potato cylinder in dish B after one hour.

[8]

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- (b) From the results of the experiment, deduce the property of the cell membrane of the potato cells and explain your deduction.

[2]

.....

.....

.....

.....

End of paper



CLEMENTI WOODS SECONDARY SCHOOL MID-YEAR EXAMINATION 2012

**GENERAL SCIENCE****SECTION B - PHYSICS/CHEMISTRY****SECTION C - BIOLOGY****Secondary 2 Express****2 Hours****9 May 2012**

Section A – 30 marks
1 mark per question

1	D	5	A	9	A	12	C	15	B
2	D	6	C	10	B	13	C	16	B
3	D	7	A	11	A	14	C	17	D
4	A	8	D					18	B

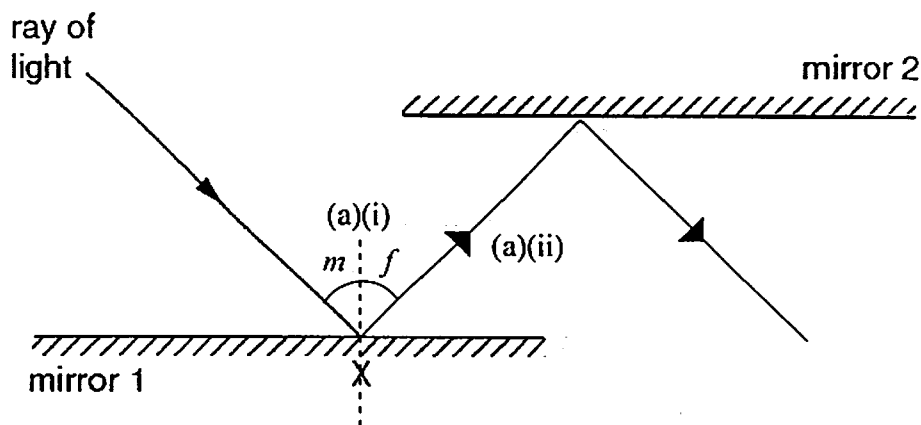
19	A	23	A	26	A	30	B
20	C	24	A	27	A		
21	D	25	C	28	C		
22	D			29	D		

Section B - 50 marks

Chemistry and Physics

- 31 (a) (i) III [3]
 (ii) IV
 (iii) I
- (b) (i)(ii) Oxygen gas O₂/ hydrogen gas H₂/ nitrogen gas N₂ [1]
 [1]
- 32 (a) X is iron (filings) [2]
 Y is sulfur
- (b) X is attracted as it is magnetic [1]
- (c) Z is a compound as it has colour different from X and Y/ cannot be attracted by magnet [1]
- (d) X is an element while Z is a compound OR
 X is attracted by magnet but Z is not attracted by magnet. [1]
- 33 (a) The particles in a solid can only vibrate within their fixed positions. [1]
- (b) When the temperature reaches the melting point, the particles gained enough energy to overcome the forces of attraction between them 1m and break free from the neighbouring particles. 1m [2]
- (c) Gaseous steam molecules possess more kinetic energy than water molecules. [2]
 $\frac{1}{2} m$
 The forces of attraction between the gas particles are very weak and $\frac{1}{2} m$
 the gas molecules are spaced out far apart as compared to those in water, 1m
 thus the volume of steam is much greater than that of water.
- 34 (a) suspension [1]
- (b) Lead nitrate + sodium bromide → sodium nitrate + lead bromide [2]
- (c) residue – lead bromide [2]
 Filtrate – sodium nitrate
- 35 (a) 1. oil [2]
 2. coal
- (b) chemical
 Kinetic [3]
 Kinetic electrical

36



[4]

(b) The reflected ray from mirror 2 is parallel to the incident ray.

[1]

37 (a) (i) $PE_{\text{top}} = mgh = 30 \times 10 \times 2.3 = 960 \text{ J}$

[3]

(ii) $PE_{\text{end}} = mgh = 30 \times 10 \times 0.3 = 90 \text{ J}$

1m @ for working $\frac{1}{2}$ @ for correct answer with unit wrong unit – $\frac{1}{2}$ m

(b) $KE = \frac{1}{2} mv^2 = \frac{1}{2} 30 \times 16 = 240 \text{ J}$

[2]

(c) (i) Energy cannot be created and destroyed,
Can be converted from one form to another,
Total energy remains constant

[2]

(ii) $PE \rightarrow PE + KE + \text{heat}$

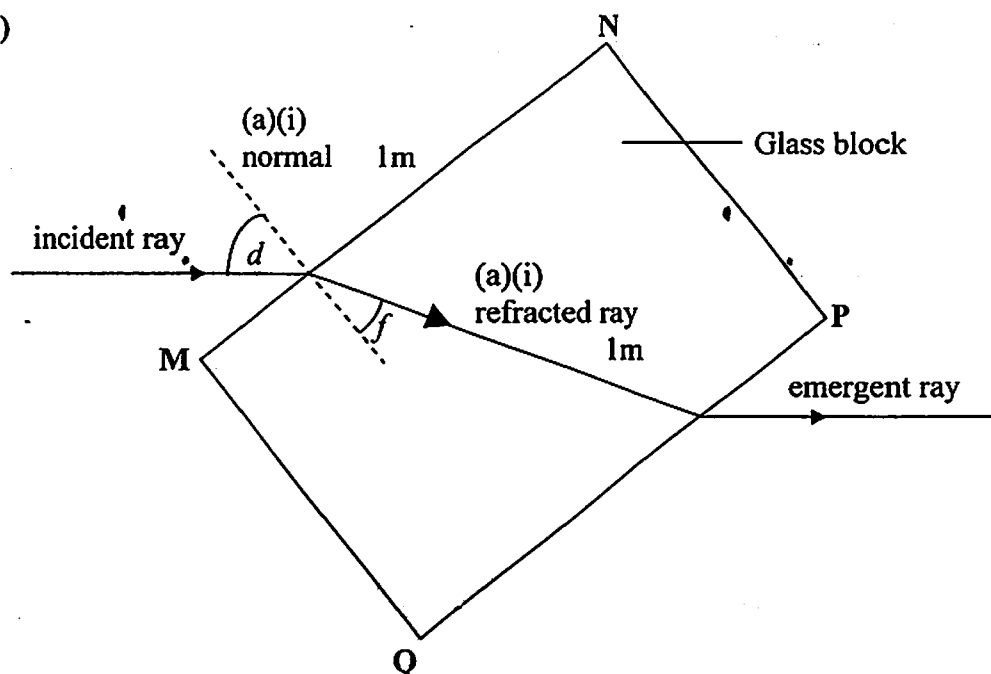
[2]

(iii) $\text{Heat} = 960 - 240 - 90 = 640 \text{ J}$

[1]

38 (a)

[2]



(b)(i)

(ii) $d =$

$f =$

(c) correct angle 1m arrow 1m

[2]

[2]

- (d) angle of reflection – same as (b)(ii) ecf
 angle of emergence – same as (b)(ii) ecf

[2]
 [2]

Section C - 20 marks

Biology

Answer all questions in the spaces provided.

39 (a) (i)

- A- chloroplast
 B- cytoplasm

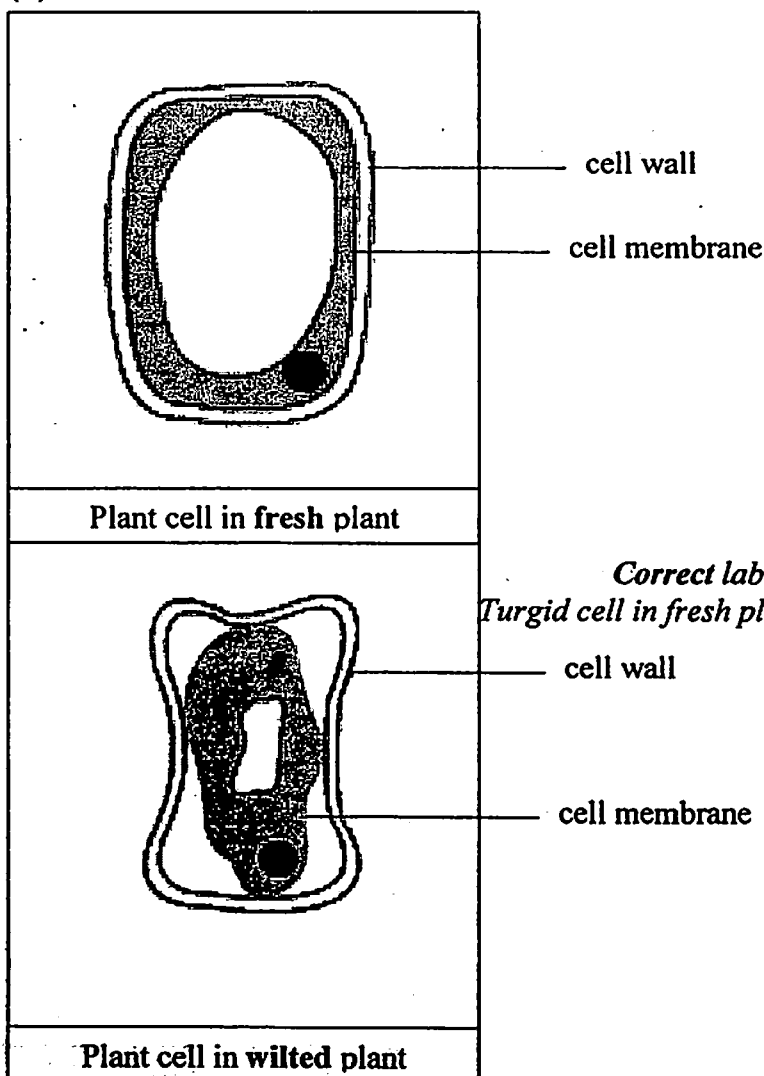
[2]

(ii) Structure C is the nucleus. [1]

It contains hereditary materials called chromosomes; needed for cell reproduction; controls ALL activities of the cell. [any one for 1 mark]

[2]

(b)



[1]

[3]

Neatness [1]

Correct labelling with parallel lines [1]

Turgid cell in fresh plant and flaccid/plasmolysed cell in wilted plant [1]

- 40 (a) *fat* [1]
(b) *Protein* [1]
(c) *Biuret's test* [1]

- 41 (a) *In dish A , water in the dish has a higher water potential than the cytoplasm and cell sap of the potato cells. [1]* [8]

*Therefore more water molecules will move into the potato cells, [1]
by osmosis across the partially permeable cell membrane. [1]
The potato cells become turgid, and therefore the cylinder becomes firm and is able to support the weight [1]*

In dish B , the concentrated salt solution in the dish has a lower water potential than the cytoplasm and cell sap of the potato cells. [1]

*Therefore more water molecules will move out of the potato cells, [1]
by osmosis across the partially permeable cell membrane. [1]
The potato cells become flaccid, and therefore the cylinder becomes soft and is unable to support the weight [1]*

- (b) *It can be deduced that the cell membrane of the potato cell is partially permeable. [1]
The membrane allows small water molecules to move in and out of the cell by osmosis, but prevents larger molecules such as salt from entering or leaving the cell. [1]*

[2]

End of Paper

Class	Candidate Name	Register Number
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FIRST TOA PAYOH SECONDARY SCHOOL

MID-YEAR EXAMINATION 2012

Secondary Two Express

Lower Sec Science

4th May 2012

Paper 1

30 minutes

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Write your name, register number and class on the Answer Sheet in the spaces provided.

There are **twenty** questions on this paper. 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.

Any rough working should be done in this booklet.

A copy of the Periodic Table is attached on the last page.

Multiple Choice Questions (30 Marks)

Answer **All** questions on the Multiple Choice Answer Sheet provided

1 Which of the following equations are examples of combination?

I calcium carbonate \longrightarrow calcium oxide + carbon dioxide

II sodium + water \longrightarrow sodium hydroxide + hydrogen

III sugar \longrightarrow carbon + water

IV carbon + oxygen \longrightarrow carbon dioxide

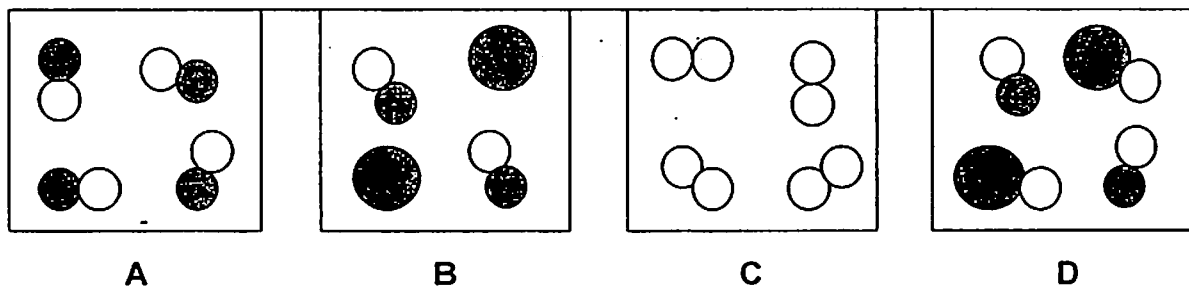
A I and II only

B I and III only

C II and IV only

D I, II and III only

Use the following diagram for questions 2 and 3.



In the diagram, each circle represents an atom. Circles of different colours and sizes represent different atoms.

2 Which diagram represents a mixture of compounds?

3 Diagram A represents a substance. Which of the following are two possible substances that diagram A may represent?

A O_2 , HCl

B CO , HCl

C He , Br_2

D Cl_2 , O_2

- | | type of mixture | example |
|---|-----------------|------------------|
| A | solid – solid | copper |
| B | liquid -liquid | alcoholic drinks |
| C | solid - liquid | Milo drink |
| D | gas - liquid | soda drink |

- A** filtration
B reverse osmosis
C simple distillation
D fractional distillation

-
- The diagram illustrates a fractional distillation column used to separate crude oil into different petroleum products. Crude oil enters the column from the side, passes through a series of horizontal trays, and is then collected in a reservoir at the bottom. The products are collected in separate containers based on their boiling points, with lower boiling point products at the top and higher boiling point products at the bottom.
- Products (from top to bottom):
- petroleum gas
 - petrol
 - kerosene
 - diesel fuel
 - lubricating oil
 - bitumen for road
- Boiling point scale:
- lower boiling point (top)
 - higher boiling point (bottom)

A petrol **B** kerosene
C petroleum gas **D** bitumen for road

- 7 Which of the following actions could be used to make a solution more concentrated?
- A Heat the solution.
 - B Add more solvent.
 - C Place the solution in a cool place.
 - D Stir the solution for a longer period of time.
- 8 The table below shows some differences between a solution and a suspension. Which one correctly describes the difference between a solution and a suspension?

	solution	suspension
A	non-homogeneous	homogeneous
B	solid particles settle at the bottom	no solid particles settle at the bottom
C	does not allow light to pass through	allow light to pass through
D	no solid particles remain on the filter paper after filtration	solid particles are obtained on the filter paper after filtration

- 9 In which of the following will the 5 g of rock sugar dissolve in 100 g of water the fastest?

	form	Temperature / °C
A	small pieces	40 °C
B	small pieces	80 °C
C	big lump	40 °C
D	big lump	80 °C

- 10 A man suffering from an excess of acid in his stomach has no indigestion tablets. Which substance could he now take to lower this acidity?
- A asprin (pH 6)
 - B salt water (pH 7)
 - C lemon juice (pH 5)
 - D bicarbonate of soda (pH 8)

A sulfuric acid **B** hydrochloric acid
C limewater **D** sodium hydroxide

plant	colour of original extract	colour change in lemon juice	colour change in oven cleaner
A	purple	pink	green
B	green	yellow	yellow
C	pink	pink	yellow
D	orange	red	green

A evaporation

B burning of petrol

C sublimation of iodine

D expansion of a piece of copper rod

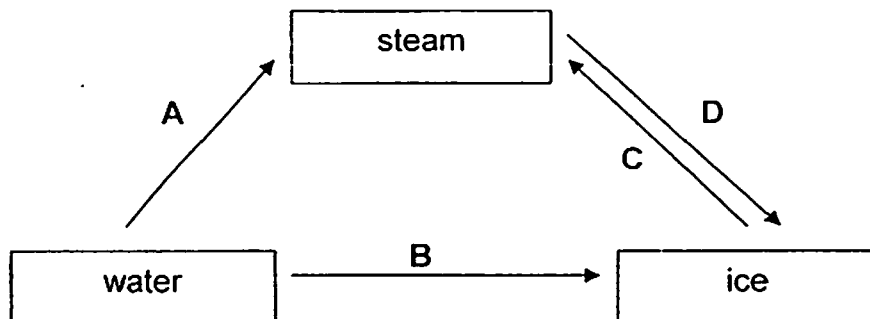
A photosynthesis

B iron becomes rusty

C bréad turns mouldy

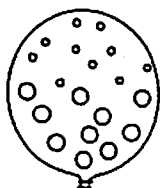
D dry íc turns into carbon dioxide

- 15 Which change, A, B, C or D involves freezing?

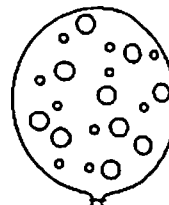


- 16 Which of the following diagrams shows the arrangement of particles inside a balloon filled with a mixture of hydrogen and nitrogen?

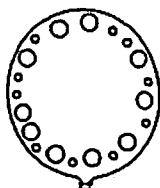
A



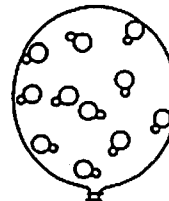
B



C



D



- 17 Which of the following substances has particles that vibrate in their fixed positions at 30 °C?

	melting point (°C)	boiling point (°C)
A	-189	-186
B	-10	58
C	-6	225
D	36	344

18 Which of the following statements is **incorrect**?

- A Element are made up of atoms.
- B Atoms cannot be created or destroyed.
- C Atoms of the same elements have the same size and mass.
- D Atoms of different elements have different number of protons but equal number of electrons.

19 What is the **correct** charge on each particle in an atom?

	proton	neutron	electron
A	positive	no charge	no charge
B	positive	no charge	negative
C	no charge	negative	postive
D	negative	positive	no charge

20 Which of the following is correct about aluminium carbonate, $\text{Al}_2(\text{CO}_3)_3$?

	number of elements	number of atoms
A	3	12
B	3	14
C	4	13
D	4	15

-End of Paper –

Group																				
I	II											III	IV	V	VI	VII	0			
											I 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 Aluminum 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulfur 16	35 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	78 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	226 Ra Radium 88	227 Ac Actinium 89																		

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

Key

a
X
b

a = relative atomic mass
 X = element symbol
 b = proton (atomic) number

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	232 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

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.)

Class	Candidate Name	Register Number
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FIRST TOA PAYOH SECONDARY SCHOOL

MID-YEAR EXAMINATION 2012

Secondary Two Express

Lower Sec Science

4th May 2012

Paper 2

1 hour 15 minutes

Candidates to answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your name, register number and class on all the work you hand in.

Write in dark blue or black pen.

You may use a soft pencil for any diagrams or graphs.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A (30 marks)

Answer all questions in the spaces provided.

Section B (30 marks)

Answer all three questions in the spaces provided. If working is needed for any question, it must be shown below that question.

The number of marks is given in brackets [] at the end of each question or part question.

A copy of the Periodic Table is printed on page 12.

For Examiner's Use	
Section A	
Section B	
B1	
B2	
B3	
TOTAL	60

Section A (30 marks)

Answer all questions.
Write your answers in the spaces provided.

A1 The following is a list of substances.

steel	sea water	pure water	aluminium
chlorine	zinc	sugar	mercury
iodine	carbon dioxide		

Choose from the list the name of

[3]

(a) a solid compound,

(b) mixture of metallic elements,


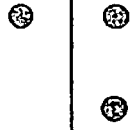

(c) an element used to make drink can,

(d) a liquid mixture which is the raw material for salt,

(e) a compound which is a gas at room temperature,

(f) a non-metallic element used in bleaches for our clothes,

- A2 (a) A chromatography was carried out on a fruit juice and four known coloured dyes, W, X, Y and Z. The results are shown in the chromatogram below.

				
x	x	x	x	x
fruit juice	W	X	Y	Z
dyes				

- (i) What dyes are present in fruit juice? [1]

.....

- (ii) Which coloured dye is not pure? [1]

.....

- (iii) Which dye is the most soluble in the solvent? Explain your answer. [2]

.....

.....

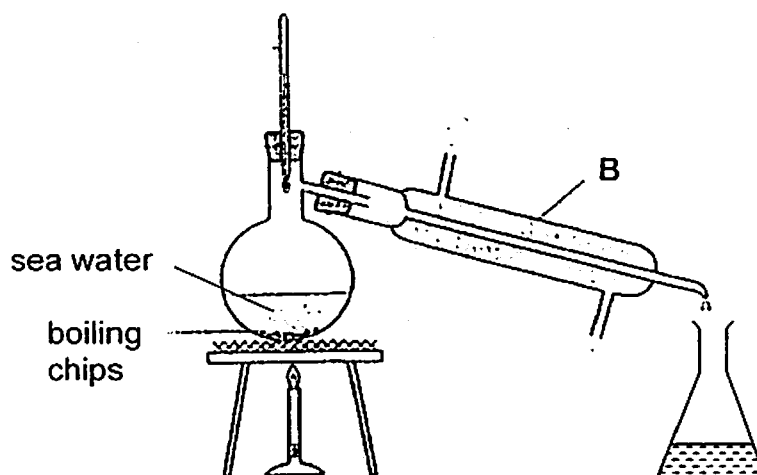
.....

- (b) A small slip of paper stained with ink is found at the scene of a crime. Why is chromatography often used in analysing the components of the ink? [1]

.....

.....

- (c) The apparatus below shows a technique of separating mixtures.



- (i) What is the above separation technique called? [1]

.....

- (ii) State the change in physical state of the distillate in the part labelled B. [1]

.....

- (iii) Why are boiling chips placed in the distilling flask? [1]

.....

.....

A3 The pH values of five solutions are shown below.

Solution	A	B	C	D	E
pH	7	9	4	12	2

- (a) Which solution reacts vigorously with magnesium ribbon? [1]

.....

- (b) Which solution will turn Universal Indicator green? [1]

.....

- A4** (a) Iodine dissolves readily in alcohol to form a solution. Name the solute and the solvent in the solution. [1]

(i) solute: _____

(ii) solvent: _____

- (b) Iodine does not dissolve readily in water. What does this tell you about the solubility of a substance? [1]

- (c) What can be done to dissolve a large piece of iodine crystal in alcohol quickly? [1]

- (d) 'Tincture of iodine' need not to shake before you apply whereas a bottle of calamine lotion is to be shaken. Explain. [1]

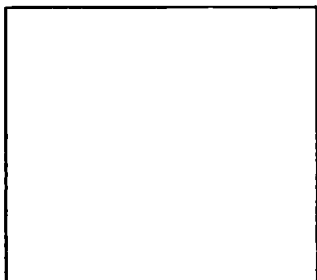
- A5** Many people prefer not to live in industrial areas where there are many factories. One of the reasons is because some factories give off air pollutants when they burn fuels.

- (a) Name the air pollutant(s) produced by burning fuels in an insufficient supply of oxygen. [1]

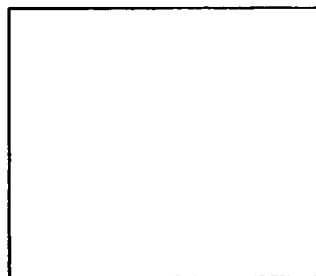
- (b) Name the air pollutant(s) produced by burning fuels that can cause global warming. [1]

- A6 (a) The melting point of ethanol is -117°C and it boils at 78°C .

Use the boxes below to illustrate the arrangement of ethanol particles at -120°C and 0°C .



at -120°C



at 0°C

[2]

- (b) Suggest why

- (i) a liquid can take up the shape of a container.

[1]

- (ii) a solid has more mass than the same volume of gas.

[1]

A7 (a) Refer to the Periodic Table provided and complete the table below.

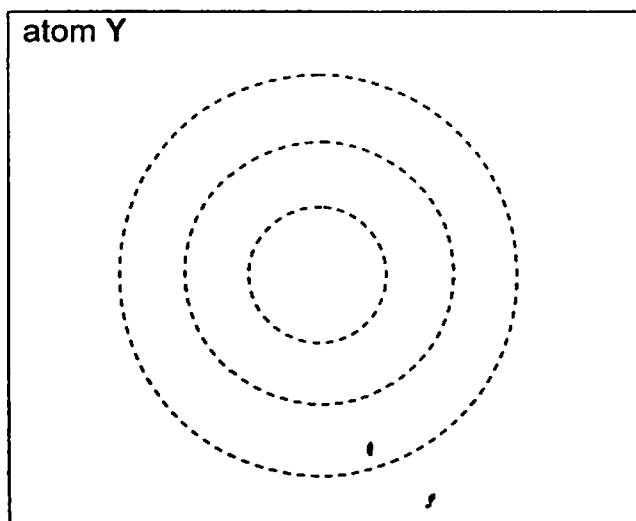
ion / atom	nucleon number	number of		
		protons	neutrons	electrons
Mg	24			
Na ⁺			12	
	16	8		10

[4]

b The symbol of the unknown atom is ${}_{13}^{27}\text{Y}$

- (i) Draw the full electronic structure of atom Y.
(Use cross 'x' to represent an electron)

[1]



- (ii) Which group in the Periodic Table does atom Y belongs to?

[1]

- (iii) Identify element Y from the Periodic Table.

[1]

Section B (30 marks)

Answer all three questions.

Write your answers in the spaces provided.

- B1 (a)** When a piece of magnesium ribbon burns in the air, a dazzling flame can be seen and a white powder is formed.

- (i)** Name the process described above. [1]

.....

- (ii)** Write a word equation to describe what happens when magnesium ribbon burns in air. [1]

.....

- (iii)** Is the product formed an element or a compound? Give a reason to support your answer. [2]

.....

.....

.....

- (b)** Is air a mixture or a compound? Give a reason to support your answer. [2]

.....

.....

.....

- (c) (i)** What is an element? [1]

.....

.....

- (ii)** Name the **two** main categories of elements in the Periodic Table. [1]

.....

-

- ! ~~~~~

components of rock salt	solubility in alcohol	solubility in water
common salt	insoluble	soluble
sand	insoluble	insoluble
other impurities	soluble	soluble

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

(b) Heating of water is a physical change while electrolysis of water is a chemical change.

- (i) State two differences between a physical and a chemical change. [2]

physical change	chemical change

- (ii) Describe in terms of particulate model of matter the changes in the energy and movement of the particles when water is heated. [2]

- (c) (i) Using the symbol, \bigcirc , to represent atoms of oxygen and \bullet , to represent atom of sulfur, draw the molecular diagrams to represent oxygen gas (O_2) and sulfur dioxide gas (SO_2) in the following table.

chemical formula	molecular diagram	chemical formula	molecular diagram
O_2		SO_2	

[2]

- (ii) How does a molecule of oxygen and a molecule of sulfur dioxide different? [1]

- B3 (a) Mary was given a bottle of hydrochloric acid and a bottle of unknown colourless solution, **liquid Y**. She used red and blue litmus papers to test for **liquid Y**. The results are as follows:

	colour of red litmus	colour of blue litmus
liquid Y	turns blue	remains blue

- (i) What is **liquid Y** most likely to be? [1]

.....

- (ii) State two **other** physical properties of **liquid Y**. [2]

.....

.....

- (iii) Name the products formed when **liquid Y** is mixed well with the hydrochloric acid. [1]

.....

- (iv) Name the process to describe the reactions that took place in (iii). [1]

.....

- (b) Mary poured some hydrochloric acid into a test tube containing calcium carbonate. A colourless gas was given off.

- (i) Name the gas that was given off. [1]

.....

- (ii) Describe a test to identify the gas given off. [2]

.....

.....

.....

- (iii) Write a chemical word equation for the reaction in (b). [2]

.....



FIRST TOA PAYOH SECONDARY SCHOOL MID-YEAR EXAMINATION 2012

SECONDARY 2 EXPRESS Lower Sec Science Marking Scheme

Paper 1 (20 marks) Answer all questions in the spaces provided.

1	C	6	C	11	A	16	B
2	D	7	A	12	B	17	D
3	B	8	D	13	B	18	D
4	A	9	B	14	D	19	B
5	B	10	D	15	B	20	B

Paper 2

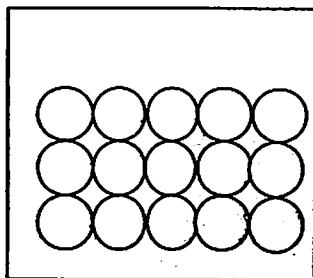
Section A (30 marks)

Answer all questions in the spaces provided

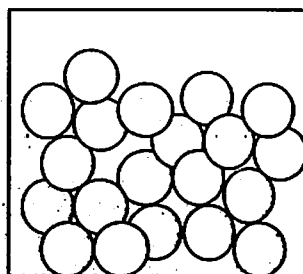
A1	a	sugar		½
	b	steel		½
	c	aluminium		½
	d	sea water		½
	e	carbon dioxide		½
	f	chlorine		½
A2	a	i	W, X and Z	1
		ii	Y	1
		iii	Z	1
			Its distance from the start line is the furthest.	1
	b	<ul style="list-style-type: none">• This method requires only small amount of dye and gives an accurate quick result.• The components of the ink is coloured (visible)• Paper chromatography can be used to separate the dyes in the ink so that the dyes composition in the ink can be seen.		½, ½

	c	i	simple distillation	1
		ii	gaseous state changes to liquid state	1
		iii	to ensure smooth boiling	1
A3	a		solution E	1
	b		solution A	1
A4	a	i	iodine	$\frac{1}{2}$
		ii	alcohol	$\frac{1}{2}$
	b		Solubility of a substance is affected by the nature of the solvent.	1
	c		Pound the iodine crystal into smaller pieces. Increase the temperature of the alcohol. (any one) Stir the mixture Heat the alcohol (cannot accept as alcohol is flammable)	1
	d		Tincture of iodine is a solution, no particle will be settled down on standing whereas calamine lotion is a suspension, its particles settle on standing. Shaking is to allow the solid particles to mix well with the liquid.	$\frac{1}{2}$, $\frac{1}{2}$
A5	a		carbon monoxide	1
	b		oxides of nitrogen	1

A6 a



at -120 °C



at 0 °C

1,1

	b	i	Particles of liquid are not arranged in a fixed, regular pattern and can move over one another.	1
		ii	The particles of solid are closely packed whereas the particles of gas are far apart. Therefore there are more particles packed in fixed amount volume of solid than that of gas.	1

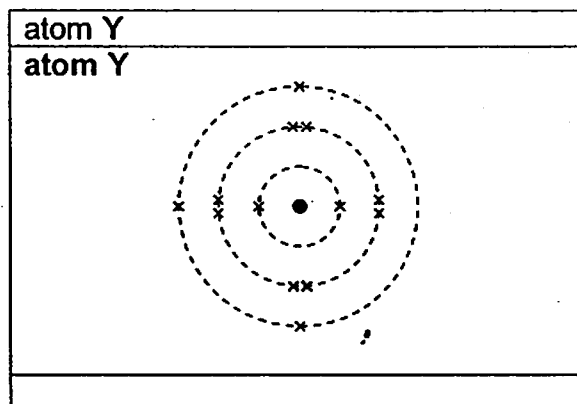
A7 a

ion / atom	nucleon number	number of		
		protons	neutrons	electrons
Mg	24	12	12	12
Na ⁺	23	11	12	10
O ²⁻	16	8	8	10

[4]

b

i



[1]



		ii	group III	1
		iii	Al (aluminium)	1

Section B : Answer All three questions

B1	a	i	Combustion / Combination	1
		ii	magnesium + oxygen \longrightarrow magnesium oxide	$\frac{1}{2}$, $\frac{1}{2}$
		iii	A compound It is formed by two different elements chemically combined together.	1 1
	b		It is a mixture. <ul style="list-style-type: none"> It is formed by simply mixing its component gases. No reaction occurs between the components. Air has the properties of its components Air can be separated into its components by fractional distillation. The properties of the constituent gases in air may vary with place and time. 	1 1 (any 1)
	c	i	An element is a substance which cannot be broken down into two or more simpler substances by chemical methods.	1
		ii	metal and non-metal	$\frac{1}{2}$, $\frac{1}{2}$
		iii	dull, brittle, non-ductile, poor conductor of heat, low density	1 Any 1
		iv	Any element in group I (lithium, potassium, rubidium, caesium, francium)	1
B2	a		<ul style="list-style-type: none"> Add alcohol to the rock salt and stir the mixture to dissolve other impurities. Filter the mixture to remove other impurities in the filtrate. Common salt and sand are retained on the filter paper as a residue. Add water to the residue collected to dissolve common salt. Filter the mixture, sand will be collected as a residue and common salt is present in the filtrate. Evaporate the filtrate to obtain solid common salt. 	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
	b	i	<div>physical change</div> <div>chemical change</div>	
			No new substances are formed	New substances are formed [1]
			The change is reversible	The change is irreversible [1]

		ii	When water is heated, the particles gain energy and vibrate and move about more vigorously and freely.	1 1

(c) i

chemical formula	molecular diagram	chemical formula	molecular diagram
O ₂		SO ₂	

1,1

		ii	Molecule of oxygen is made up of two atoms of the same kind whereas, molecule of sulfur dioxide is made up of three atoms of two different kinds.	½ ½

B3	a	i	An alkali	1
		ii	It tastes bitter. It has a soapy feel. It is corrosive. It is an electrical conductor. It turns Universal Indicator indigo or violet.	2 (any 2)
		iii	salt and water	½, ½
		iv	neutralisation	1
	b	i	Carbon dioxide	1
		ii	Pass the gas through the limewater, carbon dioxide turns limewater cloudy / a white precipitate is formed.	1 1
		iii	calcium + hydrochloric → calcium + carbon + carbon + water carbonate acid carbonate dioxide	1,1

End of Paper

Class Index No.

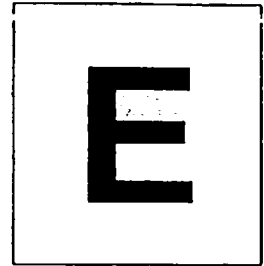
Candidate Name: _____



FUHUA SECONDARY SCHOOL

Secondary Two Express

Mid-Year Examination 2012

[illegible]

SCIENCE

Additional Materials:

Writing paper & Electronic calculator

DATE : 11 May 2012
TIME 0750h to 0950h
DURATION 2 hours

INSTRUCTIONS TO CANDIDATES

Section A

Answer all questions. Shade your answers in soft pencil on the OMR.

Section B

Answer all questions. Write your answers in the blanks provided.

Section C

Answer all questions on the writing paper provided.

The number of marks is given in brackets [] at the end of each question or part question.

The total number of marks for this paper is 100.

The use of an electronic calculator is expected, where appropriate.

You are reminded of the need for clear presentation in your answers.

PARENT'S SIGNATURE	FOR EXAMINER'S USE		Highest Mark:	Lowest Mark:
		/ 100		

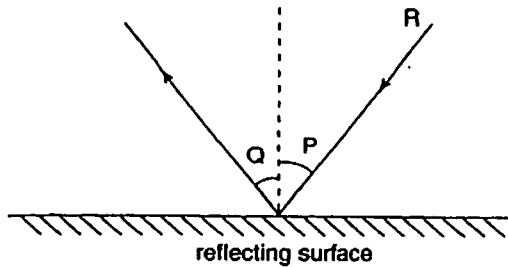
Setter: Paul Chandra Tjahjono

Vetter: Ng Yong Sheng

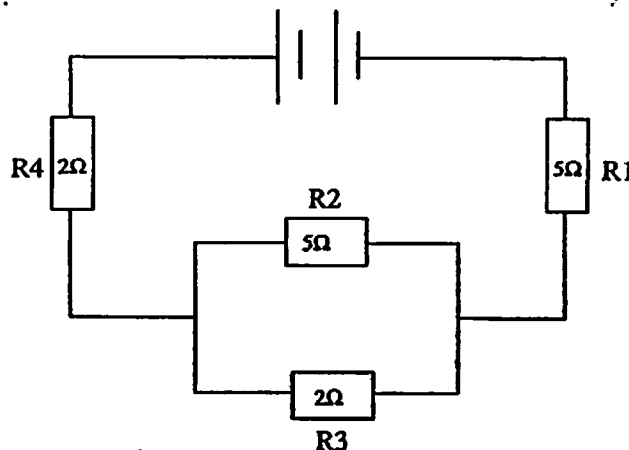
This question paper consists of 15 printed pages-including this page.

6. Which of following shows correctly the speed of light in vacuum?
 A 300 m/s B 330 m/s C 300 000 km/s D 330 000 km/s

7. Which of following correctly describes the relationship of angles P and Q?

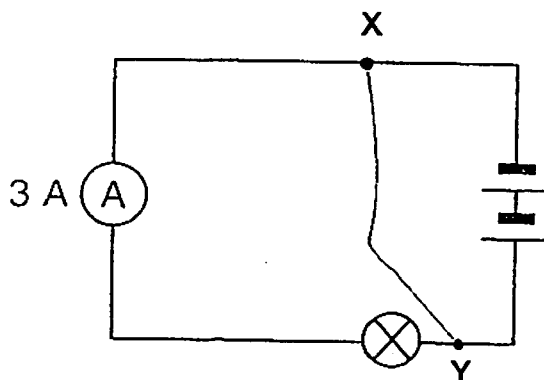


- A Angle P is larger than angle Q.
 B Angle P is smaller than angle Q.
 C Angle P is equal to angle Q.
 D Sum of angle P and angle Q is 90° .
8. A ray of light passes from medium X into medium Y. If the refracted ray of light in medium Y bends away from the normal,
 A medium X is optically denser than medium Y.
 B medium X is optically less dense than medium Y.
 C medium X and medium Y are of equal optical density.
 D medium X is vacuum.
9. Jolene wore a white dress with black polka dots. Her sister wore a similar dress except that it is red with blue polka dots. In what colour light will their dresses appear to be of the same colour?
 A White B Blue
 C Green D Red
10. Four resistors R1, R2, R3 and R4 were placed at different positions in a circuit as shown below. Which two resistors will have the same current flow?



- A R1 and R2 B R1 and R4 C R2 and R3 D R3 and R4

11. Which of the following statements about the resistance of an electric circuit is **not** true?
- A An object with a greater resistance carries a greater amount of current in a circuit than that of a lower resistance.
 - B Different metals have different resistivity.
 - C The resistance becomes greater when the length of a conducting wire increases.
 - D The SI unit of resistance is ohm (Ω)
12. The diagram below shows an experimental set-up of an electric circuit.

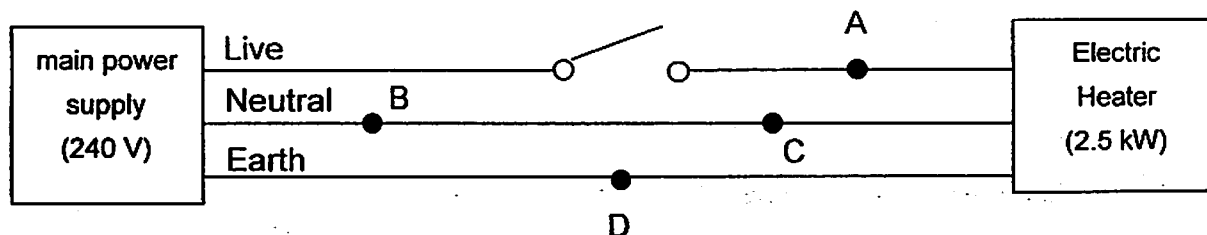


What would happen to the electric circuit when a conducting wire is connected between points X and Y?

- A The brightness of the bulb and the reading of the ammeter remain the same.
- B The brightness of the bulb decreases but the reading of the ammeter becomes lesser than 3 A but greater than zero.
- C The brightness of the bulb decreases but the reading of the ammeter becomes more than 3 A.
- D The bulb does not light up and the reading of the ammeter becomes zero.

Answer questions 13 and 14 by using the information provided below.

The diagram below shows the three wires of an electrical main power supply connected to an electric heater which has a power rating of 2.5 kW.



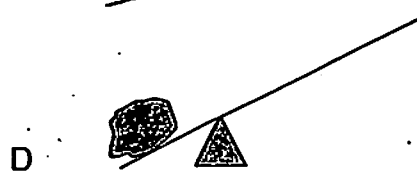
13. Which of the following fuse ratings is most suitable for the circuit above?
- A 5 A
 - B 10 A
 - C 13 A
 - D 15 A
14. Which position, A, B, C or D, should the fuse be fitted to such that the electric heater is protected in case a large current is drawn from the main power supply?

15. A current of 2 A is supplied to an electric appliance. What is the current in each of the wires when the electrical application functions normally?

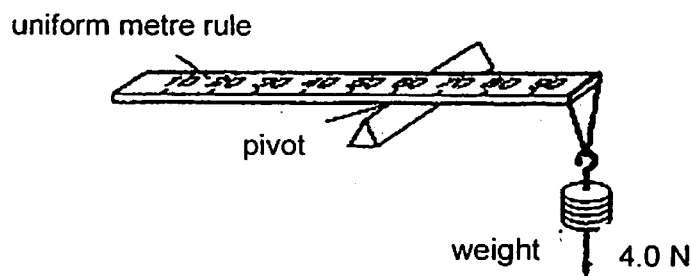
	Neutral Wire	Live Wire	Earth Wire
A	2	2	0
B	2	0	2
C	2	2	2
D	0	2	2

16. What is the purpose of boiling the leaf in water before testing it for starch?
- To remove the chlorophyll.
 - To harden the leaf.
 - To remove the glucose.
 - To kill the leaf.
17. When a variegated leaf from a plant is tested with iodine solution after being exposed to sunlight, only green parts of the leaf show blue-black colour. Which of the following inferences can be made from this observation?
- Only green parts of the leaf contain chlorophyll to carry out photosynthesis.
 - Only green parts of the leaf are able to store starch after photosynthesis.
 - Only green parts of the leaf contain chlorophyll to react with the iodine solution.
 - Only green parts of the leaf contain glucose to react with the iodine solution.
18. Which of the following statements about gravitational force is **true**?
- A satellite stays in orbit around the Earth because of the pull of gravitational force from the Moon.
 - Earth is the only planet which has gravitational force acting on all its objects.
 - The gravitational force can repel an object if its pole is placed opposite to the pole of the gravitational force.
 - The weight of an object decreases if it is placed in a location with a weaker gravitational force.
19. Which of one the following situations shows that a force is acting on the object?
- A ball at rest.
 - A ball rolling with a constant speed on a frictionless surface.
 - A falling rock.
 - An asteroid moving with a constant speed in space.
20. A man standing on the floor exerts a larger pressure on the floor than when he is lying down. This is because the
- force applied is greater when he is standing.
 - size of man is smaller when he is lying down.
 - floor on which he is standing is harder.
 - the area in contact with the floor is smaller when he is standing.

21. A piece of rock was brought back from the Moon by an astronaut. Which of its properties would be different on Earth?
 A Density B Mass C Volume D Weight
22. Ice formed on a frozen lake will break if the pressure on it is greater than 1.0 N/cm^2 . If four boys with the following weights stood on the ice, which one will cause the ice to break?
- | | Weight of boy/N | Area of feet/ cm^2 |
|---|-----------------|-----------------------------|
| A | 200 | 260 |
| B | 300 | 250 |
| C | 400 | 500 |
| D | 500 | 580 |
23. The moment of a force causes an object to
 A move forward.
 B move backward.
 C stop moving.
 D turn about a fixed point.
24. The turning effect of a force on a door is greater when it is applied at
 A a point near the hinges and perpendicular to the door.
 B a point near the hinges and parallel to the door.
 C a point far away from the hinges and perpendicular to the door.
 D a point far away from the hinges and parallel to the door.
25. Two equal forces acting on an object in opposite directions will be in equilibrium
 A only if they act on the same point on the object.
 B if they are separated by a distance.
 C when they are balanced by a third force.
 D when their moments about the same point are equal.
26. A nut can be loosen more easily with
 A a short spanner because a large turning effect can be produced.
 B a short spanner because a larger force can be produced.
 C a heavy spanner because a larger force can be produced.
 D long spanner because a large turning effect can be produced.
27. A crowbar is used to lift a heavy piece of rock. Which of the diagrams below shows the least force used for lifting the rock?



28. A uniform metre rule of weight 16.0 N is pivoted at the 60 cm mark. A 4.0 N weight is suspended from one end.



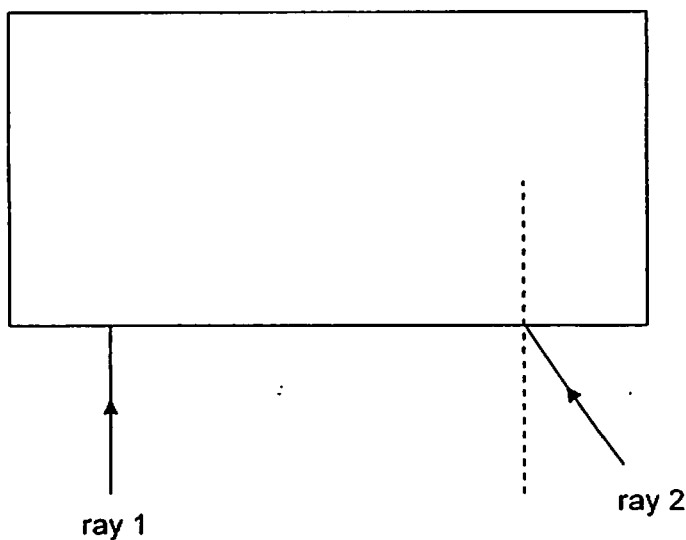
At the instant when the metre rule is horizontal, what is the value of the resultant turning moment about the pivot?

- A zero
 - B 160 Ncm anticlockwise
 - C 160 Ncm clockwise
 - D 20 N downward
29. A construction worker uses a force of 1000 N to push a wheelbarrow full of sand but it does not move. How much work has he done?
- A 0 J
 - B 10 J
 - C 100 J
 - D 1000 J
30. A boy kicks a ball away in a football field. Which of the following is true about his work done?
- A The energy has transferred from one object to another.
 - B The energy is dissipated in the air.
 - C The work done produces twice the amount of heat energy.
 - D The boy does not perform any work.

SECTION B: STRUCTURED QUESTIONS (40 Marks)

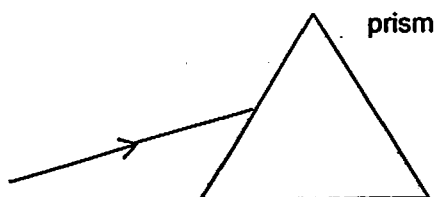
Write your answers in the blanks provided.

1. Two light rays pass into a glass block as shown. Complete the paths of the rays as they pass through and out of the glass block. [3]



2. (a) What is refraction of light? Why does it occur? [2]

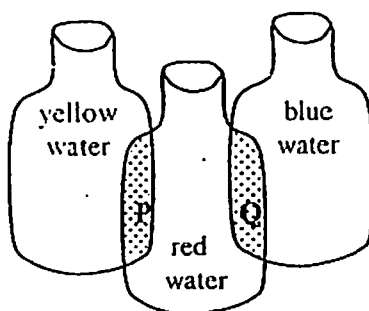
- (b) The diagram below shows a ray of white light entering a prism.



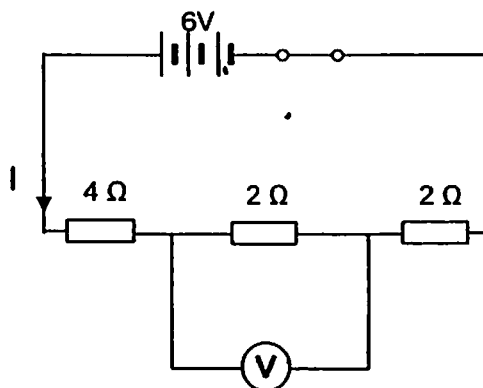
- (i) Complete it to show how a spectrum is formed and labelled the rays at the end of the spectrum. [2]

- (ii) Explain clearly what happens to the ray of light as it enters and leaves the prism. [3]

- (c) Three glass jars of coloured water are placed in front of a white light source. They are arranged in such a way that they intersect at the sides of the jars. Explain the colours you see at P and Q. [2]



3.



For the circuit diagram shown above, find the

- (a) electric current; I ,

[2]

(b) potential difference, V , across the $2\ \Omega$ resistor.

[1]

4. A 24V 12W lamp is operating normally. Calculate

(a) the current flowing through the filament of the lamp.

[2]

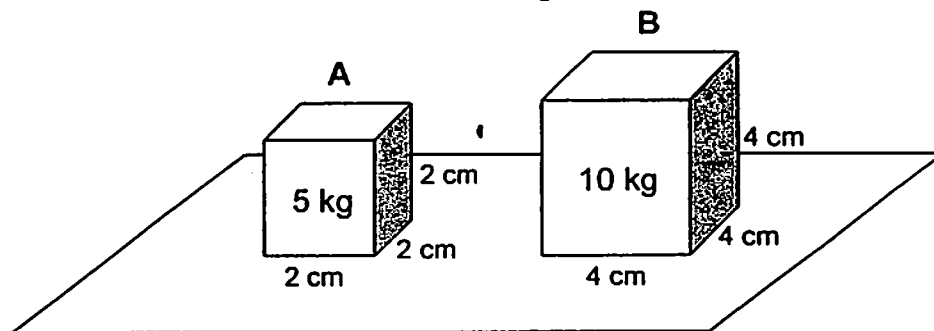
(b) the resistance of the lamp.

[1]

5. State **two** ways in which breathing and respiration are different.

[2]

6. Two cubes rest on the table as shown in the diagram below.



Cube A has a mass of 5 kg and sides of length 2 cm while cube B has a mass of 10 kg and sides of length 4 cm.

(a) What is the weight of cube A, given that g is 10N/kg ?

[1]

(b) What is the pressure exerted on the table by cube A? [2]

(c) Which cube, A or B, exerts a greater pressure on the table? _____ [1]

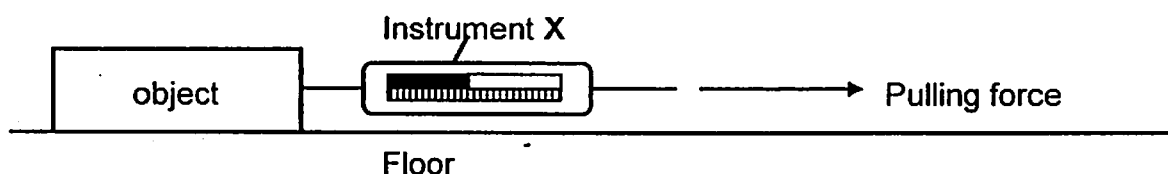
7. State the type of forces involved in each of the following situations. [3]

(a) A stone falls after being dropped from a cliff. _____

(b) Rolling a ball on the ground. _____

(c) A piece of iron sticks onto the door of a refrigerator. _____

8. The diagram below shows an experiment to measure the friction between the object and the surface of a floor.



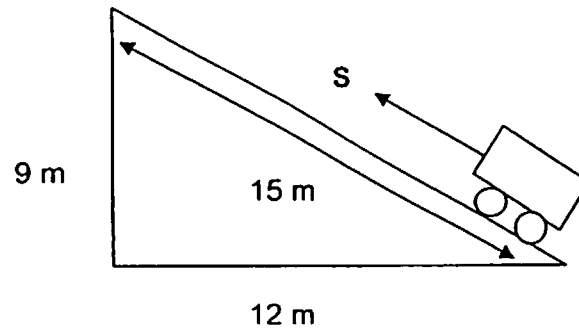
(a) What is the name of the instrument X? [1]

(b) On the diagram above, indicate the direction of the frictional force acting on the object. [1]

(c) State one way to decrease the friction in this experiment. [1]

9. (a) A man walks up a flight of 15 steps which is of 15 cm high each. If the work done against gravity by the man is 2925 J, what is the weight of the man? [2]

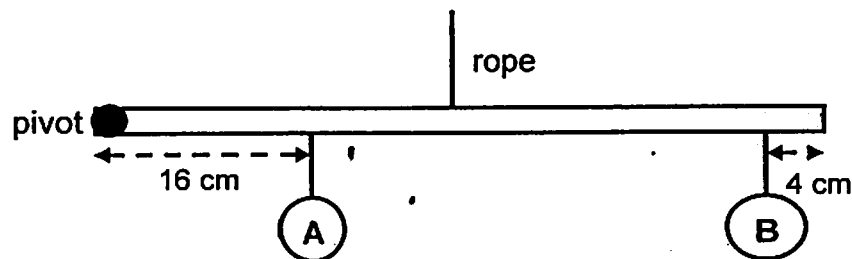
- (b) A trolley weighing 0.18 kN is pulled up a slope by a rope with a force S . The distance moved by the trolley is as shown in the diagram. Assume that the surface that the trolley moved on is frictionless,



- (i) What is the work done against gravity to pull the trolley up the slope? [1]

- (ii) The force S provides the energy needed to pull the trolley to the top of the slope. Find the force S . [2]

10. The diagram below shows a uniform rod of length 0.50 m placed with loads A and B . A rope is tied in the middle to support and balance the rod in a horizontal position. Load A has a mass of 20 kg and load B has a mass of 35 kg .



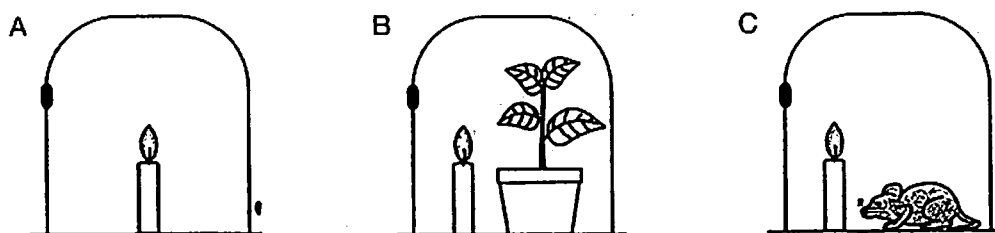
- (a) Determine the total clockwise moments caused by loads A and B . [3]

- (b) Hence, calculate the force exerted on the rope in order to maintain the rod in a horizontal position. [2]

SECTION C: FREE RESPONSE QUESTION (30 Marks)

Answer **all** questions on the writing paper provided.

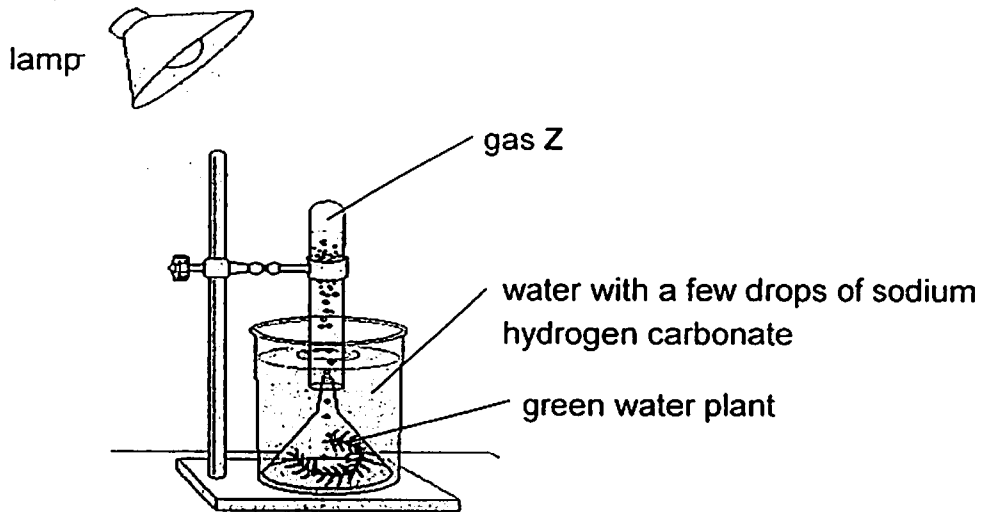
1. (a) A cyclist is riding a mountain bike during a race.
 - (i) State the form of energy associated with a moving mountain bike. [1]
 - (ii) What energy change occurs when the cyclist travels up a slope? [1]
 - (iii) What is meant by the term "*conservation of energy*"? [2]
 - (iv) Explain how the energy change of the cyclist as he travels up a slope illustrates the conservation of energy? [1]
 - (b) (i) State **two** disadvantages of using fossil fuels. [2]
 - (ii) Give **two** ways of conserving energy. [2]
 - (iii) Give **one** reason why tidal energy is not available to every country in the world. [1]
2. (a) Study the experimental set-up shown below.



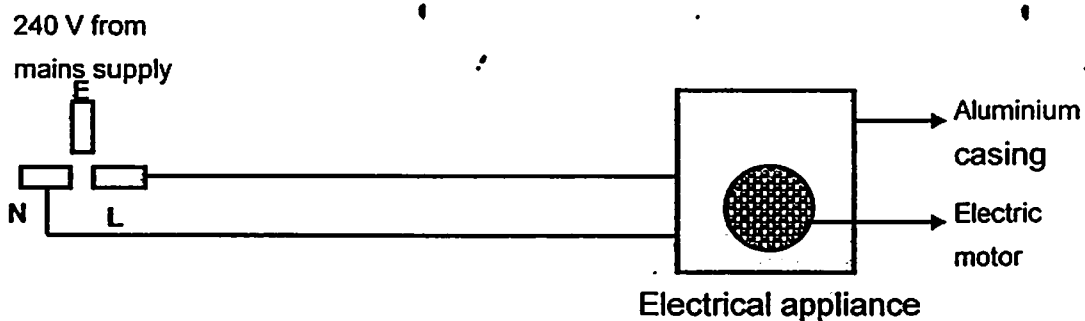
Equal amounts of air were pumped into bell jars A, B and C respectively. This experiment is carried out in bright sunlight.

- (i) List the bell-jars in order of the longest to the shortest time taken for the flame to be extinguished. [1]
- (ii) Provide an explanation for your order of bell jars in (a)(i). [2]

- (b) The figure below shows an experiment being carried out to investigate the process of photosynthesis.



- (i) State the conditions necessary for photosynthesis to take place. [2]
 - (ii) Suggest the name of gas Z. [1]
 - (iii) Sodium hydrogen carbonate is said to release a gas that aids photosynthesis. Name this gas. [1]
 - (iv) Another similar experiment is carried out except that sodium hydrogen carbonate is **not** added into the water. Do you think the volume of gas Z produced would be the same, more or lesser as compared to the experiment above? Explain your answer. [2]
 - (v) Write down the equation for photosynthesis [1]
3. The diagram shows the wiring system between the electrical appliance and the mains supply of 240 V in a household. The body of the electrical appliance is made of aluminium casing. The electrical appliance has a power rating of 3 kW.



- (a) Determine the current flowing through the electric motor of the appliance when it functions normally. [1]
- (b) The appliance is turned on for 9 000 s each day. What is the total cost of energy consumption in a week if the cost for each unit of electricity in households is 25 cents? (Note: Give your answer to the nearest cent.) [3]

- (c) (i) Explain why the connection between the mains supply and the electrical appliance can be hazardous to the users if the wire L touches the aluminium casing when it is faulty. [2]
- (ii) Suggest how the hazards of electricity in (c)(i) can be avoided. [2]
- (iii) Name a circuit breaker that works with what you have suggested in (c)(ii) and describe its functions. [2]

End of Paper



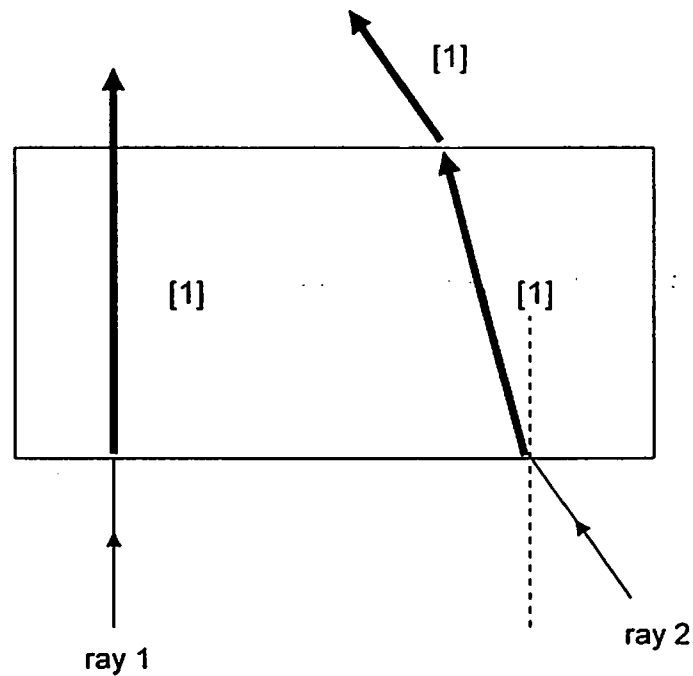
00070

Section A

1	B	7	C	13	C	19	C	25	D
2	C	8	A	14	A	20	D	26	D
3	B	9	D	15	A	21	D	27	D
4	D	10	B	16	D	22	B	28	A
5	B	11	A	17	A	23	D	29	A
6	C	12	D	18	D	24	C	30	A

Section B

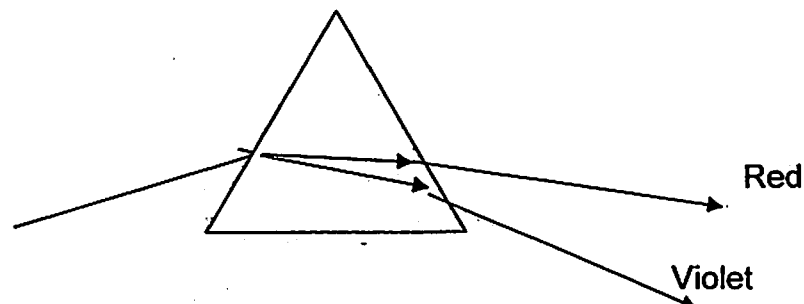
Q1



Q2 (a) It is the bending of light (1/2) as it travels from one medium to another medium of different optical densities. (1/2)

The difference in speeds of light in the 2 media causes the bending. [1]

(b) (i)



Correct light ray and labeling for red [1]

Correct light ray and labeling for red [1]

- (ii) Different colours in white light travel at different speed through the glass [1]
 And therefore bends at different angles [1]
 thus splitting into a different spectrum. [1]

- (c) P : red – only the red component of yellow light can pass through
 Q: black– the blue light is absorbed by the red solution

Q3

- (a) $I = V/R$
 $= 6/(4+2+2)$ [1]
 $= 6/8$
 $= 0.75 \text{ A}$ [1]
- (b) $V = IR$
 $= 0.75 \times 2$
 $= 1.5 \text{ V}$ [1]

Q4

- (a) $I = P/V$
 $= 12/24$ [1]
 $= 0.5 \text{ A}$ [1]

- (b) Resistance of lamp $= V/I$
 $= 24/0.5$
 $= 48 \Omega$ [1]

Q5

Breathing involves the exchange of gases whereas respiration involves the release of energy from food. [1]

Breathing takes place in the lungs whereas respiration takes place in every living cell. [1]

Q6

- (a) Weight $= 5 \times 10 = 50 \text{ N}$ [1]
- (b) Area of cube $A = 0.02 \times 0.02$
 $= 0.004 \text{ m}^2$ [1]
- $P = F/A$
 $= 50 / 0.004$
 $= 12500 \text{ N/m}^2 \text{ (or } 12.5 \text{ N/cm}^2 \text{)}$ [1]
- (c) Cube A [1]

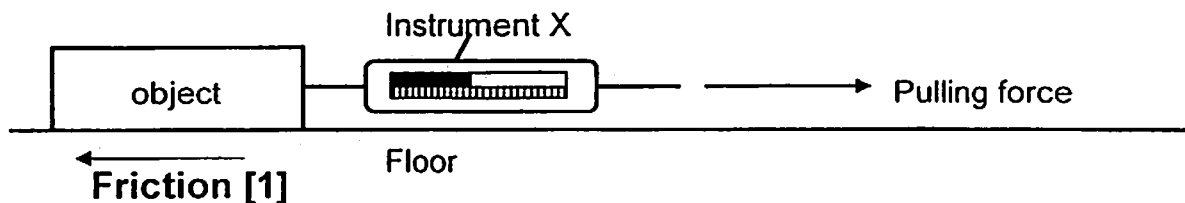
Q7

- (a) Gravitational Force [1]
 (b) Frictional Force [1]
 (c) Magnetic Force [1]

Q8

(a) Spring Balance [1]

(b)



(c) Add oil to the surface of the floor. [1]
(or any other suitable lubricant to reduce friction)

Q9

(a) Work done = $F \times d$

$$2925 = F \times (15 \times 0.15) \quad [1]$$

$$F = 1300 \text{ N} \quad [1]$$

(b) (i) $W = F \times d$
 $= 180 \times 9$
 $= 1620 \text{ J} \quad [1]$

(ii) Work done pushing the trolley = Work done lifting up the trolley
 up the ramp against gravity

$$S \times 15 = 1620 \quad [1]$$

$$S = 108 \text{ N} \quad [1]$$

Q10

(a) Total clockwise moments = $(F_1 \times d_1) + (F_2 \times d_2)$
 $= (20 \times 10 \times 0.16) [1] + (35 \times 10 \times 0.46) [1]$
 $= 32 + 161$
 $= 193 \text{ Nm} [1]$

(b) When in horizontal position,

$$\text{Total anti-clockwise moments} = \text{Total clockwise moments}$$

$$F \times d = 193 \quad [1]$$

$$F \times 0.25 = 193$$

$$F = 644 \text{ N} \quad [1]$$

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Section C

Q1

- (a) (i) Kinetic Energy [1]
 (ii) Kinetic energy \rightarrow Gravitational potential energy [1]
 (iii) No energy is created or destroyed. [1]
 Total amount of energy is the same throughout. [1]
 (iv) The amount of kinetic energy lost is exactly converted into gravitational potential energy gained as the cyclist travels up the slope. [1]
 (if only state KE \rightarrow GPE when cycling up [1/2] only)
- (b) (i) Burning of fossil fuels will cause air pollution. [1]
 (harmful [1/2]; non-renewable [0])
 There is a limited supply of fossil fuels. [1]
- (ii) Switch off the lights when not in use.
 Switch off electrical appliances when not in use.
 Use energy-saving light bulbs.
 Use fan instead of air-conditioner.
 Accept any 2 answers, [1] each
 (use energy saving appliances or use renewable energy without giving examples [1/2] only)
- (iii) Not all countries have suitable sites for tidal barrages (if put dam then have to be specific; cannot mix up with hydroelectricity) [1]
 Or
 Building a barrage affects a very wide coastal region; too expensive, etc...

Q2

- (a) (i) B, A, C
- (ii) In B plant photosynthesize [1/2], producing oxygen [1/2].
 In A oxygen only used for burning [1/2]
 In C rats also respire [1/2], using oxygen
- Or
- (ii) B take the longest time as the plant photosynthesize [1/2], producing oxygen [1/2].
 C takes the shortest time as the rats also respire [1/2], using oxygen

- (b) (i) Light energy (or sunlight) [1]
 Chlorophyll [1]
 (ii) Oxygen [1]
 (iii) Carbon dioxide [1]
 (iv) Volume of gas Z would be lesser. [1]
 Carbon dioxide is needed for photosynthesis. [1/2]
 The carbon dioxide presence is only due to respiration of the plant or existing dissolved carbon dioxide in water. [1/2]

Or

Lesser carbon dioxide [1/2] available for photosynthesis [1/2]

- (v) carbon dioxide + water –chlorophyll & sunlight → glucose + oxygen
 (anything missing [0]; sugar instead of glucose[1/2])

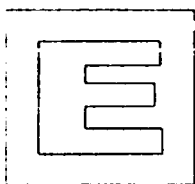
Q3

(a) $P = IV$
 $I = P/V$
 $= 3000 / 240$
 $= 12.5 \text{ A}$ [1]

(b) $E = Pt$ (convert to 2.5h [1])
 $= 3 \times (9000/3600) \times 7$
 $= 3 \times 2.5 \times 7$
 $= 52.5 \text{ kWh}$ [1]

Cost = 52.5×0.25
 $= \$13.13$ [1]

- (c) (i) Current will flow through the casing because it is a conductor of electricity. [1]
 The casing becomes 'live' and the user will receive an electric shock if he were to touch on the casing [1]
 (ii) Place an earth wire between the socket marked E to the aluminium casing. [1]
 It conducts the leakage of current to the ground. [1]
 (iii) Residual Current Circuit Breaker. [1]
 (RCCB or ELCB or residual circuit breaker [1/2])
 It breaks the circuit when current flowing through the earth wire exceeds 30 mA or when there is faulty equipment being used. [1]



GAN ENG SENG SCHOOL
Mid-Year Examination 2012



CANDIDATE
NAME

CLASS

INDEX
NUMBER

SCIENCE (Two Express)

Paper 1

11 May 2012
Papers 1 and 2 : 2 hours

Additional Materials: OTAS

Calculators are allowed in the examination

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Write your name, class and index number on the OTAS.

There are thirty questions in this paper. 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 OTAS.

Read the instructions on the OTAS very carefully.

Answers to Paper 1 and 2 must be handed in separately.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

You are advised to spend no more than 30 minutes on Paper 1.

Any rough working should be done in this booklet.

A copy of the Periodic Table is inserted on page 11.

Total Marks
30

Answer all the questions with the most suitable option A, B, C or D.

- 1 What happens to the water particles in a water bag when the water bag is compressed by Joshua's hands?

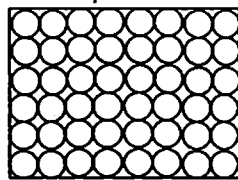
A Water particles will have greater space between each other.
 B Water particles will shrink in size.
 C Water particles will slide over one another.
 D Water particles will have weaker forces of attraction between them.

- 2 A substance changes from the state in which its particles are arranged in regular pattern at 20°C to an irregular arrangement in 90°C.

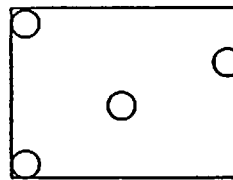
Which statement is **definitely** true?

A The particles of the substance are very closely packed at 20°C.
 B The particles of the substance have weak forces of attraction between them at 100°C.
 C The substance is a liquid at 90°C.
 D The substance melts at above 20°C.

- 3 The diagrams show the arrangement of molecules in a substance at two different temperatures.



-200 °C



-50 °C

Which substance could the diagrams represent?

	Melting Point (°C)	Boiling Point (°C)
A	-150	-30
B	-150	-100
C	-200	-50
D	-220	-100

- 4 Which example can be explained by the particulate model of matter?

A Cloud
 B Energy
 C Light
 D Vacuum

- 5 An atom of an element has a proton number of 17 and mass number of 35.

Which statement is **definitely true** to describe the atomic structure of another isotope of this element?

- A It has a proton number of 17 and mass number of 35.
- B Its number of electrons is 18.
- C Its number of neutrons is 19.
- D Its number of protons is 17.

- 6 Which set of particles have the same electronic configuration?

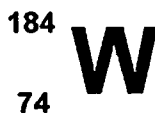
- A B, C, N, O
- B H, Li, Na, K
- C He, Ne, Ar, Kr
- D O^{2-} , F^- , Ne, Na^+

- 7 Element L is from Group II and Element M is from Group V.

What is the chemical formula of the compound containing L and M?

- A LM
- B L_2M_3
- C L_2M_5
- D L_3M_2

- 8 Study the symbol of the element shown below.



Which statement is **not correct** about the symbol?

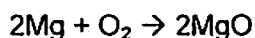
- A The element is tungsten.
- B The number of neutrons is more than the number of protons.
- C There are 74 electrons in the atom.
- D There are 184 neutrons in the atom.

- 9 Hydrogen peroxide, initially liquid, is heated and becomes gases such as water vapour and oxygen.

What statement describes the above process correctly?

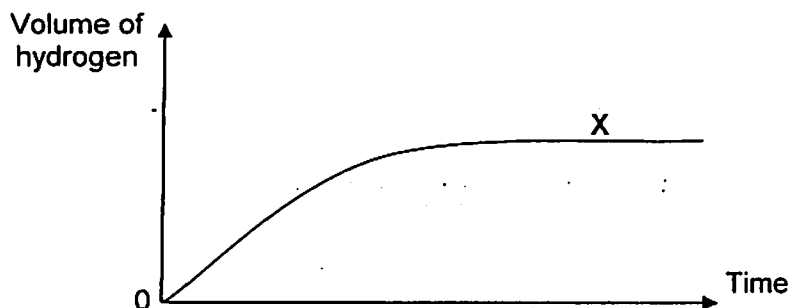
- A Boiling takes place.
- B Decomposition takes place.
- C Evaporation takes place.
- D Oxidation takes place.

- 10 Magnesium is silver-grey in colour. When pure magnesium is heated in the presence of oxygen, magnesium oxide, a white substance, is formed.



Which statement is not true?

- A A bright light and heat are released in the reaction.
 B Mg and O₂ gas undergo oxidation to form MgO.
 C The properties of MgO is different from Mg.
 D The total number of atoms of the reactants and the products are not conserved.
- 11 Zinc reacts with an excess dilute hydrochloric acid. The graph shows how the volume of hydrogen gas given off changed with time.



Why does the graph become horizontal at X?

- A All the dilute hydrochloric acid has been reacted.
 B All the zinc has reacted.
 C Hydrogen is produced at a constant rate.
 D The reaction has started to slow down.
- 12 Which chemical equation is correctly balanced where $x = 1$, $y = 2$, $z = 3$?
- A $x \text{Al}_2(\text{CO}_3)_3 + z \text{H}_2\text{SO}_4 \rightarrow x \text{Al}_2(\text{SO}_4)_3 + x \text{H}_2\text{O} + z \text{CO}_2$
 B $y \text{C} + x \text{O}_2 \rightarrow x \text{CO}$
 C $x \text{Ca}(\text{OH})_2 + y \text{HNO}_3 \rightarrow x \text{Ca}(\text{NO}_3)_2 + y \text{H}_2\text{O}$
 D $z \text{Fe} + z \text{O}_2 \rightarrow y \text{Fe}_2\text{O}_3$
- 13 How does energy flow through ecosystems?

	Energy enters as	Energy is transferred as	Energy leaves as
A	Chemical	Heat	Chemical
B	Chemical	Chemical	Heat
C	Light	Heat	Chemical
D	Light	Chemical	Heat

- 14 The diagram shows losses from a tiger to the environment

*Heat energy from the
whole body surface*



*Carbon dioxide and
water in exhaled air*

*Water, salts and
urea in urine*

What will not be returned to the ecosystem and recycled?

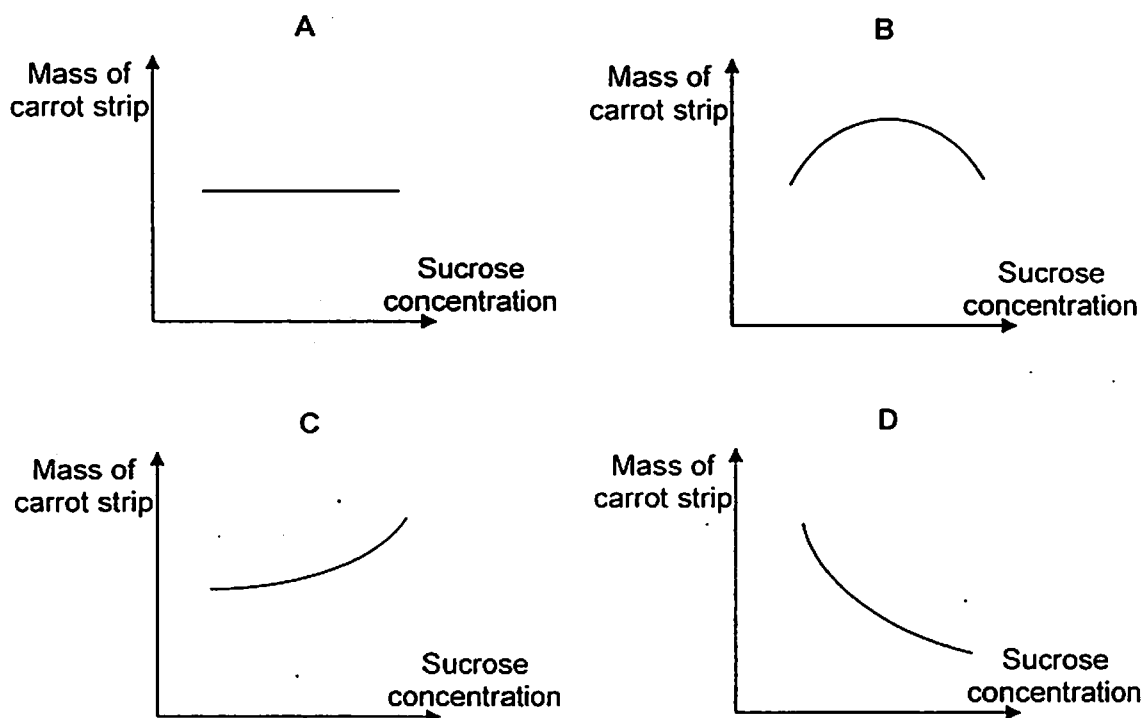
- A Carbon dioxide
 - B Heat energy
 - C Salts
 - D Urea
- 15 Which statement best describes ecosystem?
- A Ecosystem is made up of a group of living things interacting among themselves and with their non-living physical surroundings.
 - B Ecosystem is made up of humans creating an environment for plants and animals to live.
 - C Ecosystem is made up of plants and animals interacting with each other while animals feed on plants.
 - D Ecosystem is made up of many eco-gardens combining together.
- 16 Army ants travel on the forest floor and stir up various flying insect species. As the insects flee from the army ants, the birds following the ants catch the fleeing insects. In this way, the birds benefit while the army ants are unaffected.

Which term best describe the relationship of army ants and birds?

- A Commensalism
- B Mutualism
- C Parasitism
- D Predator-prey

- 17 A carrot strip was placed in sucrose solutions of different concentrations. The changes in mass of the carrot strip are recorded onto a graph.

Which graph shows the results of the experiment?



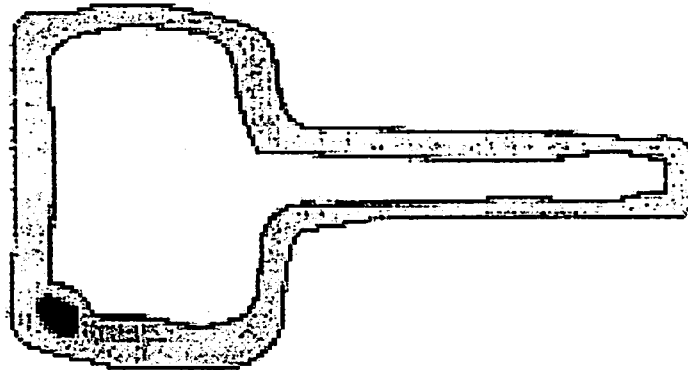
- 18 The table shows the results of an investigation into the absorption of products of digestion in the presence and absence of oxygen.

Product of digestion	Absorption in the presence of oxygen	Absorption in the absence of oxygen
Amino acids	1.7 units	1.7 units
Fatty acids	5.0 units	2.0 units
Glucose	2.3 units	2.3 units
Glycerol	4.8 units	2.7 units

Which conclusion can be drawn from these results?

- A** All products of digestion are absorbed by both active transport and diffusion.
- B** All products of digestion are absorbed by diffusion only.
- C** Amino acids and glucose are absorbed mainly by diffusion.
- D** Fatty acids and glycerol are absorbed by active transport only.

- 19 The diagram shows a root hair cell.

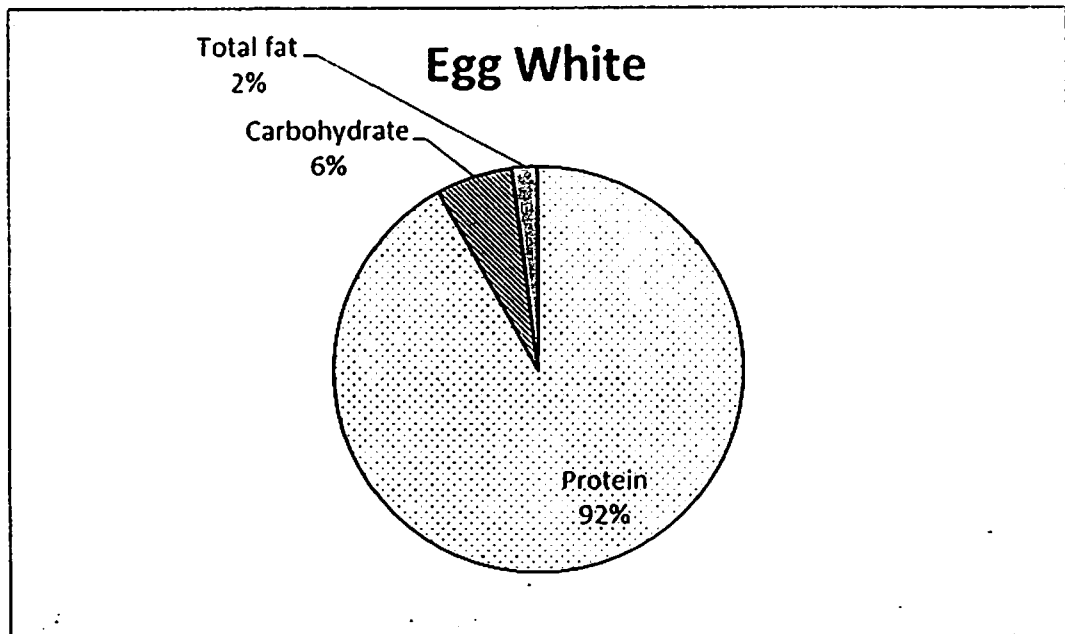


The inside of the root hair cell contains concentrated solution of mineral ions while the surrounding contains dilute solution of mineral ions.

Which statement is correct?

- A Water molecules move into the root hair cell because the water potential is higher inside the cell.
 - B Water molecules move into the root hair cell because the water potential is lower inside the cell.
 - C Water molecules move out of the root hair cell because the water potential is higher inside the cell.
 - D Water molecules move out of the root hair cell because the water potential is lower inside the cell.
- 20 Which of the following examples is not suitable to demonstrate the process of diffusion?
- A Alcohol on the tabletop disappears after a period of time.
 - B The foul smell of garbage can be detected from the ground level of HDB block.
 - C The spray of perfume in an enclosed room can be detected at all corners.
 - D Water becomes brownish when a tea bag is placed in it.
- 21 Which characteristic is true for bile?
- A Bile digests fats into fatty acid and glycerol.
 - B Bile decreases the surface area is to volume of fats.
 - C Bile is bitter-tasting, dark green to yellowish brown fluid.
 - D Bile is produced in gall bladder and stored in liver.

- 22 Hui Mei likes to eat egg white. The chart below shows the composition of the nutrients of egg white.



Which parts of the alimentary canal would the egg white be mostly digested?

- A Mouth, oesophagus, stomach
 - B Mouth, stomach, ileum
 - C Stomach, duodenum, ileum
 - D Stomach, ileum, ascending colon
- 23 Carbohydrates will start to be digested in and ends at
- A mouth, ileum
 - B mouth, rectum
 - C mouth, stomach
 - D stomach, ileum
- 24 Gallstones are formed when bile contains too much cholesterol. If Hudson has gallstones in gall bladder, the doctor might advise him to go for surgery to remove his gall bladder. The surgical removal of the gall bladder is called cholecystectomy.
- What happens if Hudson has his gall bladder removed?
- A The cholesterol level will be reduced.
 - B The digestion of fats would stop.
 - C There will be only partial digestion of proteins.
 - D The speed of fat digestion becomes very slow.

25 Four different liquids were extracted from the human alimentary canal.

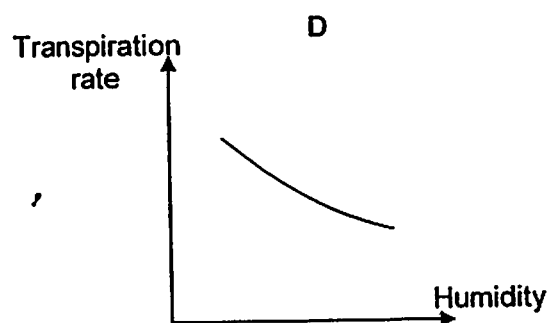
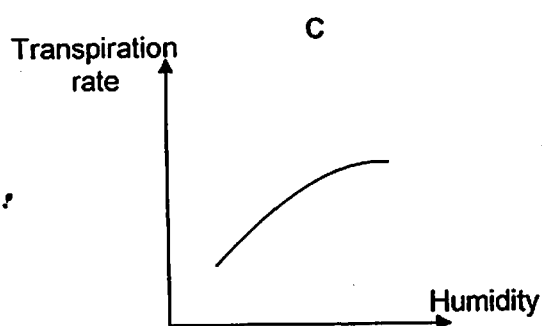
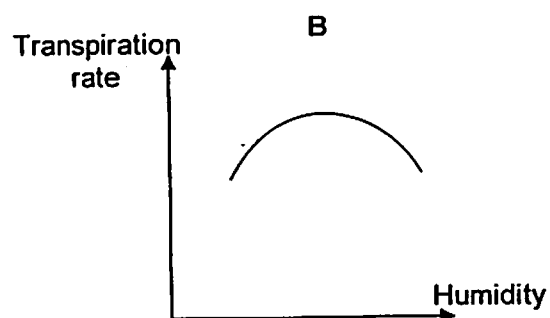
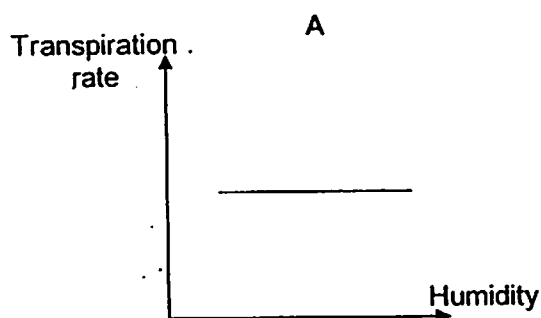
- Bile
- Gastric juice
- Pancreatic juice
- Saliva

Eliza took one of the liquid and mix with a piece of magnesium ribbon. When she inserted a lighted splint into the gas released from the reaction, a 'pop' sound was heard.

Which liquid did Eliza use?

- A Bile
- B Gastric juice
- C Pancreatic juice
- D Saliva

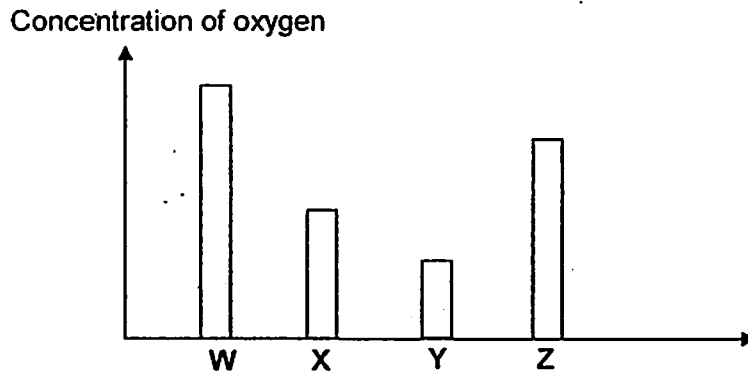
26 Which graph shows the effect of increased humidity on the transpiration rate of a plant?



27 Which process does not help in moving water up the stem from the roots?

- A Capillary action
- B Diffusion
- C Root pressure
- D Transpiration pull

- 28 Which shows the correct flow of the blood in the human circulatory system from the heart to the lungs and back to the heart?
- A Left atrium → Pulmonary vein → Lungs → Pulmonary artery → Right ventricle
 - B Left ventricle → Pulmonary artery → Lungs → Pulmonary vein → Right atrium
 - C Right atrium → Pulmonary vein → Lungs → Pulmonary artery → Left ventricle
 - D Right ventricle → Pulmonary artery → Lungs → Pulmonary vein → Left atrium
- 29 When a sample of blood is dehydrated, which component of the blood will decrease in amount significantly?
- A Plasma
 - B Platelets
 - C Red blood cells
 - D White blood cells
- 30 Blood samples from four different blood vessels (aorta, pulmonary artery, pulmonary vein and vena cava) were collected and their levels of oxygen were investigated.



Which blood vessel is X?

- A Aorta
- B Pulmonary artery
- C Pulmonary vein
- D Vena cava

END OF PAPER

The Periodic Table of the Elements

Group																					
I	II											III	IV	V	VI	VII	0				
										<div>1 H Hydrogen 1</div>										<div>4 He Helium 2</div>	
<div>7 Li Lithium 3</div>	<div>9 Be Beryllium 4</div>											<div>11 B Boron 5</div>	<div>12 C Carbon 6</div>	<div>14 N Nitrogen 7</div>	<div>16 O Oxygen 8</div>	<div>19 F Fluorine 9</div>	<div>20 Ne Neon 10</div>				
<div>23 Na Sodium 11</div>	<div>24 Mg Magnesium 12</div>											<div>27 Al Aluminium 13</div>	<div>28 Si Silicon 14</div>	<div>31 P Phosphorus 15</div>	<div>32 S Sulfur 16</div>	<div>35.5 Cl Chlorine 17</div>	<div>40 Ar Argon 18</div>				
<div>39 K Potassium 19</div>	<div>40 Ca Calcium 20</div>	<div>45 Sc Scandium 21</div>	<div>48 Ti Titanium 22</div>	<div>51 V Vanadium 23</div>	<div>52 Cr Chromium 24</div>	<div>55 Mn Manganese 25</div>	<div>56 Fe Iron 26</div>	<div>59 Co Cobalt 27</div>	<div>59 Ni Nickel 28</div>	<div>64 Cu Copper 29</div>	<div>65 Zn Zinc 30</div>	<div>70 Ga Gallium 31</div>	<div>73 Ge Germanium 32</div>	<div>75 As Arsenic 33</div>	<div>79 Se Selenium 34</div>	<div>80 Br Bromine 35</div>	<div>84 Kr Krypton 36</div>				
<div>85 Rb Rubidium 37</div>	<div>88 Sr Strontium 38</div>	<div>89 Y Yttrium 39</div>	<div>91 Zr Zirconium 40</div>	<div>93 Nb Niobium 41</div>	<div>98 Mo Molybdenum 42</div>	<div>Tc Technetium 43</div>	<div>101 Ru Ruthenium 44</div>	<div>103 Rh Rhodium 45</div>	<div>106 Pd Palladium 46</div>	<div>108 Ag Silver 47</div>	<div>112 Cd Cadmium 48</div>	<div>115 In Indium 49</div>	<div>119 Sn Tin 50</div>	<div>122 Sb Antimony 51</div>	<div>128 Te Tellurium 52</div>	<div>127 I Iodine 53</div>	<div>131 Xe Xenon 54</div>				
<div>133 Cs Caesium 55</div>	<div>137 Ba Barium 56</div>	<div>139 La Lanthanum 57</div>	<div>178 Hf Hafnium 72</div>	<div>181 Ta Tantalum 73</div>	<div>184 W Tungsten 74</div>	<div>186 Re Rhenium 75</div>	<div>190 Os Osmium 76</div>	<div>192 Ir Iridium 77</div>	<div>195 Pt Platinum 78</div>	<div>197 Au Gold 79</div>	<div>201 Hg Mercury 80</div>	<div>204 Tl Thallium 81</div>	<div>207 Pb Lead 82</div>	<div>209 Bi Bismuth 83</div>	<div>Po Polonium 84</div>	<div>At Astatine 85</div>	<div>Rn Radon 86</div>				
<div>Fr Francium 87</div>	<div>226 Ra Radium 88</div>	<div>227 Ac actinium 89</div>																			

*58-71 Lanthanoid series

†90-103 Actinoid series

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

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

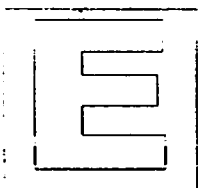
The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).



GAN ENG SENG SCHOOL - Mid-Year Examination 2012 - SCIENCE

Answers:

- 1) C
- 2) A
- 3) B
- 4) A
- 5) D
- 6) D
- 7) D
- 8) D
- 9) B
- 10) D
- 11) B
- 12) C
- 13) D
- 14) B
- 15) A
- 16) A
- 17) D
- 18) C
- 19) B
- 20) A
- 21) C
- 22) C
- 23) A
- 24) D
- 25) B
- 26) D
- 27) B
- 28) D
- 29) A
- 30) D



GAN ENG SENG SCHOOL

Mid-Year Examination 2012



CANDIDATE
NAME

CLASS

INDEX
NUMBER

SCIENCE (Two Express)

Paper 2

11 May 2012
Papers 1 and 2: 2 hours

Candidates answer on the Question Paper.
Calculators are allowed in the examination

READ THESE INSTRUCTIONS FIRST

Write your class, index number and name on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use a soft pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid/tape.

Answer **all** questions in Section A.
Answer **four** questions in Section B of which **Question 8 is compulsory**.
Enter the numbers of the Section B questions you have answered in the grid below.

At the end of the examination, hand in your answers to Paper 1 and Paper 2 separately.

The number of marks is given in brackets [] at the end of each question or part question.

A copy of the Periodic table is inserted on page **16**.

For Examiner's Use	
Section A	
Section B	
Q8	
Q	
Q	
Q	
Total	70

SECTION A (30 marks)

Answer all the questions in this section.

- 1 (a) An atom (not of isotope) has 20 neutrons.

- (i) Write down all possible chemical formula of the compounds formed when this atom becomes an ion and combines with a carbonate ion. [2]

.....

- (ii) What gas will be produced when the compounds mix with a nitric acid? [1]

.....

- (iii) Describe how you can test the presence of the gas in (a) (ii)? [2]

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- (b) "An atom will always have the number of neutrons greater than or equal to the number of protons." [2]

Comment on the reliability of this statement.

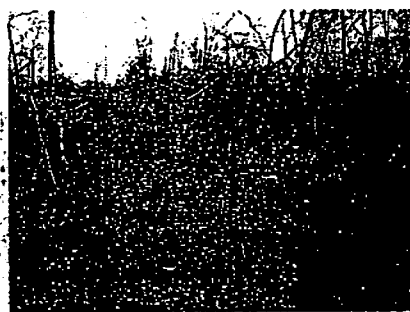
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- 2 Study the pictures below.

The left picture shows a plot of land before factories were built near it. The right picture shows the same plot of land after 15 years which the factories were built.



- (a) The air pollutants suspected for this above change can be carbon dioxide, carbon monoxide, lead compounds, oxides of nitrogen, and sulfur dioxide. [2]
Name two air pollutants responsible for this.

.....

- 2 (b) Give another similar harmful effect on man by the air pollutants stated in (a). [1]

.....

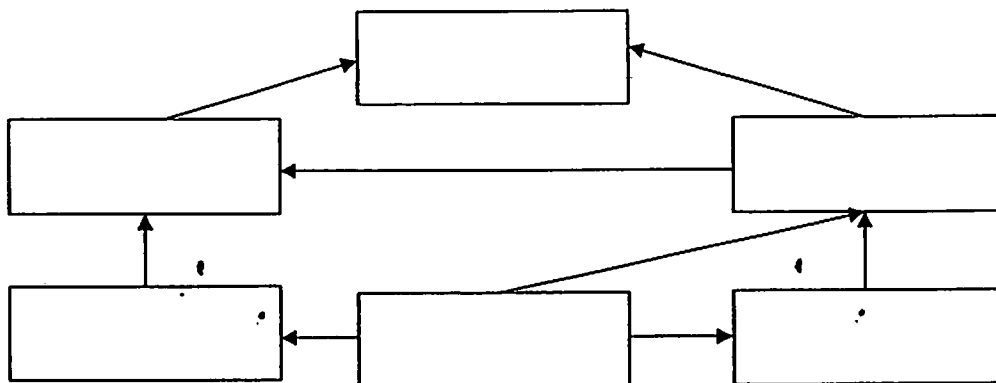
- (c) Explain how this phenomenon in the long run can lead to global warming. [2]

.....

- 3 Study the relationship between the six new species – Aripas, Bintos, Carlos, Dinnos, Elesos, and Fisgos.

*Aripas feed on Carlos and Elesos.
 Bintos and Dinnos feed on Fisgos.
 Carlos feeds on Fisgos and Dinnos.
 Elesos feed on Bintos and Carlos.*

- (a) Complete the food web by filling in the correct species. [3]



- (b) Write down the longest food chain from this food web. [1]

.....

- (c) One of the species is an omnivore. Identify the omnivore. [1]

.....

- 4 Study the melting points and boiling points of Substances P, Q, R and S.

Substance	Melting Point / °C	Boiling Point / °C
P	-101	10
Q	-15	78
R	-10	101
S	77	380

- (a) Which substance(s) are in liquid state at room temperature 25°C? [1]

.....

- (b) Which liquid will evaporate the fastest at room temperature? Explain. [2]

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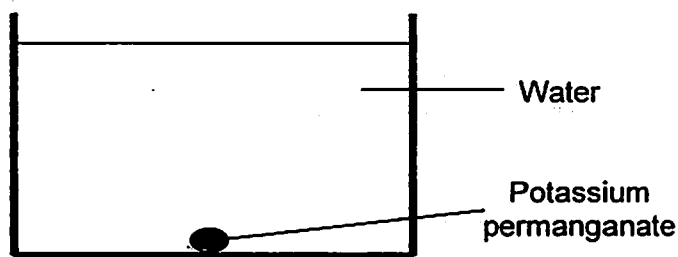
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- (c) Using the particulate model of matter, describe Substance S in terms of forces of attraction at room temperature. [1]

.....

- 5 A drop of potassium permanganate, purple in colour, was placed at the base of the tank filled with water.



The mixture was in the tank for a few days without stirring.

- (a) What happens to the water in the tank after few days? [1]

.....

- (b) Explain what happens in (a). [2]

.....

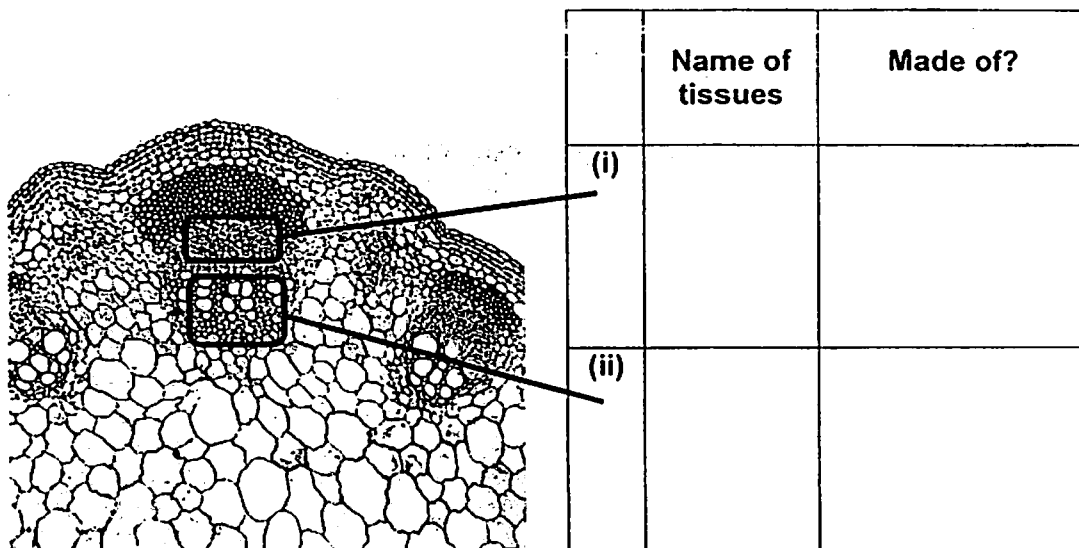
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- 6 The diagram below shows a section of the transport system in a typical flowering plant.



- (a) Fill in the table the names of the vessels and what they are made up. [2]

- (b) What is the function the vessels in (i). [1]

.....

.....

- 7 (a) Name all the organs of the alimentary canal which do not have digestion of fats or starch taking place. [1]

.....

- (b) What is the main function of proteins? [1]

.....

.....

- (c) Write down the end products of proteins after digestion. [1]

.....

END OF SECTION A

SECTION B (40 marks)

Answer Q8 and any 3 other questions in this section.

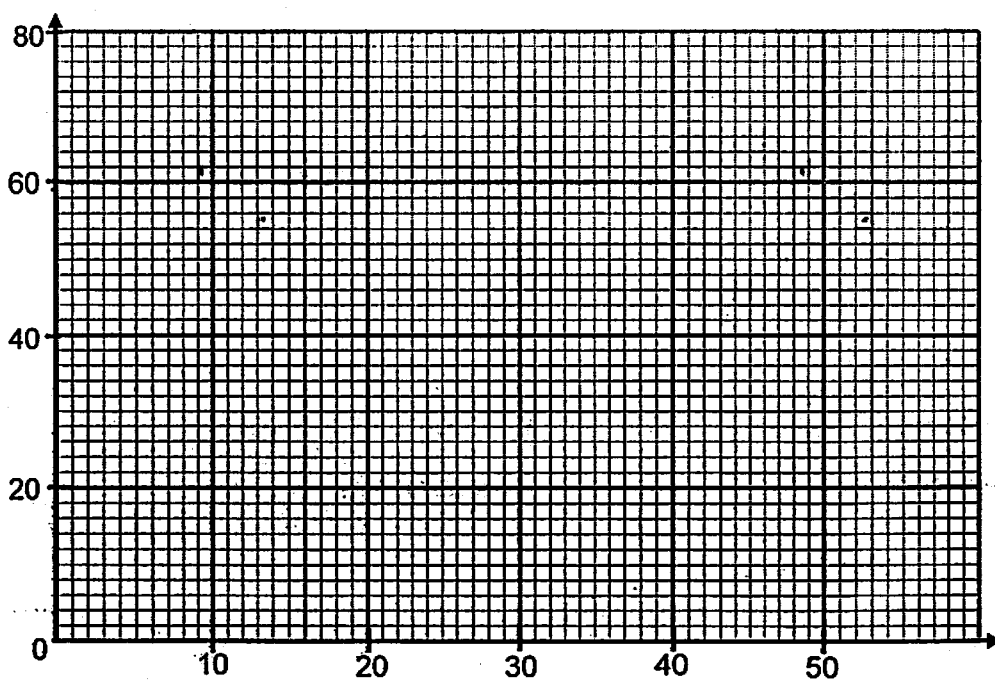
- 8 The blood circulatory system consists of heart, blood vessels and blood.

Points A, B, C and D may be the starting points of the heart, an artery, a vein and a capillary (not in the same order) where the pressure of the blood is measured. The pressure of the blood differs at each starting point of the different parts of the blood circulatory system.

The table below shows the pressure of the blood as it completes one circulation of the body (excluding the lungs).

Distance from Point A / units	Pressure of blood / units	Starting point of Blood Circulatory System
0	10	A
10	6	B
14	80	-
18	64	-
22	70	-
26	56	-
30	60	C
40	20	D
50	10	A

- (a) Plot the graph of pressure of blood against distance from Point A of the blood circulatory system using the table above. Use multi straight lines to connect all the points. [4]



- 8 (b) State which labeled section (A, B, C of D) of the graphs shows the pressure of the blood as it passes through the [2]

(i) artery:

(ii) capillary:

(iii) heart:

(iv) vein:

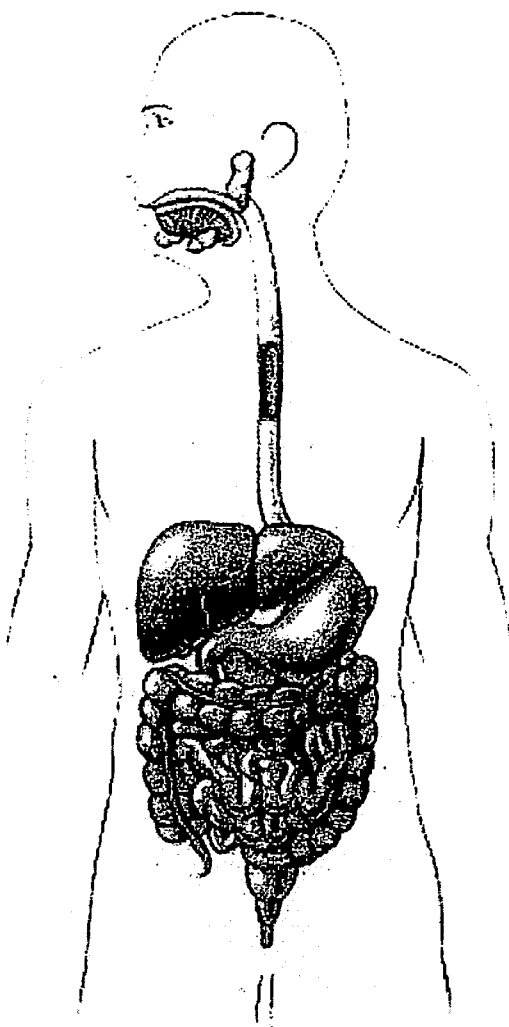
- (c) Suggest why the blood pressure in the pulmonary artery is not as high as that in the aorta. [2]

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- (d) List down two differences between an artery and a vein. [2]

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- 9 The diagram below shows a human alimentary canal.



- (a) Mark 'P', 'Q', and 'R' on the organs which help digestion but are not part of the alimentary canal in the above diagram and write down one function of each organ in the table. [3]

Organs	Function
P	
Q	
R	

- 9 (b) List down three physical digestions occurring in the alimentary canal in the table below. [3]

Organs of alimentary canal	How the physical digestion takes place

- (c) Describe how starch is broken down to its simplest form from the start to the end of the alimentary canal. [4]
(In your description, write down the organs where the digestions occur, the actions of enzymes for starch and the end products of starch.)

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10 Study the table below.

Particle	Atomic number	Nucleon number	No. of protons	No. of electrons	No. of neutrons
A	7	14			
B	8	16			
C	9	19			
D	10	20			
E	11	23			
F	12	24			

Kisshan conducts a research about Particles A to F.

Particles A, C and F are atoms.

Particles B, D and E have the same number of electrons.

(a) With the given information about Particles A to F, complete the table above. [3]

(b) Explain how you determine the number of electrons for Particles B, D and E. [1]

.....

(c) Particle B can combine with Particle E to form a compound.

(i) Write down the chemical formula of this compound. [1]

.....

(ii) Use 'dot' and 'cross' diagram, draw the electronic structure of the compound in (c) (i). [3]

10 (d) Sean discovers a new particle G which has 7 protons and 8 neutrons.

(i) Which particle (A to F) is an isotope of G? [1]

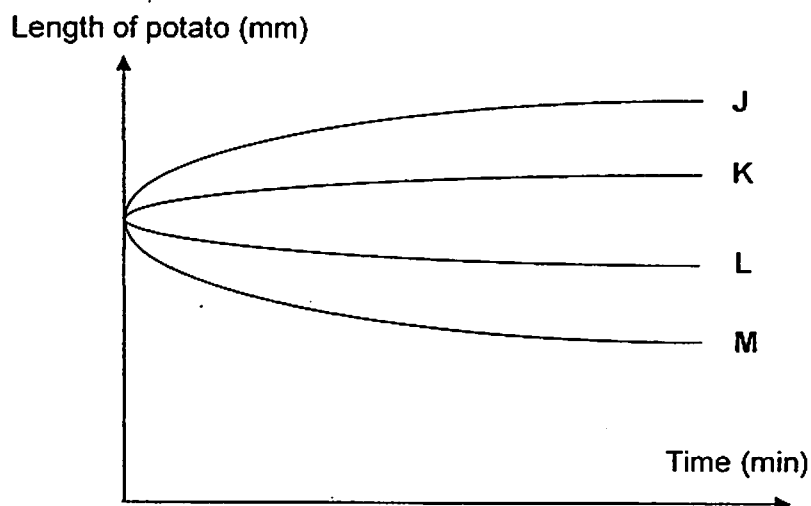
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(ii) Explain your choice in (d) (i). [1]

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- 11 (a) Four identical potato strips are placed in four different solutions J, K, L and M. Each solution could be 0.1 mol/dm^3 sucrose solution, 0.3 mol/dm^3 sucrose solution, 0.6 mol/dm^3 sucrose solution or distilled water. The length of each potato strip is recorded on the graph over time.



- (i) Which solution is distilled water? Explain. [3]

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- (ii) Estimate and write down the sucrose concentration of the potato strip before immersing into the solutions. [1]

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- (iii) On the graph in (a), predict and draw the length of potato strip over time if the potato strip is placed in a solution with the same sucrose concentration mentioned in (a) (ii). [1]

- (iv) Explain the graph you have drawn in (a) (iii). [2]

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- 11 (b) Due to drinking insufficient water, Kevan had developed an ulcer on his mouth. He was in intense pain and decided to see a doctor.

After consulting Dr Ryan, Kevan was advised to put some salt on his ulcer.

- (i) What happens to the size of the ulcer when salt is placed on it? [1]

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- (ii) Explain your answer in (b) (i). [2]

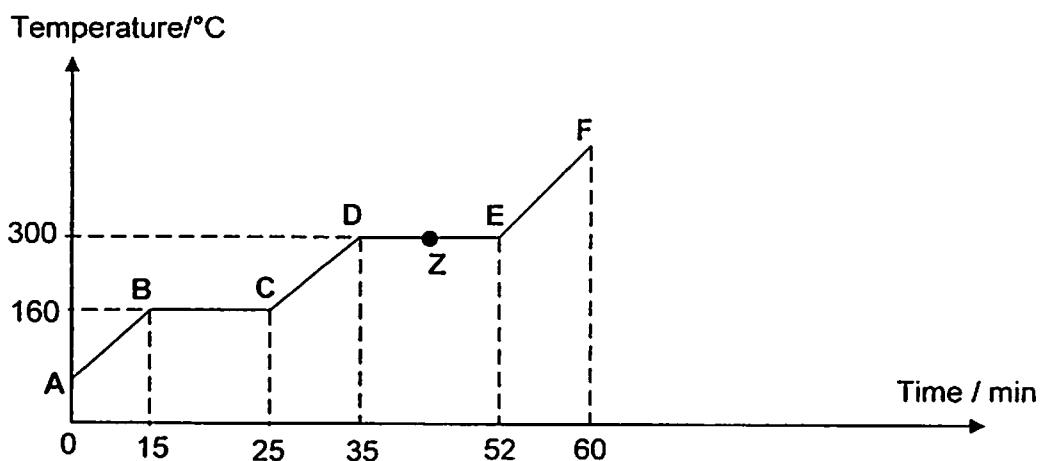
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12 The graph below shows a heating curve of an unknown substance X.



(a) List down the section(s) which X is and could be a solid.

[1]

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(b) Using the particulate model of matter, explain what happens to X along Section DE.

[4]

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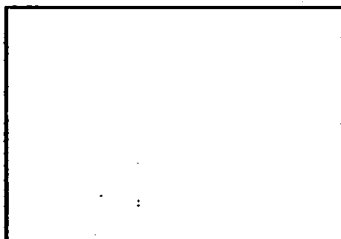
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(c) Draw the arrangement of particles at Point Z in the space provided.

[1]



12 (d) After 60 minutes of heating, the substance X is cooled to 200°C.

(i) On the graph in Q12, complete the graph by including the above information. [1]

(ii) Using particulate model of matter, describes the particles at 200°C in terms of their motion and forces of attraction. [3]

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END OF PAPER

The Periodic Table of the Elements

Group																								
I	II													III	IV	V	VI	VII	0					
<div>1 H Hydrogen 1</div>																								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 Cesium 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	226 Ra Radium 88	227 Ac Actinium 89																						

*58-71 Lanthanoid series

†90-103 Actinoid series

<div>140</div> <div>Ce</div> <div>Cerium</div> <div>58</div>	<div>141^a</div> <div>Pr</div> <div>Praseodymium</div> <div>59</div>	<div>144</div> <div>Nd</div> <div>Neodymium</div> <div>60</div>	<div>Pm</div> <div>Promethium</div> <div>61</div>	<div>150</div> <div>Sm</div> <div>Samarium</div> <div>62</div>	<div>152</div> <div>Eu</div> <div>Europium</div> <div>63</div>	<div>157</div> <div>Gd</div> <div>Gadolinium</div> <div>64</div>	<div>159</div> <div>Tb</div> <div>Terbium</div> <div>65</div>	<div>162</div> <div>Dy</div> <div>Dysprosium</div> <div>66</div>	<div>165</div> <div>Ho</div> <div>Holmium</div> <div>67</div>	<div>167</div> <div>Er</div> <div>Erbium</div> <div>68</div>	<div>169</div> <div>Tm</div> <div>Thulium</div> <div>69</div>	<div>173</div> <div>Yb</div> <div>Ytterbium</div> <div>70</div>	<div>175</div> <div>Lu</div> <div>Lutetium</div> <div>71</div>
<div>232</div> <div>Th</div> <div>Thorium</div> <div>90</div>	<div>Pa</div> <div>Protactinium</div> <div>91</div>	<div>238</div> <div>U</div> <div>Uranium</div> <div>92</div>	<div>Np</div> <div>Neptunium</div> <div>93</div>	<div>Pu</div> <div>Plutonium</div> <div>94</div>	<div>Am</div> <div>Americium</div> <div>95</div>	<div>Cm</div> <div>Curium</div> <div>96</div>	<div>Bk</div> <div>Berkelium</div> <div>97</div>	<div>Cf</div> <div>Californium</div> <div>98</div>	<div>Es</div> <div>Einsteinium</div> <div>99</div>	<div>Fm</div> <div>Fermium</div> <div>100</div>	<div>Md</div> <div>Mendelevium</div> <div>101</div>	<div>No</div> <div>Nobelium</div> <div>102</div>	<div>Lr</div> <div>Lawrencium</div> <div>103</div>

Key	<div> <div>a</div> <div>X</div> <div>b</div> </div>	<div>a = relative atomic mass</div> <div>X = atomic symbol</div> <div>b = proton (atomic) number</div>
-----	---	--

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

5066 CHEMISTRY (WITH SPA) O LEVEL (2009)



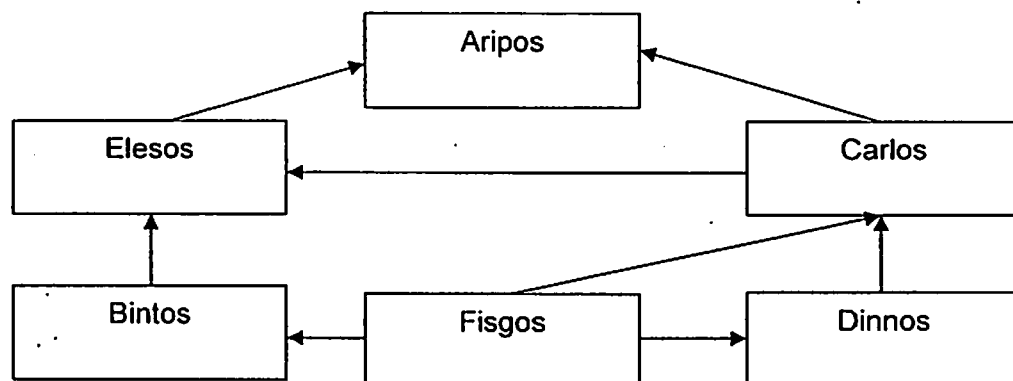
Section A

- 1ai K_2CO_3 [1], $CaCO_3$ [1]
 1aii Carbon dioxide [1]
 1aiii Pass the test gas into the limewater. [1]
 White precipitates formed in the limewater [1] will indicate the presence of carbon dioxide.

- 1b False [1], hydrogen has more protons than neutrons [1].

- 2a Sulfur dioxide [1], oxides of nitrogen [1]
 2b They cause respiratory problems / damage lungs / alter metabolism rate [1].
 2c Plants damaged will lead to less carbon dioxide being absorbed / more carbon dioxide in the atmosphere [1].
 Excess carbon dioxide in the atmosphere will create a greenhouse effect [1] which will lead to global warming.

3a



[3] – {1 mark for every 2 correct answers. No ½ mark.}

- 3b Fisgos → Dinnos → Carlos → Elesos → Aripas [1]
 3c Carlos [1]
 4a Q and R [1] {no ½ mark}
 4b Q [1],
 because it has lower boiling point / its boiling point is closer to the room temperature [1]
 4c Very strong [1]
 5a The water turns purple in colour [1].
 5b Concentration of potassium permanganate in the drop is higher than that in the water [1].
 Potassium permanganate molecules move away from the drop to the rest of the water via diffusion [1].

6a

	Name of vessel	Made of?
(i)	Phloem	Living cells
(ii)	Xylem	Dead cells

[2] – {1 mark for each correct row. No ½ mark}

6b

Carries dissolved food in the form of sucrose from the leaves to the rest of the plant [1]

7a

Stomach, large intestines/colons, rectum [1] {no ½ mark}

7b

Used for growth of new cells / repair of damaged tissues [1]

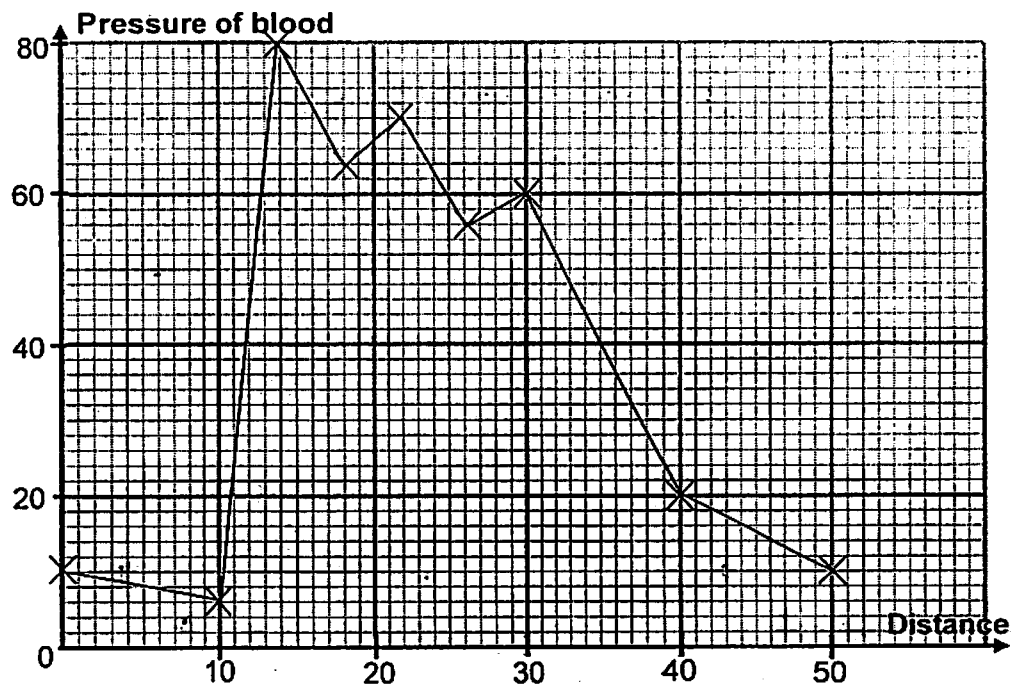
7c

Amino acids [1]

Section B

8a

Plot the graph of pressure of blood against distance from Section A of the blood circulatory system using the table above.



[1] – Correct labeling of axes

[2] – Correct points plotted (1 mark every 5 correct plotted points)

[1] – Correct straight lines drawn

8bi

C

8bii

D

8biii

B

8biv

A

[2] – 1 mark for every 2 correct answers

8c

Pulmonary artery pumps blood to the lungs which is a shorter distance [1].

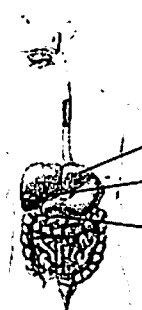
Aorta pumps blood to the whole body [1].

8d

Artery	Vein
Carry blood away from the heart	carry blood towards heart
blood at high pressure, moves in spurts	blood at the lowest pressure
no valves	valves to stop backflow of blood
thick muscular walls	thinner walls with less muscle compared to arteries
no substance enters or leaves the vessel	no substances enters or leaves vessel
pulse created by heart pumping and contraction of wall muscle	no pulse
strong walls	flexible and squashed easily pushed further along vessel

[2] – any 2

9a



Organs	Function
P	Produces bile [1]
Q	Stores bile [1]
R	Produces pancreatic juice [1]

{1 full mark awarded for correct label and function. No ½ mark given}

9b

Organs of alimentary canal	How the physical digestion takes place
Mouth	Chewing [1] large food particles to smaller food particles
Stomach	Churning [1] of food particles for enzymes to act on
Duodenum / Small intestines	Emulsifying of fats/Breaking large fats molecules into smaller fats molecules [1] by bile

{1 full mark for correct organ and process. No ½ mark given}

9c

In the mouth

- Starch is broken down into maltose by salivary amylase secreted [1]

In oesophagus

- Starch is broken down into maltose by salivary amylase from mouth [1]

In duodenum/small intestines

- Starch is broken down into maltose by pancreatic amylase. [1]
- Maltose is broken down into glucose by maltase. [1]

10a

Particle	Atomic number	Nucleon number	No. of protons	No. of electrons	No. of neutrons
A	7	14	7	7	7
B	8	16	8	10	8
C	9	19	9	9	10
D	10	20	10	10	10
E	11	23	11	10	12
F	12	24	12	12	12

[3] – {1 full mark for every 2 correct rows; no ½ mark given}

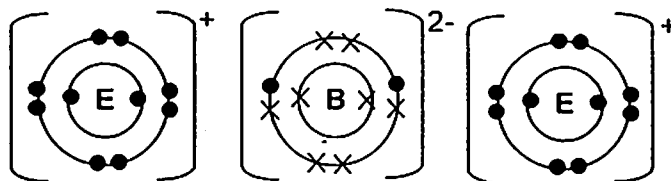
10b

Particle D cannot become an ion / has a stable electronic structure / is a noble gas [1], so its number of electrons must be the same as its number of protons (10). Particles B and E can lose/gain electrons to form ions.

10ci

E₂B [1]

10cii



[1] – correct positive ions drawn

[1] – correct negative ion drawn

[1] – correct charges indicated

10di

A [1]

10dii

G has the same number of protons as A but different number of neutrons as A [1]
{1 full mark for same no. of protons and different no. of neutrons. No ½ mark}

11ai

Solution J {no mark awarded if solution is incorrect, even though explanation is correct}
As water potential in distilled water is the highest compared to the potato strip [1], more water will enter the potato via osmosis through the partially permeable membrane [1].

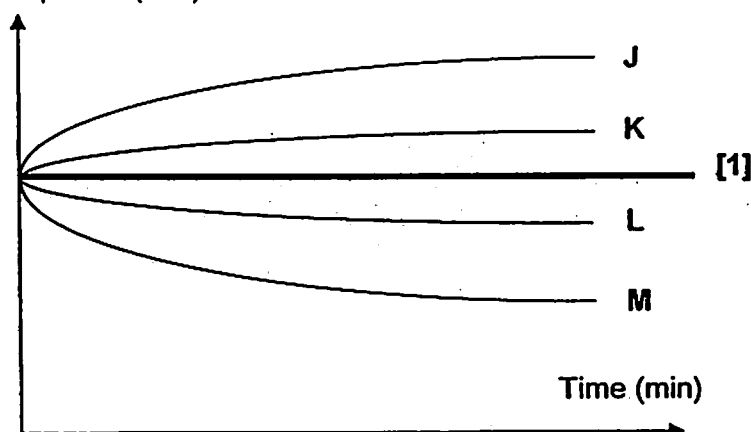
The potato cells will have the largest increase in size [1] and will not burst with the presence of cell wall.

11aii

Any value between 0.1 to 0.3 mol/dm³ sucrose concentration [1]

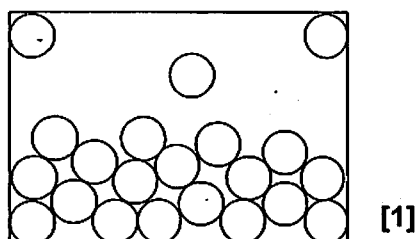
11aiii

Length of potato (mm)

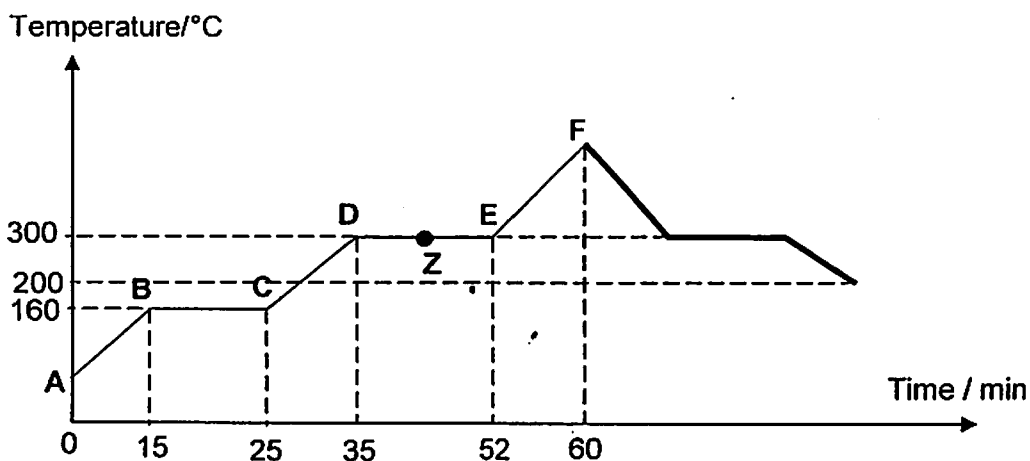


- 11aiv As the water potential of the potato strip is the same as that in the solution [1], there is no net movement of water [1] molecules moving in/out of the potato strip, resulting in no increase in length of potato over time.
- 11bi The size of the ulcer will shrink / becomes smaller [1].
- 11bii When salt is placed on the ulcer, the water potential in the ulcer is less than that in the surrounding [1].
Most water molecules will leave the ulcer via osmosis through partially permeable membrane [1].
This results in the size of ulcer shrinking.
- 12a AB, BC [1] {No ½ mark}
- 12b Heat is absorbed by the particles / The particles gain kinetic energy. [1]
The particles vibrate more vigorously [1]
Which weakens forces of attraction / breaks bonds of attraction between them [1]
This cause the particles to move further apart [1]
Now the particles move randomly at high speed [1]
{any 4}

12c



12di



[1] – correct shape of graph

[1] – indication of 300°C and 200°C at critical points

12dii

- The particles move by sliding past one another. [1]
The particles have strong / quite strong forces of attraction between them [1].

Class: Sec 2 /	Register No	Name:
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**Pasir Ris Crest Secondary School
Mid-Year Examination 2012
Secondary Two Express**

Science (Physics)

**10 May 2012
1 hour**

INSTRUCTIONS TO CANDIDATES

Do not open this booklet until you are told to do so.

Write your name, register number and class in the spaces at the top of this page.

Section A (15 marks)

There are **fifteen** questions in this section.
Answer **all** the questions. For each question,
there are four possible answers, **A, B, C and D**.
Choose the correct answer and shade accordingly
on the OTAS paper using **2B pencil only**.

Section B (15 marks)

Answer **all** the questions. Write your answers in
the spaces provided in the question paper.

Section C (20 marks)

Answer **all** the questions. Write your answers in
the spaces provided in the question paper.

For Examiner's Use	
Section A	/ 15
Section B	/ 15
Section C	/ 20
Total	/ 50
Parent's Signature	

This question paper consists of **12** printed pages including this cover page.

My Reflection ... "What was" "Why?" "What next?"

Section A - MCQ (15 marks)

Answer ALL questions. Record your answers in the OTAS form provided.

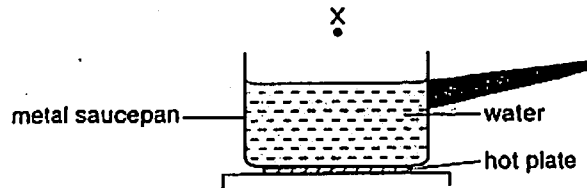
1. Which of the following is the best conductor of thermal energy?

- A Steel
- B Glass
- C Styrofoam
- D Wood

2. Your feet feel warmer on a rug than on your tile floor because your rug is _____.

- A usually warmer than your tile floor
- B a better insulator than your tile floor
- C a better conductor than your tile floor
- D a denser material than your tile floor.

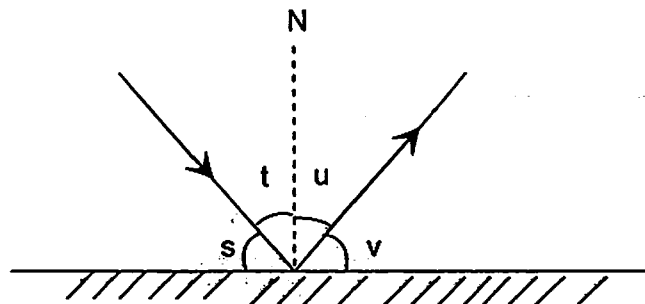
3. The diagram shows a metal saucepan containing water and placed on a hot plate. After some time, the air at point x also becomes hot.



What is the main process by which heat travels from the hot plate through the base of the metal saucepan before reaching the point X?

- Through the base
of the saucepan**
- A conduction
 - B vibration
 - C diffusion
 - D radiation

4. The diagram shows a light ray reflected off a plane mirror.



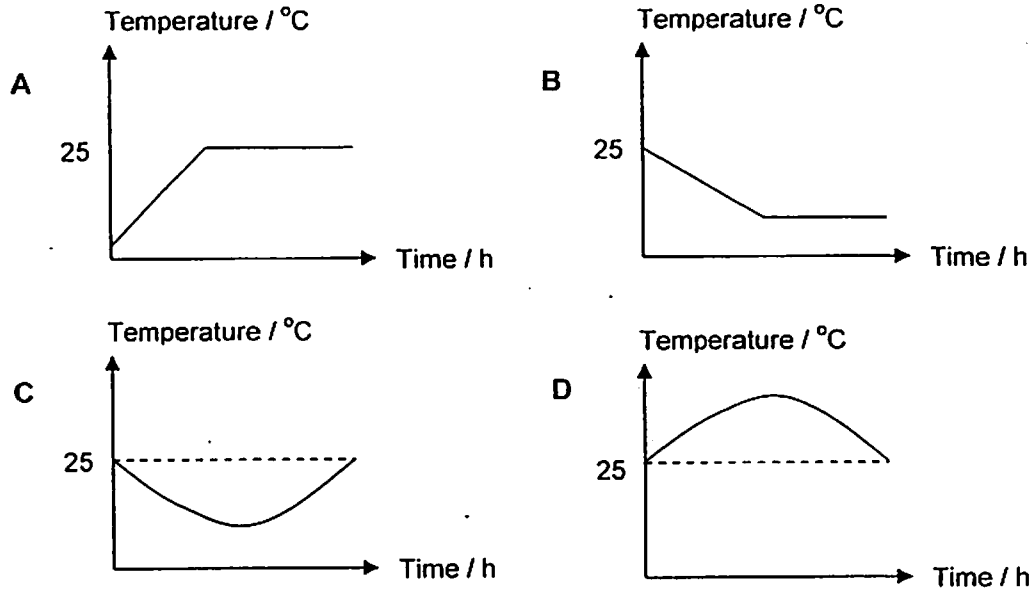
Which of the following statements is true?

- A Angle t is always smaller than angle u.
- B Angle s is always equal to angle v.
- C Angle u is always equal to angle v.
- D Angle v is always bigger than angle t.

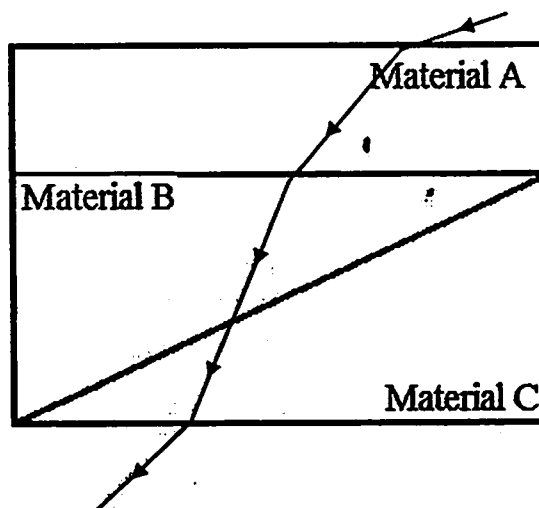
5. In a vacuum, substances absorb heat energy by the process of

- A conduction.
- B convection.
- C radiation.
- D all of above.

6. Which of the following graph shows what happens to the temperature of a glass of cold water when placed on a table with a room temperature of 25°C ?

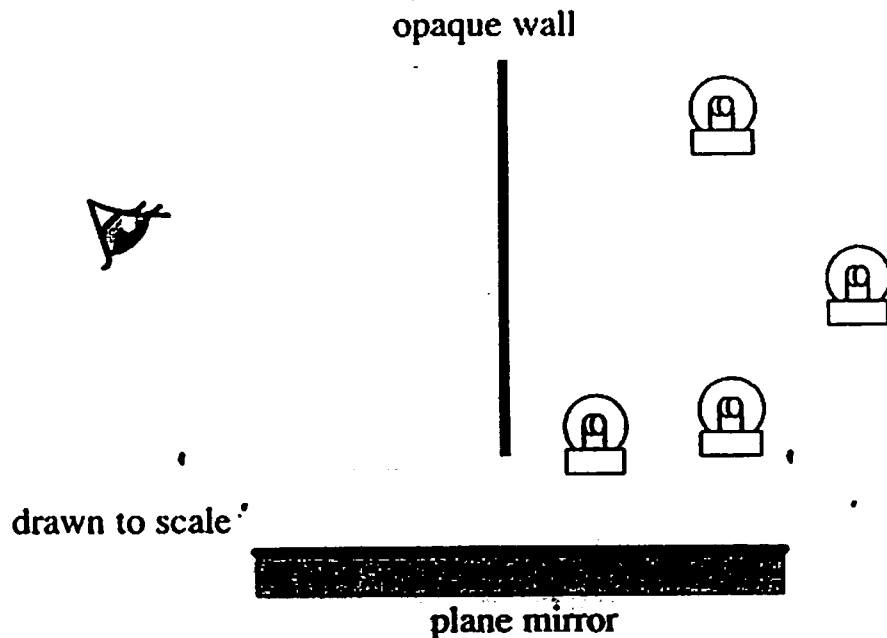


7. The diagram below shows the path of light as it passes through 3 different types of materials. Which of the following can be inferred from the diagram?



- A Material A is optically denser than Material B.
- B Material B is optically denser than Material C.
- C Material C is optically denser than Material B.
- D Material B and Material C have the same optical density

8. If glass expanded more than mercury, then the column of mercury in a mercury thermometer would rise when the temperature
- A increase.
 - B decrease.
 - C remain the same.
 - D changes rapidly.
9. Johnson is sitting inside a room lighted with a cyan light bulb and is wearing a red coloured T-shirt. If his friend were to enter the same room, what is the colour of Johnson's T-shirt that his friend will see?
- A Blue
 - B Magneta
 - C Black
 - D Red
10. Four light bulbs are concealed from an observer by an opaque wall as shown in the diagram below.



Without shifting the positions of the observer and the bulbs, how many bulbs can the observer see from the mirror?

- A 1
- B 2
- C 3
- D 4

11. Which is/are the condition(s) needed for total internal reflection to take place?

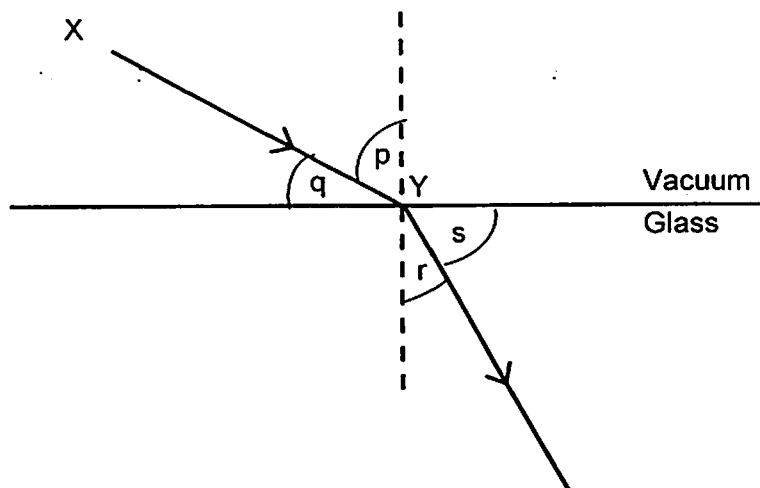
- 1 Light ray travels from an optically denser medium to an optically less dense medium.
- 2 The angle of incidence is not 0° .
- 3 The angle of incidence must be greater than the critical angle.

A 1 and 2 B 1 and 3 C 2 and 3 D 1, 2 and 3

12. During a very cold winter, water pipes sometimes burst. The reason for this is

- A the ground contracts when colder, pulling pipes apart.
- B water expands when freezing.
- C water contracts when freezing.
- D the thawing process releases pressure on the pipes.

13. The figure below shows a light ray XY travelling from vacuum to glass.



What is the refractive index of the glass?

- | | | | |
|---|---------------------|---|------------------------------|
| A | $\sin(p) / \sin(r)$ | B | $\sin^{-1}\{\sin(p) / (r)\}$ |
| C | $\sin(q) / \sin(r)$ | D | $\sin^{-1}\{\sin(q) / (r)\}$ |

14. Conduction can occur in _____.

- (i) solids
- (ii) liquids
- (iii) gases

- | | | | |
|---|-------------|---|-------------------|
| A | (i) | B | (ii) & (iii) |
| C | (i) & (iii) | D | (i), (ii) & (iii) |

15. Water (i) _____ when cooled to a temperature of 4°C .

Therefore, its density at 4°C is (ii) _____.

	(i)	(ii)
A	Contracts	Decreased
B	Contracts	Increased
C	Expands	Decreased
D	Expands	Increased

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Section B (15 marks)

16. a. Eva wrote on her exam paper that "*Unlike solids and liquids, gases do not expand when heated or contract when cooled.*" Is this statement correct? Explain your answer with an example.

[2]

- b. A metal spoon and a plastic spoon are placed on a table in an air-conditioned room. Which spoon will feel colder when being held on the finger? Explain your answer.

[2]

17. The image in the mirror is a *virtual* image,

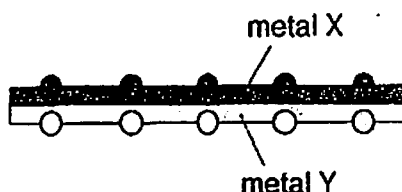
- a. list three other characteristics of a mirror image.

[3]

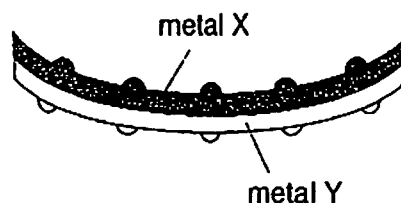
- b. explain what is the difference between *real* and *virtual* images.

[1]

18. The figures below show a bimetallic strip made of metal X and metal Y, before and after it is being heated by a Bunsen burner for about 10 minutes.



Before heating



After heating

- a. Explain why the metallic strip bent after it is being heated by the Bunsen Burner?

_____ [1]

- b. Which metal, X or Y, expands more when it is heated?

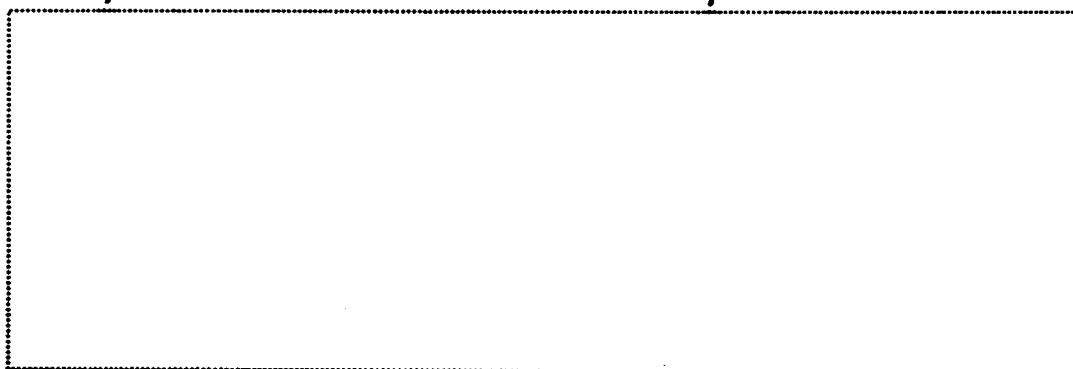
_____ [1]

- c. The metals used to make this bimetallic strip are brass and steel. Given that brass contracts more than steel given the same drop in temperature, identify metal X and metal Y.

metal X is _____ [1]

metal Y is _____ [1]

- d. Liquid nitrogen is nitrogen in a liquid state at an extremely low temperature. At atmospheric pressure, liquid nitrogen boils at -196°C and can cause rapid freezing on contact with objects. Draw and label, in the box below, the shape of the bimetallic strip after being in contact with liquid nitrogen for 5 minutes. [2]

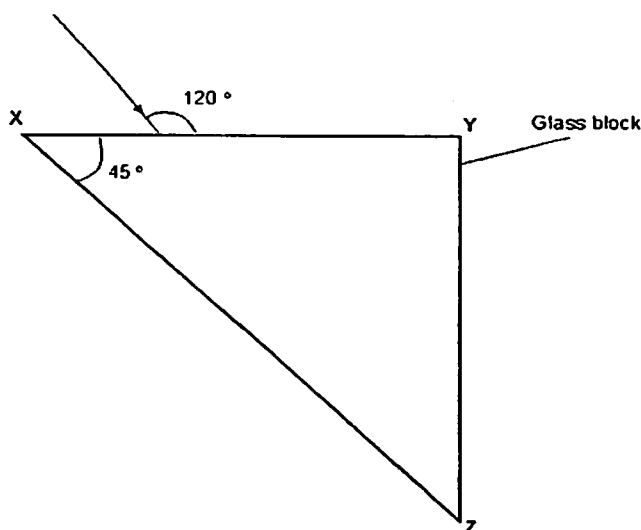


- e. State a useful application for the use of bimetallic strip.

_____ [1]

Section C (20 Marks)

19. A light ray is incident upon a triangular glass block with a speed of 3×10^8 m/s as shown in the Fig. 19.1 below (not to scale). It was found that the speed of light is two-third that of speed of light in air when it enters the glass block.

**Fig. 19.1**

- a. Explain what will happen to the light ray as it enters the glass.

[2]

- b. Define critical angle.

[1]

- c. Determine the refractive index, n , of the glass block. Hence, find the angle of refraction in the glass. **[4]**

- d. Given that the critical angle of the glass is 42° and that the refracted ray forms an angle of 64.5° with the surface XZ. Draw on Fig 19.2 and complete the path of the light ray until it emerges from the glass into the air again. Clearly label the angle of incidence, angle of refraction and/or angle of reflection at each point of incidence. [4]

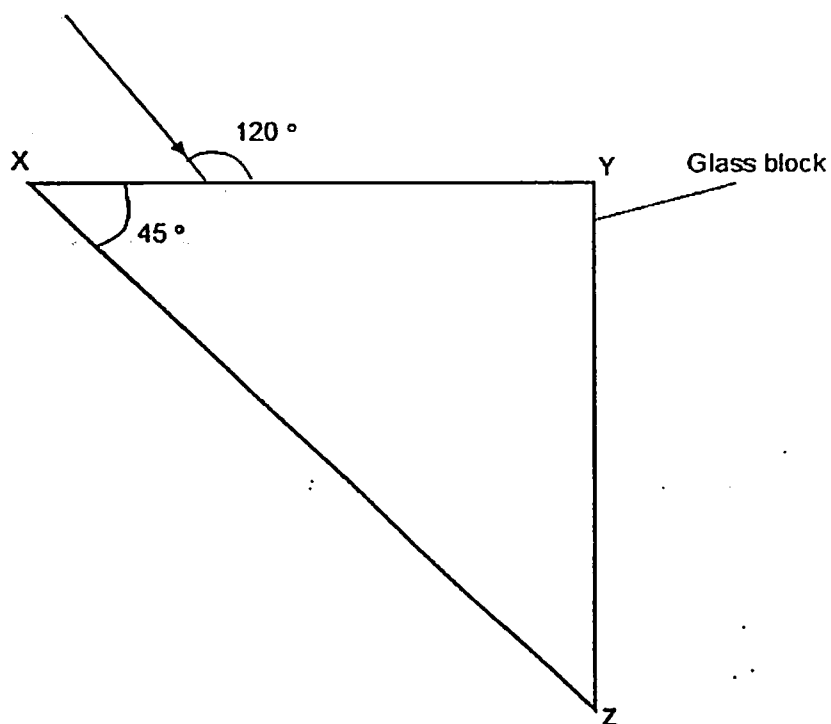
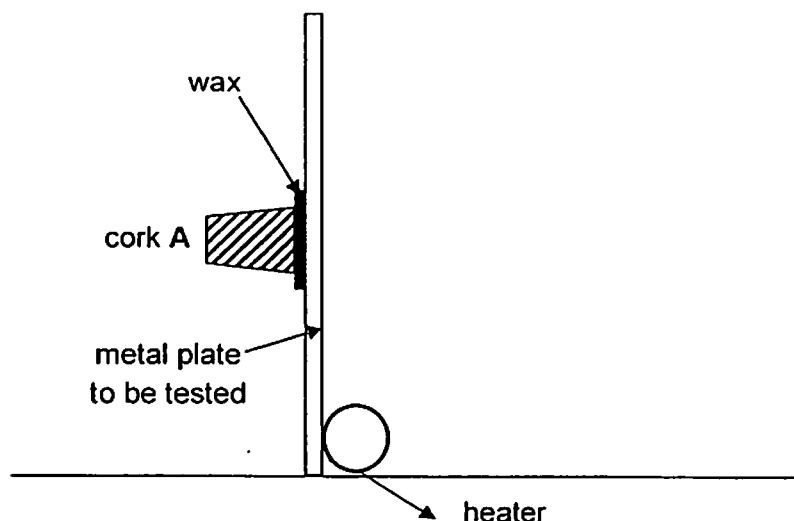


Fig. 19.2

20. Thermal conductivity is a measure of the ability of a substance to conduct heat. In an experiment, as setup below, a student wants to investigate the relationship between the thermal conductivity of several metallic plates with the duration at which the cork will fall.



The table below shows the metal plates used in the experiment and their respective thermal conductivities:

Materials	Copper	Stainless Steel	Iron	Silver	Brass
Thermal Conductivity, $W/(m.K)$	400	16	80	429	109

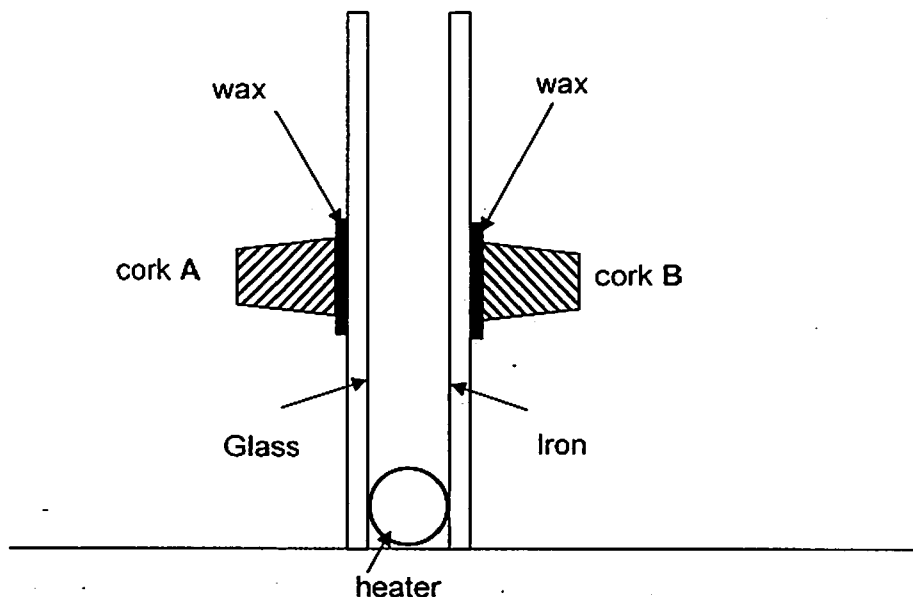
- a. Given that the time taken for the cork to fall off Copper and Iron is 20 s and 53 s. What can you infer about the relationship between the thermal conductivity of metallic plates with the duration at which the cork will fall? Explain your answer.

[2]

- b. Based on your answer in (a), rank the metals that are able to keep the cork intact for the longest to shortest duration:

[2]

- c. The diagram below shows two plates placed vertically in contact with an electric heater. The plates are exactly identical except for the materials used. Identical corks are attached by thin layers of wax to the surfaces of the plates facing away from the heater as shown. The heater has been switched on for 15 minutes and one cork falls before another.



- i. Which cork, A or B, would fall of first? Explain your answer.

[3]

- ii. Name the process which is mainly responsible for the heat transfer in the above scenario.

[1]

- iii. Identify two other variables that must be kept constant in order to ensure a fair experiment is conducted.

[2]

State the experiment to test expansion in solids.

types of Metal rods with wax.

End-of-Paper

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Name: _____ Index No. _____ Class: _____

Queenstown Secondary School



Secondary Two Express Mid-Year Examination 2012 Science

4 May 2012
Friday

Time : 0745 - 0930
Duration : 1 hr 45 mins

Instructions to candidates:

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO.

Write your name, class and registration number on the answer sheet provided.

Section A

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 – the OMS.

At the end of the examination, hand in your answers to Section A separately.

Section B

Answer all questions in this section.

Write your answers in the spaces provided on the question paper.

Section C

Answer all questions in this section.

Write your answers in the spaces provided on the question paper.

Information for candidates

The number of marks is given in brackets []
at the end of each question or part question.

A copy of the Periodic Table is attached on the last page.

Examiner's Use	
Section A	
Section B	
Section C	
TOTAL	

Section A: Multiple Choice Questions (30 marks)

There are **thirty** questions in this paper. 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. (Take the value of $g = 10\text{ms}^{-2}$)

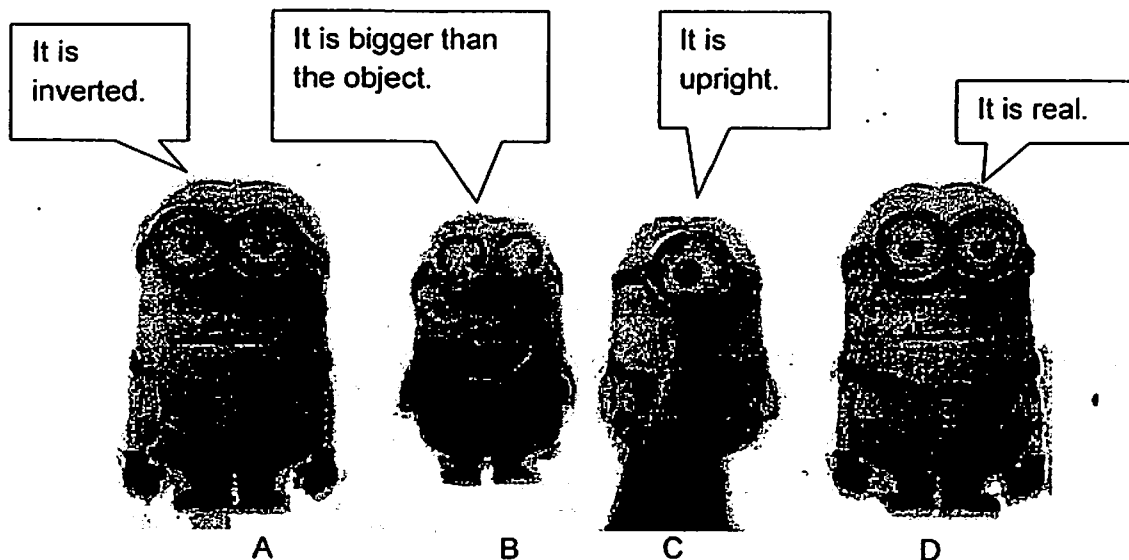
- 1 Susie wants to explain to Calvin that light travels in straight line.



Which of the following observations below can she use to support her explanation?

- | | | | |
|---|-------------------------------|---|--------------------------|
| A | A straw in water appears bent | C | Shadows |
| B | Formation of rainbows | D | Image formed in a mirror |

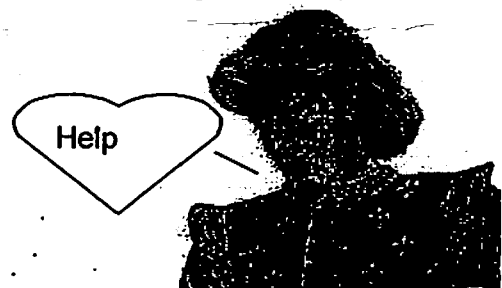
- 2 Four minions A, B, C and D are each asked to give a property of a mirror image.



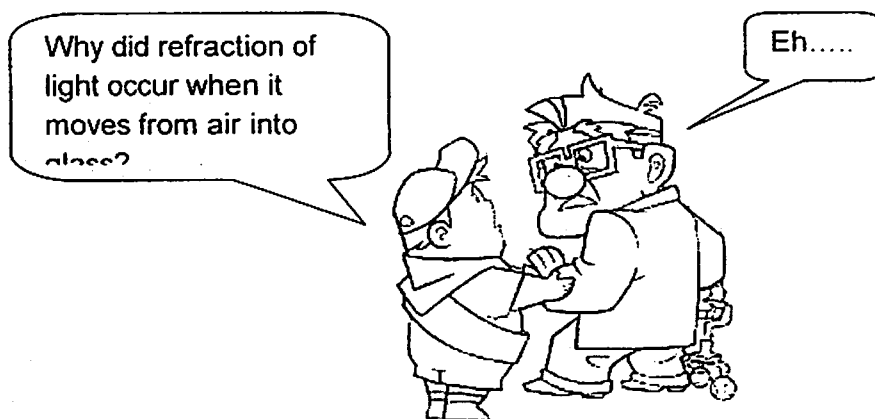
Who is correct ?

- 3 Prince Charming wants to check his appearance but he cannot find a mirror. He needs a surface which can produce regular reflection. Which of the following can he use?

- | | |
|---|--------------------------------|
| A | A basin of water |
| B | A sheet of smooth aluminium |
| C | A piece of rough frosted glass |
| D | Shiny diamond |

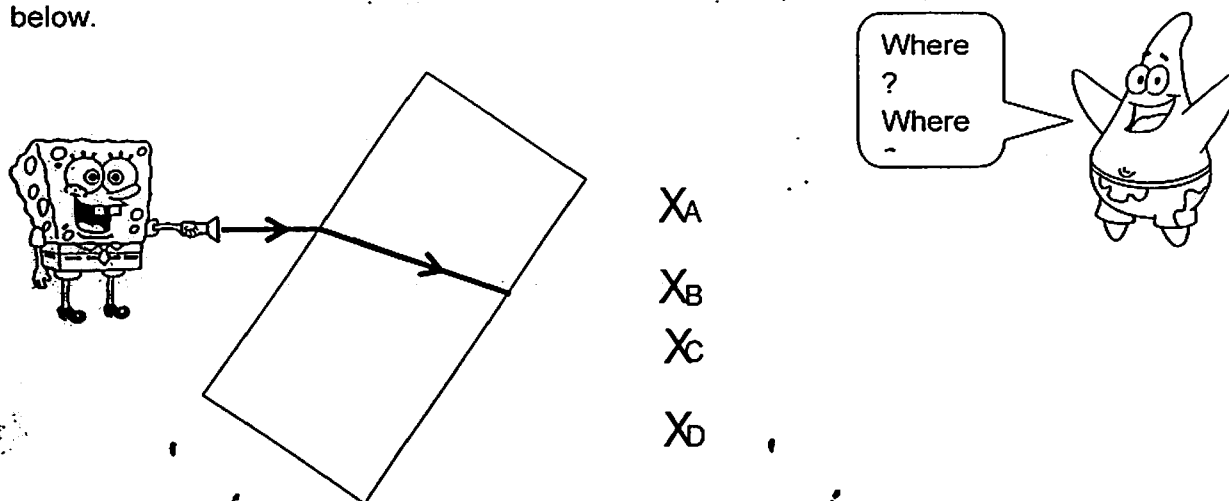


- 4 Russell asks Carl a question as shown in the diagram below.



How should Carl answer him?

- A It's because light always tries not to move in a straight line.
 - B It's because light changes its speed when it enters the glass.
 - C It's because light always chooses the shortest path.
 - D It's because light gains energy when it enters the glass.
- 5 Spongebob shines a ray of light into a block of glass and the path of light in the glass is shown below.



Where should Patrick stand so that the emergent ray of light will shine onto him?

- 6 Figure 6 shows Mumble the penguin dancing. What are the energy changes involved?

- A Chemical potential energy is changed into kinetic energy.
- B Elastic potential energy is changed into kinetic energy.
- C Kinetic energy is changed into gravitational potential energy.
- D Kinetic energy is changed into chemical potential energy.

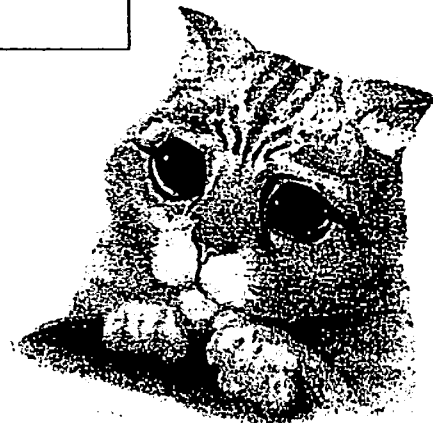


- 7 Puss in boots writes his ideas about energy as shown below and shows them to you.

1. I have the ability to do work because I have energy.
2. The more energy I create, the more work I can do.
3. If I don't like energy, I can always destroy it.

As a Physics student, how many of his statement/s do you think is/are wrong?

- | | | | |
|---|---|---|---|
| A | 0 | C | 2 |
| B | 1 | D | 3 |



- 8 Which of the following factors will affect the kinetic energy of an object?

- | | | | |
|---|-----------------------------|---|---------------------|
| A | size of the object | C | speed of the object |
| B | acceleration due to gravity | D | shape of the object |

- 9 Jeremy Lin threw a basketball upwards.

Which of the following below describes correctly what happens to the kinetic energy and gravitational potential energy of the ball just before it reaches the highest point?

- | | |
|---|---|
| A | It gains both kinetic and potential energy. |
| B | It gains kinetic energy but loses potential energy. |
| C | It gains potential energy but loses kinetic energy. |
| D | It loses both kinetic and potential energy. |



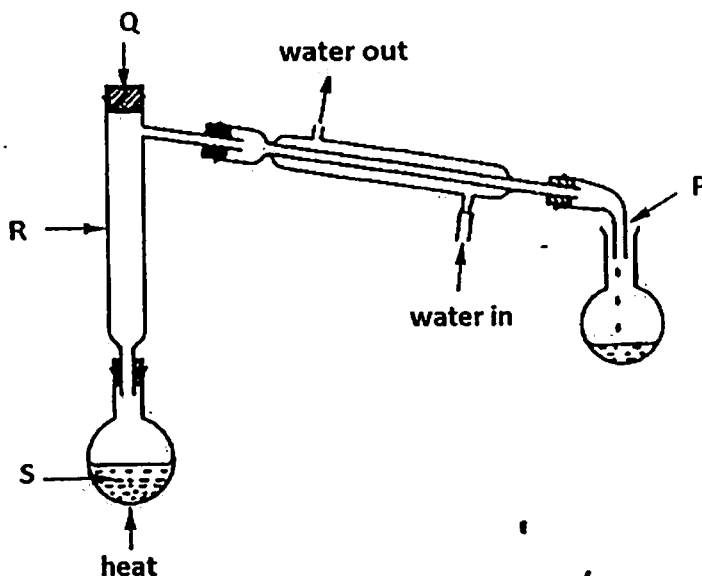
- 10 Megamind needs a renewable source of energy for his new invention. Which of the following sources of energy below can be used?

- (I) Fossil fuel
- (II) Biomass
- (III) Wind
- (IV) Sun

- | | |
|---|---------------------------|
| A | (I), (II), (III) and (IV) |
| B | (I), (III) and (IV) |
| C | (II), (III) and (IV) |
| D | (IV) only |



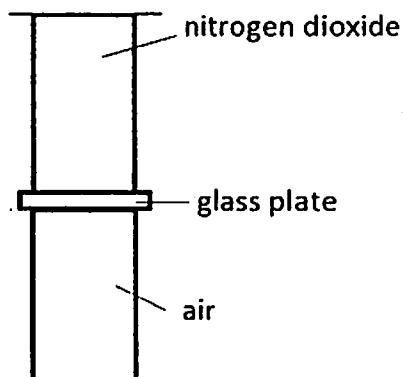
- 11 Which would you use to measure exactly 30.5 cm^3 of aqueous hydrochloric acid?
- A Burette
 - B Marked Beaker
 - C Measuring Cylinder
 - D Pipette
- 12 A flask contains liquid chloroform and water. They are separated using a separating funnel.
- Which conclusion can be made from this observation alone?
- A Chloroform and water are immiscible.
 - B Chloroform and water have different boiling point.
 - C Chloroform and water have different solubility.
 - D Chloroform has a higher density than water.
- 13 A mixture of two liquids is fractionally distilled in the apparatus shown below.



Which one of the following changes would you make to best improve the separation of the liquids?

- A Filling tube R with glass beads.
- B Increasing the rate of heating in the distillation flask.
- C Inserting a thermometer at Q.
- D Putting anti-bumping stones into S.

- 14 Nitrogen dioxide is a dark brown gas which is denser than air. A gas jar containing nitrogen dioxide is sealed with a glass plate and is then inverted on top of a gas jar containing air.



The glass plate is then removed. After some time, a uniform light brown colour was seen throughout the gas jars. This was the result of the movement of

- A air from outside entering the gas jars.
- B air moving upwards into the gas jar at the top.
- C nitrogen dioxide molecules and air moving into different gas jars at the same time.
- D nitrogen dioxide molecules moving downwards into the gas jar at the bottom.

- 15 The boiling points of some elements are given in the table.

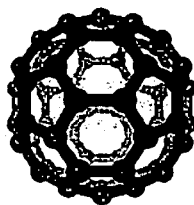
<i>Element</i>	<i>Boiling point / °C</i>
Nitrogen	-196
Xenon	-108
Oxygen	-183

A mixture of nitrogen, xenon and oxygen at -200°C is allowed to warm up to -150°C .

Which elements are still in the liquid state at -150°C ?

- A A mixture of nitrogen and oxygen
- B A mixture of nitrogen and xenon
- C Nitrogen only
- D Xenon only

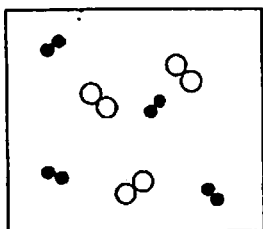
- 16 The substance buckminsterfullerene was discovered in 1985. It is a perfect sphere with the chemical formula C_{60} as shown below.



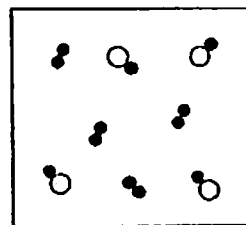
From the above information, what can you deduce about buckminsterfullerene ?

- A It only contains one element.
 B It is a compound made up of 60 atoms.
 C It is a mixture of 60 atoms.
 D It is a mixture of 60 elements.
- 17 Which diagram shows a mixture of one element and one compound ?

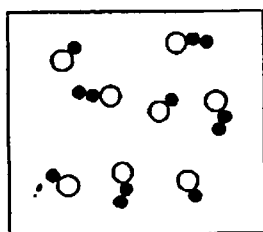
A



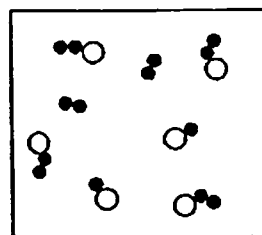
C



B



D



- 18 Which pair of atoms contain the same number of neutrons ?

- A $^{114}_{48}\text{Cd}$ and $^{119}_{50}\text{Sn}$
 B $^{59}_{27}\text{Co}$ and $^{59}_{28}\text{Ni}$
 C $^{133}_{55}\text{Cs}$ and $^{132}_{54}\text{Xe}$
 D $^{63}_{29}\text{Cu}$ and $^{65}_{29}\text{Cu}$

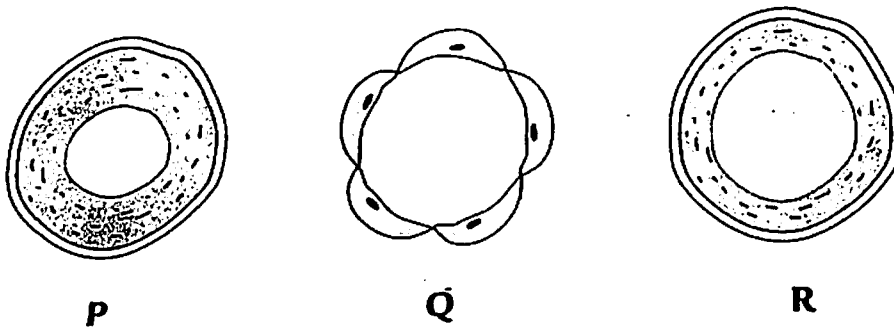
23 How do nitrate ions, oxygen and water enter root hair cells?

	Active Transport	Diffusion	Osmosis
A	Mineral salts	Oxygen	Water
B	Mineral salts	Water	Oxygen
C	Oxygen	Mineral salts	Water
D	Oxygen	Water	Mineral salts

24 Which of the following explains the presence of white blood cells near a damaged tissue.

- A To stop bleeding by clotting.
- B To transport more oxygen to the cells of damaged blood vessel.
- C To transport waste material to the excretory organ for removal.
- D To fight bacteria which might have entered the bloodstream.

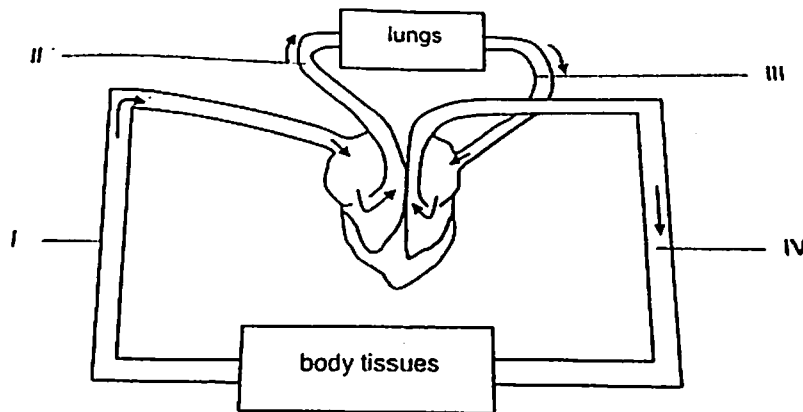
25 The diagrams show the different types of blood vessels P, Q and R.



Which of the following features is correct for each vessel?

	Require valves to aid the blood flow	Substances can pass through the wall	Blood under high pressure
A	P	Q	R
B	R	P	Q
C	R	Q	P
D	Q	R	P

- 26 The diagram below shows a plan of the circulatory system.



Which blood vessel contain the highest concentration of oxygen and carbon dioxide respectively?

	Oxygen	Carbon Dioxide
A	I	II
B	I	III
C	II	IV
D	III	II

- 27 In the human alimentary canal, carbohydrates are digested as indicated below.



Which of the following represents enzyme 1 and enzyme 2 correctly?

	Enzyme 1	Enzyme 2
A	Amylase	Lipase
B	Amylase	Maltase
C	Lipase	Pepsin
D	Maltase	Amylase

- 28 In which part of the digestive system is carbohydrate digested?

- A The small intestine and large intestine
- B The stomach and the small intestine
- C The mouth and the small intestine
- D The mouth and the stomach

- 29 Runners take glucose drinks before races because glucose drinks _____.

- A contain sugar which acts as food and eases the process of digestion
- B have more sugar and less water, thus prolong urination
- C can be directly absorbed by the body very quickly and provides instant energy to run
- D has enzymes which help them run faster

30 Which of the following statements about enzymes are correct ?

- I: Enzymes function best at body temperature.
- II: Enzymes speed up the process of digestion.
- III: The body gets enzymes from food.
- IV: Digestion cannot take place without enzymes

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

Name: _____ ()

Class: _____

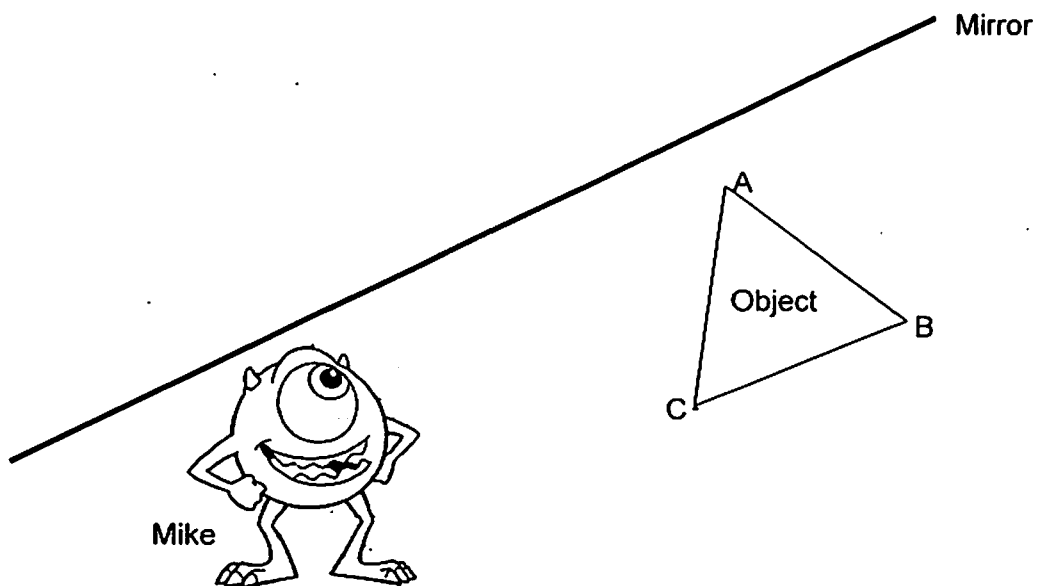
FOR EXAMINER'S USE	
Total	
Section B	
Section C	

Section B
(40 marks)

Answer all questions.

Write your answers in the space provided on the question paper.

- 1 The diagram below shows Mike and a triangular object in front of a mirror.

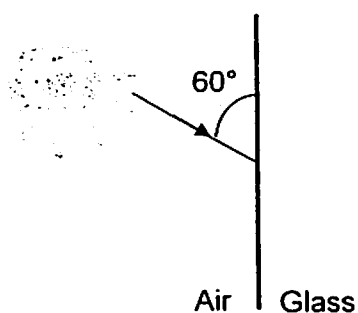


- (a) Locate and draw the mirror image of the triangular object ABC. [2]
- (b) Draw light rays to show the eye of Mike sees the image of point C. [2]
- (c) A mirror image is virtual. Explain the meaning of virtual image. [1]

.....

.....

- 2 The diagram below shows a ray of light from the sun incident on a glass window surface.



- (a) State the angle of incidence [1]
- (b) Given that the refractive index of the glass is 1.51, calculate the angle of refraction. State the formula which you use clearly. [3]

- (c) Describe one effect of refraction of light in everyday life. [1]

3

- (a) Select, from the following list, one method by which each of the following may be separated from the stated mixture. [5]

You may use a method once, more than once, or not at all.

Chromatography

Evaporation to dryness

Magnetism

Crystallisation

Fractional distillation

Use of separating funnel

Distillation

Filtration

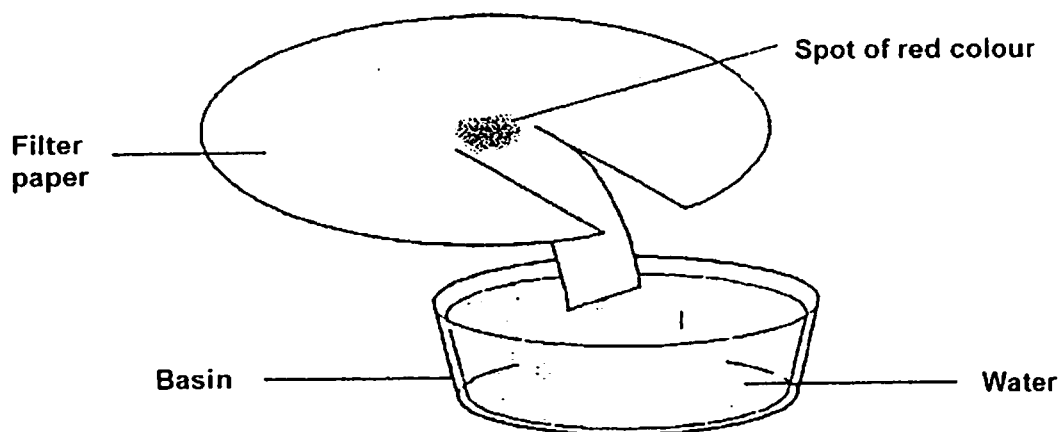
- (i) Iron fillings and sand
- (ii) Heptane (boiling point 98 °C) and Octane (boiling point 126 °C)
.....
- (iii) Salt from a salt solution
- (iv) Pure water from a solution of water and food dyes
- (v) Olive oil from water

- (b) Describe the experimental steps involved in obtaining sugar from a sugar solution. [2]

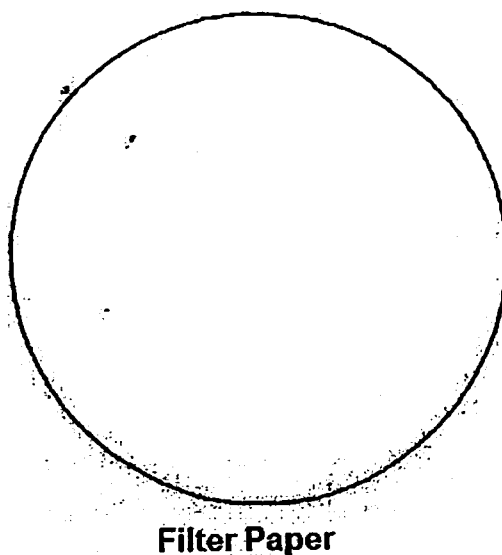
(i)
.....

(ii)
.....

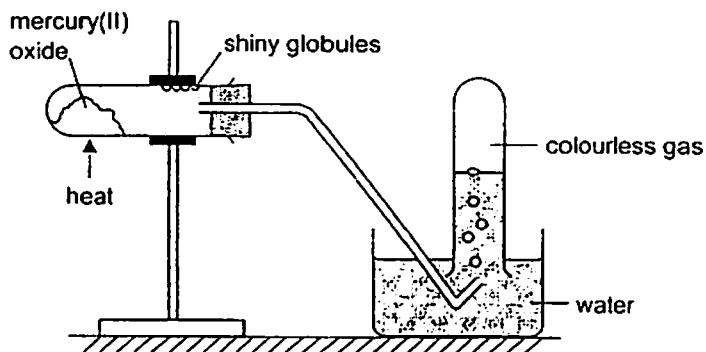
- 4 Some sweets and candies are coloured red by a mixture containing three dyes. The apparatus in the diagram is used to analyse the mixture.



- (a) What solvent is being used ? [1]
-
- (b) Explain why a strip of the filter paper is made to dip into the liquid. [1]
-
- (c) Draw in the diagram below how you would expect the filter paper to appear after several minutes. [1]



- 5 The set-up below shows the heating of mercury (II) oxide, HgO . Mercury (II) oxide is an orange solid at room temperature.



The results are summarized below:

- Shiny silvery globules obtained.
- A colourless gas collected.

- (a) Name the **metallic** element in mercury (II) oxide.

[1]

.....

- (b) Name the **non-metallic** element in mercury (II) oxide.

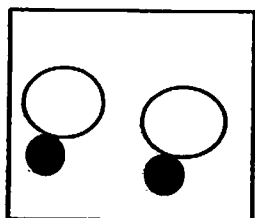
[1]

.....

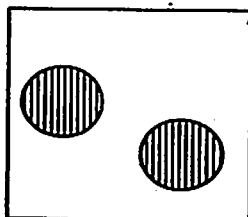
- (c) Draw a particle model of the non-metallic element named in (b).

[1]

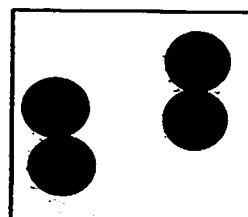
Some examples of particle models are shown below:



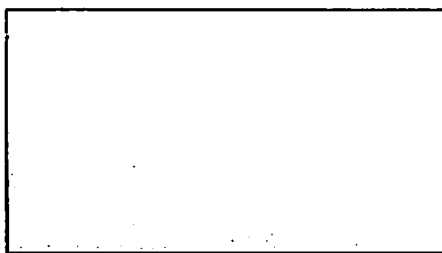
Hydrogen chloride gas



Neon gas



Hydrogen gas



Particle Model for the Non-Metallic Element in (b)

- (d) Give one reason, based on the results obtained, why mercury (II) oxide is a compound

[1]

.....

.....

- (e) State two differences between steel (a mixture of iron and carbon) and iron carbide (Fe_3C). [2]

(i)

.....

.....

(ii)

.....

.....

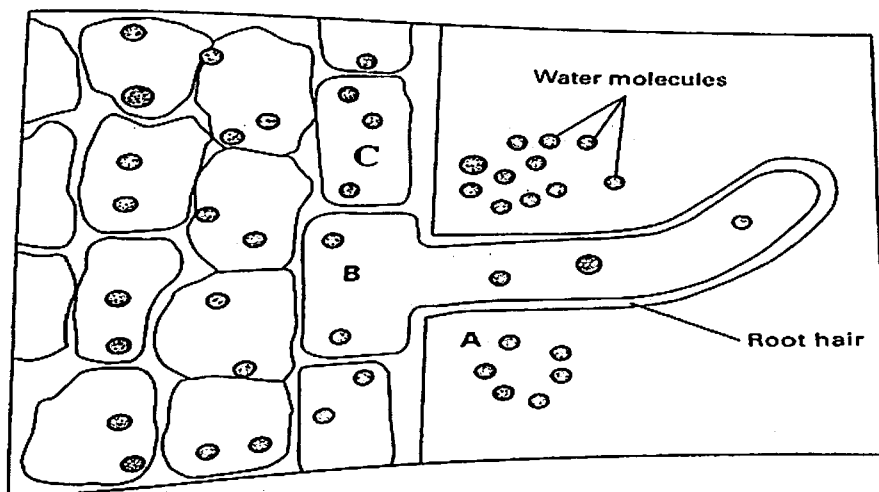
- 6 The table shows the atomic structure of 6 particles, represented by the letters A to F. The particles are atoms or ions. The letters are not symbols of the elements.

<i>Particle</i>	<i>Electrons</i>	<i>Protons</i>	<i>Neutrons</i>
A	6	6	6
B	2	2	2
C	12	12	12
D	10	12	12
E	6	6	8
F	10	13	14

Use the letters **A** to **F** to answer the following questions.

- (a) Which **two** particles are ions ? [1]
 and
- (b) Which particle exists as a noble gas ? [1]
- (c) Which **two** particles are an atom and an ion of the same element ? [1]
 and
- (d) Which **two** particles are isotopes of the same element ? [1]
 and

- 7 The figure below shows a section of the root of a green plant.



- (a) Name the process by which water at region A moves into Cell B and then to Cell C and explain how the process takes place. [3]

.....

.....

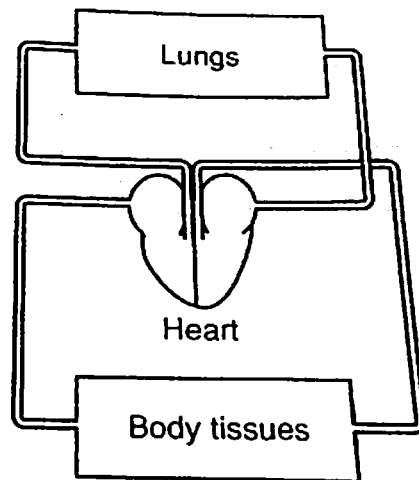
.....

.....

- (b) Apart from water name another substance found in region A which can be absorbed into Cell B. [1]

.....

- 10 The diagram below shows a cross-section of a human heart.



(ai) Draw arrows in the diagram to show blood circulation in the body. [1]

(aii) Briefly describe how the blood circulates around the body. [2]

.....

.....

.....

(aiii) How is the blood circulation in humans different from that in fishes? [1]

.....

.....

(b) Name two major components that make up blood and state their functions. [2]

.....

.....

.....

Section C

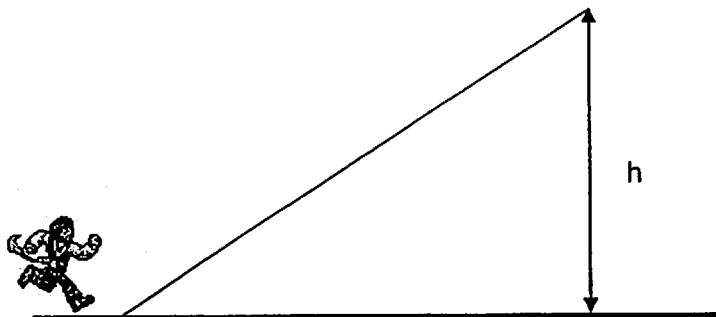
(30 marks)

Answer all questions.

Write your answers in the space provided on the question paper.

1

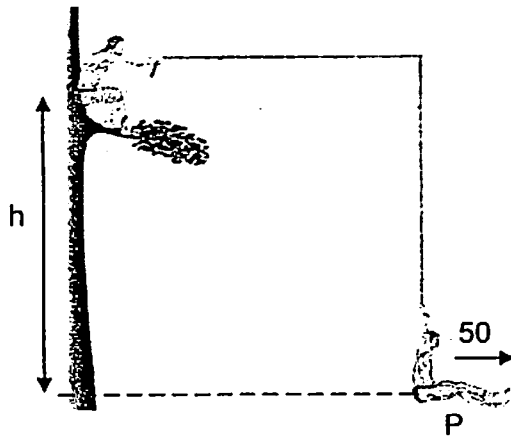
- (a) Jack Sparrow follows a treasure map and runs towards the treasure. He comes to a slope and runs up.



- (i) If he has a mass of 70 kg and gains a gravitational potential energy of 105 000 J, calculate the height h of the slope. (Take $g = 10 \text{ m s}^{-2}$). [2]

- (ii) When Jack Sparrow reaches the top of the slope, he continues his run. After running for some time, he gains a kinetic energy of 3500 J. Without considering the answer for part (a), calculate his speed at this instant. [2]

- (b) Tarzan takes a vine and swings to the other side.



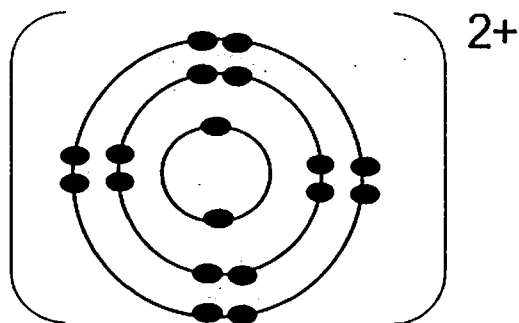
- (i) Given that Tarzan has a mass of 60 kg and he achieves a speed of 50 m/s at the lowest point of the swing, P, calculate the amount of kinetic energy gain by him. [2]

- (ii) From the answer in (i), calculate the height h which he falls to reach P. [3]

- (iii) The amount of kinetic energy gained by Tarzan when he falls to point P is actually less than the calculated value in part (i). State one possible way in which energy is lost during the swinging. [1]

2

(a) The following diagram shows the electronic structure of an ion of an atom.



Using the Periodic Table,

[3]

(i) Identify the element.

.....

(ii) State its nucleon number.

.....

(iii) State the number of valence electrons present in the element.

.....

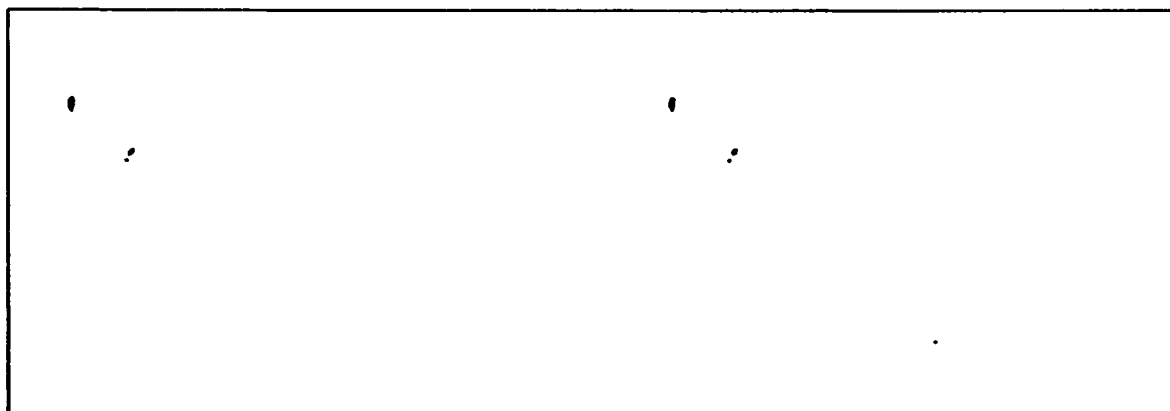
(iv) Describe how the ion above was formed from its atom.

[1]

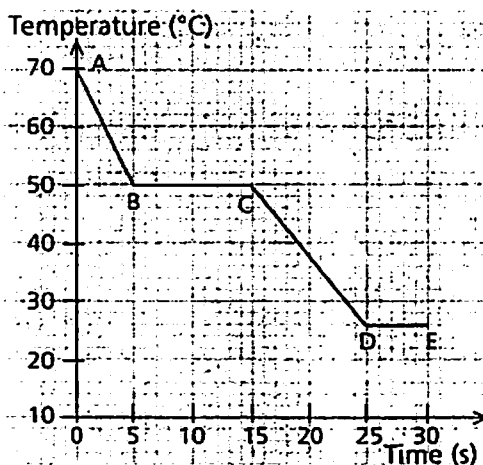
.....

(v) Draw a diagram to illustrate the electronic structure of the atom of this element.

[1]



- (b) A hot liquid X was allowed to cool in air. The temperature was measured every five seconds. The graph below represents the cooling curve of X.



- (i) State the boiling point of X.

[1]

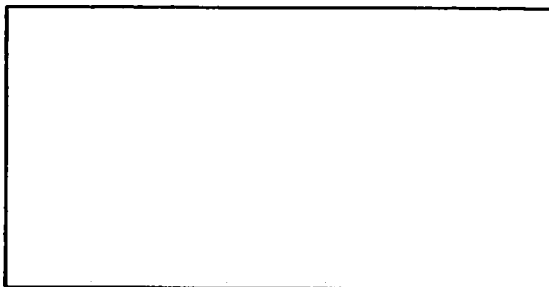
- (ii) Compare the arrangement and movement of the particles of X at 20 °C (solid state) and 150 °C (gaseous state) respectively by completing the table below.

[2]

	At 20 °C (solid state)	At 150 °C (gaseous state)
Arrangement of particles		
Movement of particles		

- (iii) Draw a diagram to illustrate the arrangement of particles of X at 35 °C.

[1]



- (iv) In which parts of the graph is energy being given out to the surrounding ?

[1]

..... and

The Periodic Table of the Elements

Group																														
I	II											III	IV	V	VI	VII	0													
<div>Key</div> <div>relative atomic mass atomic symbol name atomic number</div>											1 H hydrogen 1												2							
											7 Li lithium 3		9 Be beryllium 4												5	6	7	8	9	10
											23 Na sodium 11		24 Mg magnesium 12												13	14	15	16	17	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			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														
†90-103 Actinoid series			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														

relative atomic mass

atomic symbol

name

atomic number

1
H
hydrogen
1

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).



MYE SEC 2 EXP Science 2012

ANSWER SCHEME for Physics

MCQ:

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

Section B

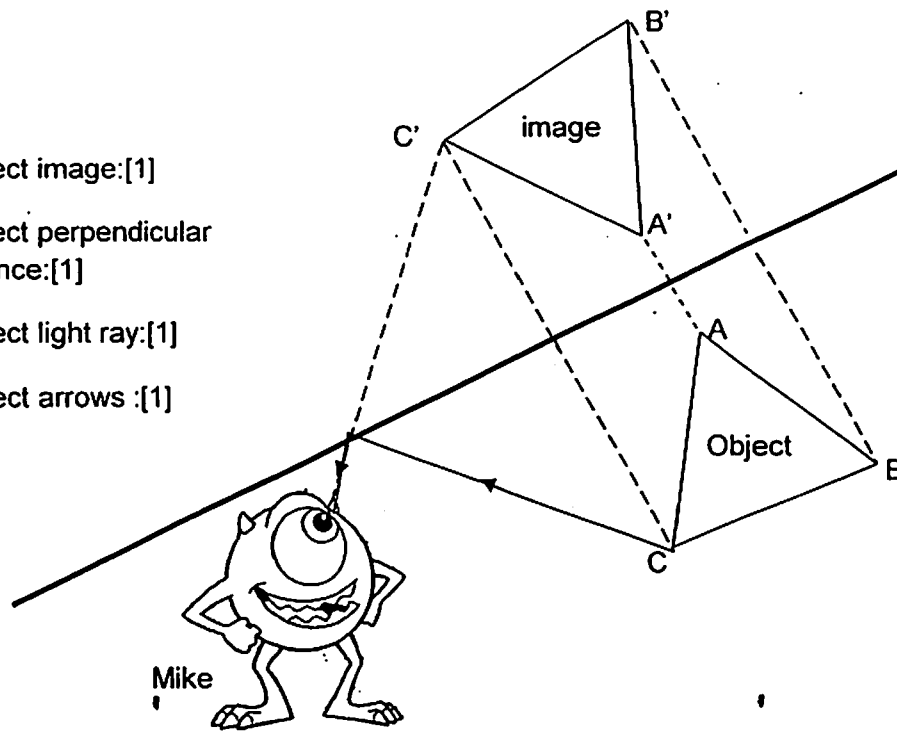
1.

a) Correct image:[1]

Correct perpendicular
distance:[1]

b) Correct light ray:[1]

Correct arrows :[1]



c) A virtual image is an image that cannot be formed on a screen. [1]

2a) 30° [1]

b) $n = \sin i / \sin r$ [1]

$1.51 = \sin 30^\circ / \sin r$ [1]

$\sin r = 0.331$

$r = 19.3^\circ$ [1]

c) An object in water will appear nearer than it actually is. [1]

Any logical answer.

Section C

1. a)(i) $E_p = mgh$

$$105\,000 = 70 \times 10 \times h \text{ [1]}$$

$$h = 150 \text{ m [1]}$$

(ii) $E_k = \frac{1}{2}mv^2$

$$3500 = \frac{1}{2} \times 70 \times v^2 \text{ [1]}$$

$$v^2 = 100$$

$$v = 10 \text{ m/s [1]}$$

b) (i) $E_k = \frac{1}{2}mv^2$

$$= \frac{1}{2} \times 60 \times 50^2 \text{ [1]}$$

$$= 75\,000 \text{ J [1]}$$

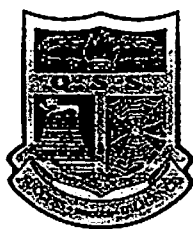
(ii) From conservation of energy,

$$E_p \text{ at top} = E_k \text{ at the bottom [1]}$$

$$mgh = 75\,000$$

$$60 \times 10 \times h = 75\,000 \text{ [1]}$$

$$h = 125 \text{ m [1]}$$



QUEENSWAY SECONDARY SCHOOL

MID-YEAR EXAMINATION 2012

LOWER SECONDARY SCIENCE

Level: SEC. 2 Express

Total Time: **1 hr 30 mins**

Total Marks: **80**

NAME: _____ INDEX NO: _____ CLASS: _____

READ THESE INSTRUCTIONS FIRST:

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO.

Read these notes carefully.

Write your name, Class and Index No. above.

There are **TWO SECTIONS**. Answer **ALL** questions.

SECTION 1: PHYSICS (35 m)

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

SECTION 2: CHEMISTRY (45 m)

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

A copy of the Periodic Table can be found on page 20.

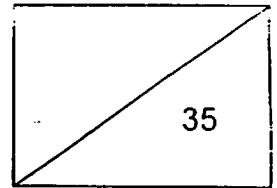
INFORMATION FOR CANDIDATES:

The intended number of marks for questions is given in [] at the end of each question or part question.

Hand in **SECTIONS 1 and 2 separately**.

You may use a calculator.

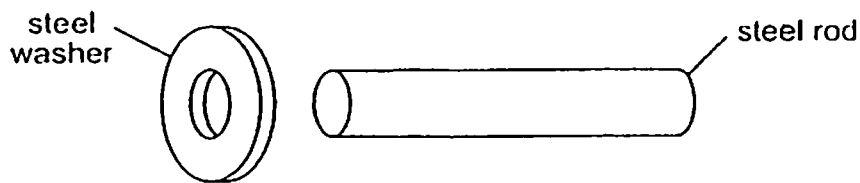
PHYSICS SECTION



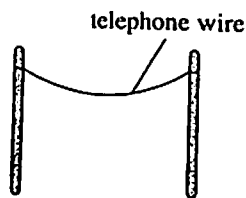
SECTION 1 (A) (10 marks)

Answer all the questions in this section in the table on page 5.

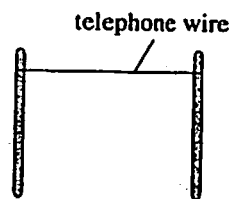
- 1 An engineer wants to fix a steel washer on to a steel rod. The rod is just too big to fit into the hole of the washer when they are both at room temperature. How could the engineer fit the washer on to the rod?



- A Heat the rod and then place it in the hole.
 B Heat the washer and place it over the rod.
 C Cool the washer and place it over the rod.
 D Cool the washer and rod to below room temperature and push them together.
- 2 Why do the telephone wires sag during the day and become tight at night?



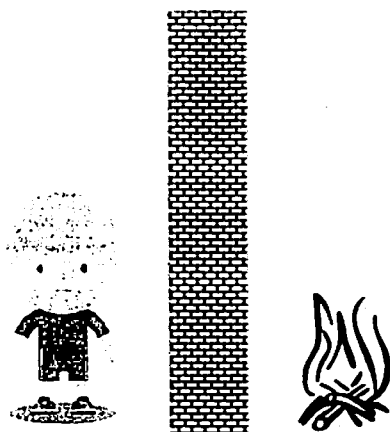
In the day



At night

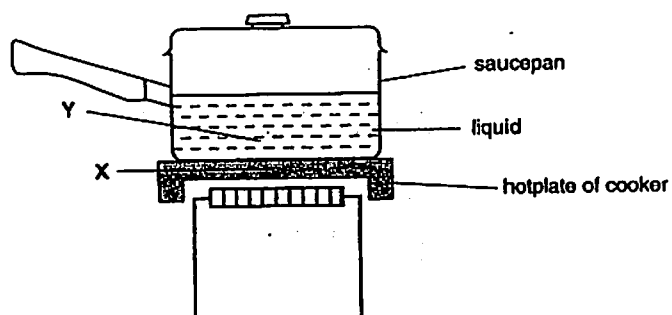
- A In the day, the wires expand and at night, they contract.
 B In the day, the wires contract and at night, they expand.
 C More birds are on the telephone wires in the day.
 D The telephone wires are old.

- 3 The diagram shows a tall brick wall in between a boy and a camp fire. How does the thermal energy reach the boy?



- A Radiation → Conduction → Radiation
 B Radiation → Conduction → Convection
 C Radiation → Convection → Radiation
 D Radiation → Convection → Convection

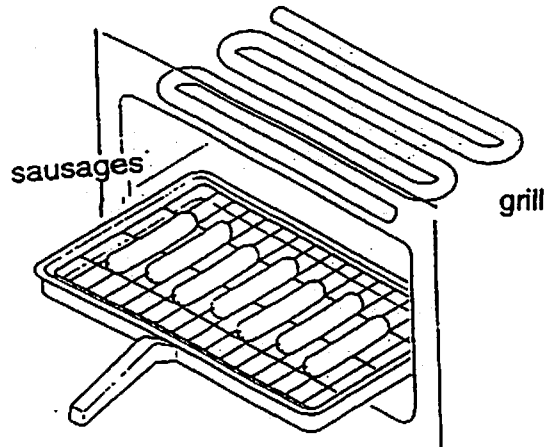
- 4 The diagram shows liquid in a saucepan being heated on an electric cooker.



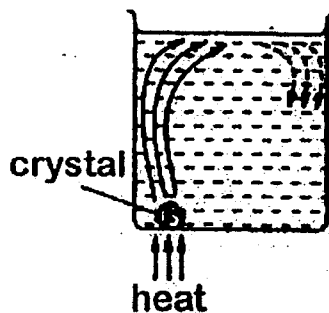
Which of the following best describes the type of energy transfer taking place at X and Y?

- | | X | Y |
|---|------------|------------|
| A | conduction | conduction |
| B | conduction | convection |
| C | convection | conduction |
| D | convection | convection |

- 5 Some sausages are heated under a red-hot grill. The main way in which heat reaches the sausages is by radiation. Which statement best describes this process?



- A Energy is passing from one air molecule to the next molecule.
 B Hot air circulates around, so that all the air is heated.
 C Hot air near the grill passes energy to the cold air near the sausages.
 D The heat energy is carried by waves from the grill to the sausages.
- 6 The diagram shows a crystal being heated in a beaker of water. The crystal releases a dye which shows how the water circulates around the beaker. What is happening to cause the water above the crystal to rise?

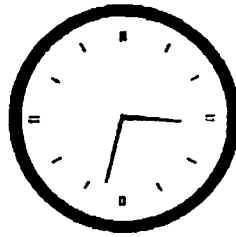


- A The water contracts and its density decreases.
 B The water contracts and its density increases.
 C The water expands and its density decreases.
 D The water expands and its density increases.
- 7 Which of the following statements about light are NOT TRUE?

- I Light travels in a straight line.
 II Light travels slower than sound.
 III Light emits from luminous and non-luminous objects.
 IV A beam of light is made up of a single ray of light.

- A I and III only
 B II, III and IV only
 C I, II and IV only
 D All of the above

- 8 The figure below shows an image of a wall clock reflected on a plane mirror. What is the correct time shown on the wall clock?



- A 3:33 pm
 B 8:27 pm
 C 8:33 pm
 D 9:33 pm
- 9 When Aaden used a magnifying glass to examine an insect, the insect appeared _____.
- A bigger and nearer
 B bigger and further
 C smaller and nearer
 D smaller and further
- 10 Black objects appear black because _____.
- A it reflects all the colours and absorbs none
 B it reflects black and absorbs the other colours
 C it absorbs all the colours and reflects none
 D it absorbs black and reflects the other colours

ANSWERS:

1		3		5		7		9	
2		4		6		8		10	

END OF SECTION 1(A)

SECTION 1 (B): Structured Questions (17 marks)

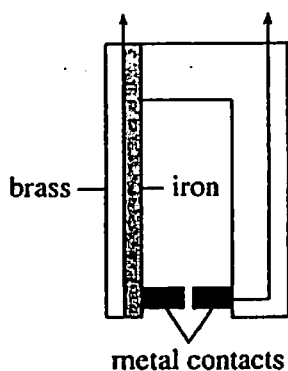
Answer all the questions in this section in the spaces provided.

- 1 Johnny left a sealed glass bottle of coke in a freezer. Two days later, when he took out from the freezer, he observed crack lines on the bottle.

(a) What happens to the volume when the coke changes to ice? [1]

(b) Explain the presence of crack lines on the bottle. [1]

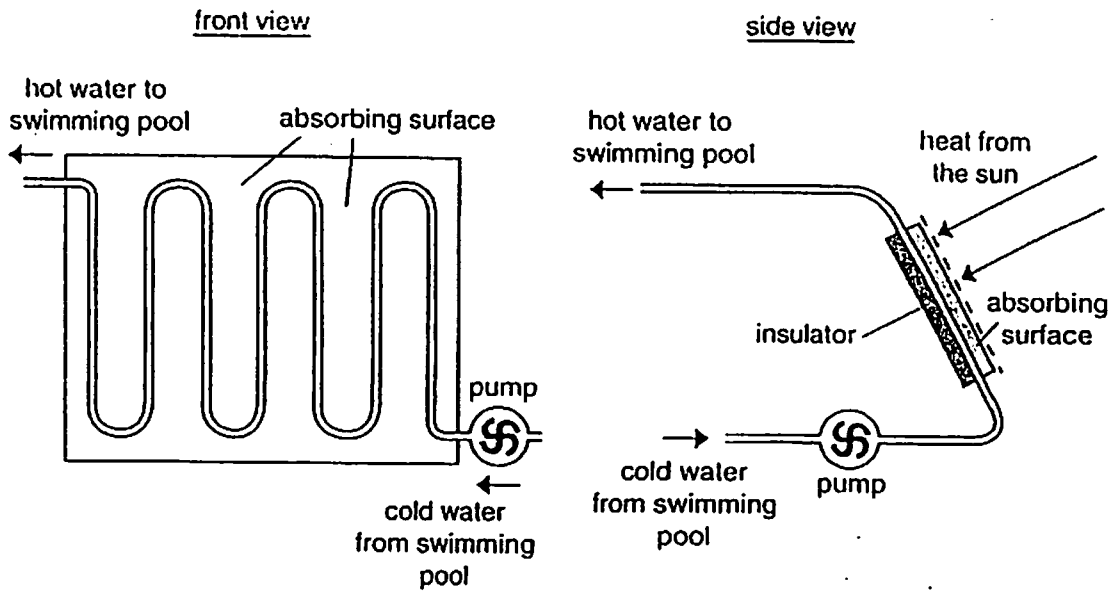
- 2 The diagram below shows how a bimetallic strip is made use of in a thermostat.



(a) What would happen when the bimetallic strip is hot? Explain your answer. [2]

(b) Give an example of an electrical home appliance which uses such thermostat. [1]

- 3 The water in a swimming pool is heated by solar panels. Two views of a solar panel are shown below in figure below.



- (a) Which method of heat transfer takes place between the Sun and the solar panels? [½]

- (b) What colour should the absorbing surface be painted? Explain your answer. [1]

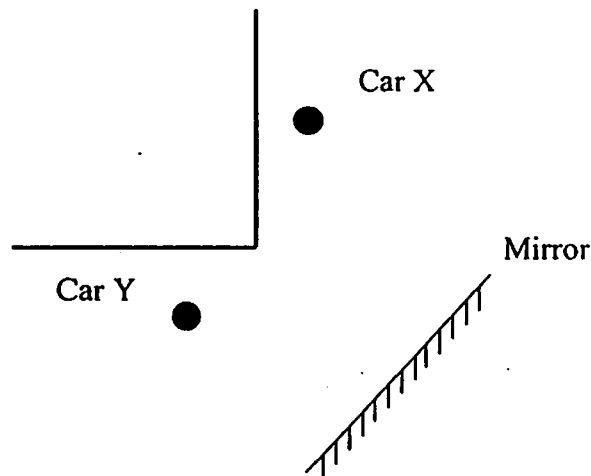
- (c) Explain why the water pipe is bent into the shape shown. [2]

- (d) What material should the water pipe be made of? Explain your answer. [1½]

- (e) Explain why there is insulation behind the solar panel. [1]

- (f) Explain why the cold water enters the bottom of the panel and the hot water exits the top of the panel as shown in figure. [2]

- 4 The diagram below (not drawn to scale) shows a mirror placed at a bend in a carpark. This mirror ensures that car Y can see the image of car X when coming round the bend.



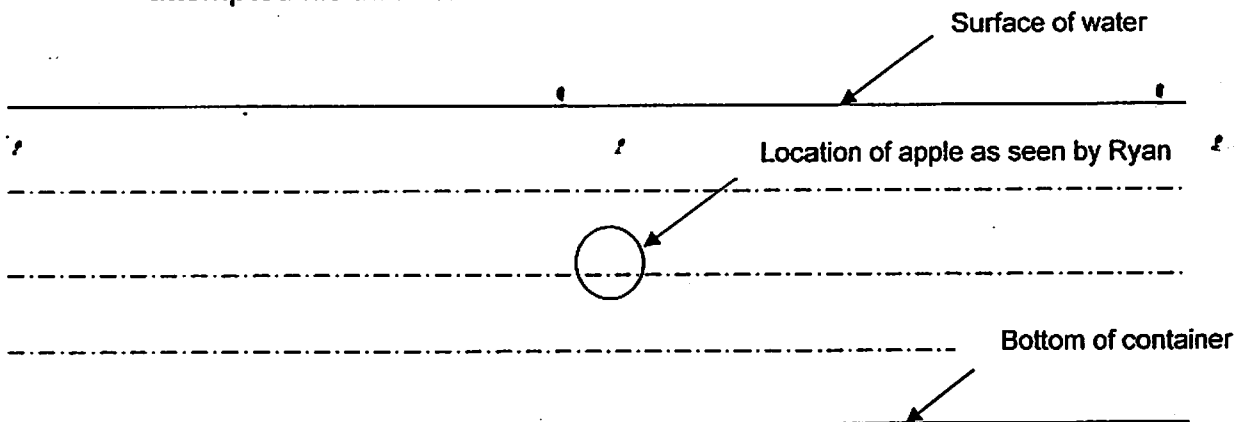
- (a) What type of mirror (plane or convex or concave) would you recommend for use in car parks? [1]
- (b) Explain your choice of mirror in part (a). [1]
- (c) Give TWO characteristics of the image formed in part (a). [2]

Section 1(C) : Free Response Questions (8 marks)
 Answer all the questions in this section in the spaces provided.

- 1 (a) With the aid of diagrams, show the difference between a regular reflection and diffused reflection. [2]

- (b) "The Law of Reflection DOES NOT hold true for diffused reflection". Is this statement true or false. Explain your answer. [2]

- (c) While attending a carnival with his family, Ryan came across a booth offering an interesting game. Some apples were fully submerged in a big container of water. The objective of the game was to use a sharpened rod to throw and pierce one apple. Ryan singled one apple and decided to use all three chances given to pierce it. The figure below shows what Ryan saw before he attempted his throws.



- (i) Is the image of apple seen by Ryan virtual or real? [1]

- (ii) Indicate with a cross (x) on the figure above where should Ryan aim in order to pierce the apple? [1]

(iii) Explain your choice of location as indicated in part (ii)

[2]

END OF SECTION 1



QUEENSWAY SECONDARY SCHOOL

Mid-Year Examination 2012

Sec 2E Lower Secondary Science Mark Scheme

PHYSICS SECTION:

SECTION 1(A): Multiple Choice Questions (10 marks)

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

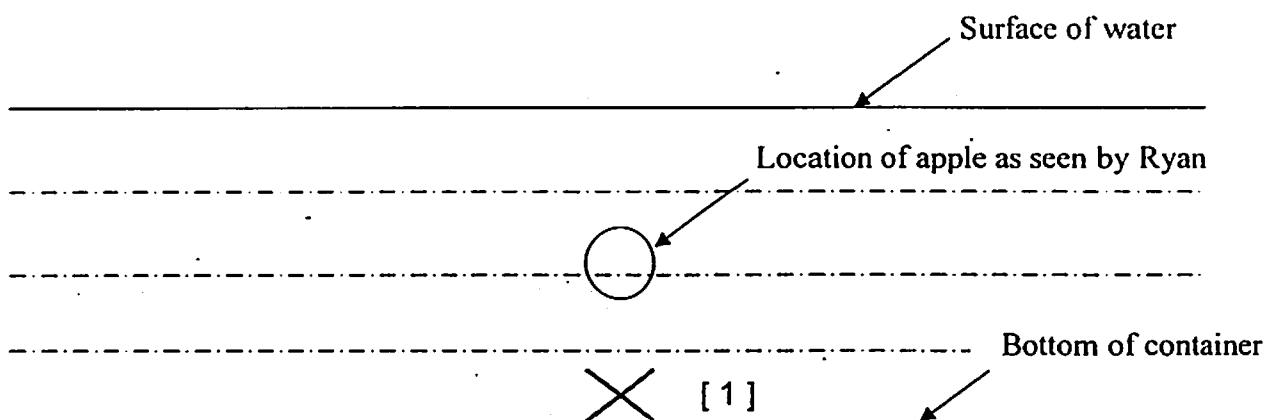
SECTION 1(B): Structured Questions (17 marks)

- 1
 - (a) The volume *increases*. [1]
 - (b) The *force of expansion* pushes against the bottle and cause the cracks. [1]
- 2
 - (a) *The bimetallic strip bends to the right [1] when it is hot and the metal contacts touch each other, closing the electrical circuit. This is because brass expands more than iron [1] for the same temperature increase/rise, causing the metallic strip to bend.*
 - (b) electric oven OR electric iron, [1]
- 3
 - (a) Radiation [½]
 - (b) Black [½]. Because it is a good absorber of heat [½].
 - (c) To increase the surface area [1]. In order to increase the amount of heat absorbed [1].
 - (d) Copper OR any metal [½]. Because they are good conductor of heat [1].
 - (e) To prevent heat loss from the panels by conduction. [1]
 - (f) Cold water is heated and expands [1]. It becomes hot water which is less dense and moves out at the top [1].
- 4
 - (a) Convex mirror [1]
 - (b) To form upright image [½] and large field of view [½].
 - (c) Virtual OR Upright OR Laterally inverted OR Same size as object OR Same colour as object [Any 2, 1 mark each]

Section 1(C): Free Response Questions (8 marks)

- 1 (a) Regular reflection [1] Diffused reflection [1]
 (1) $i = r$ (1) $i = r$
 (2) smooth surface (2) rough and uneven surface
- (b) False [1]. In diffused reflection, due to rough and uneven reflecting surface, parallel beam of light is reflected in different directions [1] but law of reflection still holds.
- (c) (i) Virtual [1]

(ii)



- (iii) Due to refraction of light from the apple [1], the image seen by Ryan seems nearer to water surface but above the real object [1].

*** END OF MARKING SCHEME ***

Name: Reg. No. Class:



Founded 1842

St.Margaret's Secondary School

Mid-Year Examination 2012

LOWER SECONDARY SCIENCE

Secondary Two Express Paper 1 (30 marks)

9 May 2012

Duration: 2 Hours (For both Papers 1 and 2)

Total Marks: 100 (For both Papers 1 and 2)

Additional Material: OTAS

READ THESE INSTRUCTIONS FIRST

Do not open this Booklet until you are told to do so.

You may start with either Paper 1 or Paper 2.

Write your name, index number and class on the OTAS sheet and in the spaces provided on this page.

Answer all 30 questions in this paper.

For each question, there are four possible answers, A, B, C and D. Choose the one you consider correct and shade your choice of answer on the OTAS sheet provided, with a soft 2B pencil.

Erase unwanted answers thoroughly from the answer sheet.

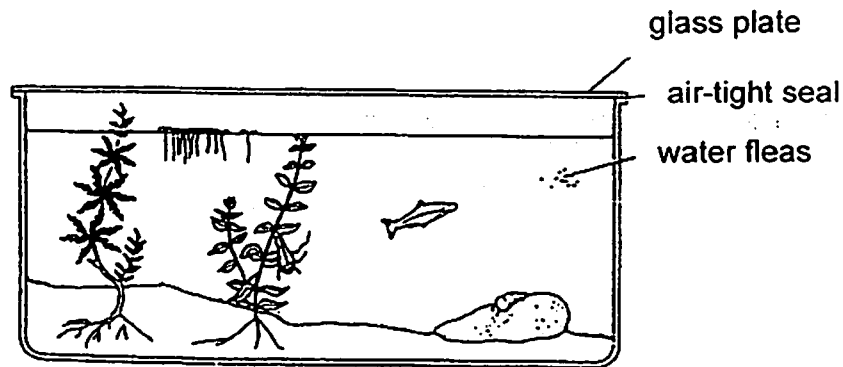
Each correct answer will score one mark.

Calculators are allowed in this paper.

A copy of the Periodic Table has been printed on Page 14 of this paper.

This question paper consists of 14 printed pages.

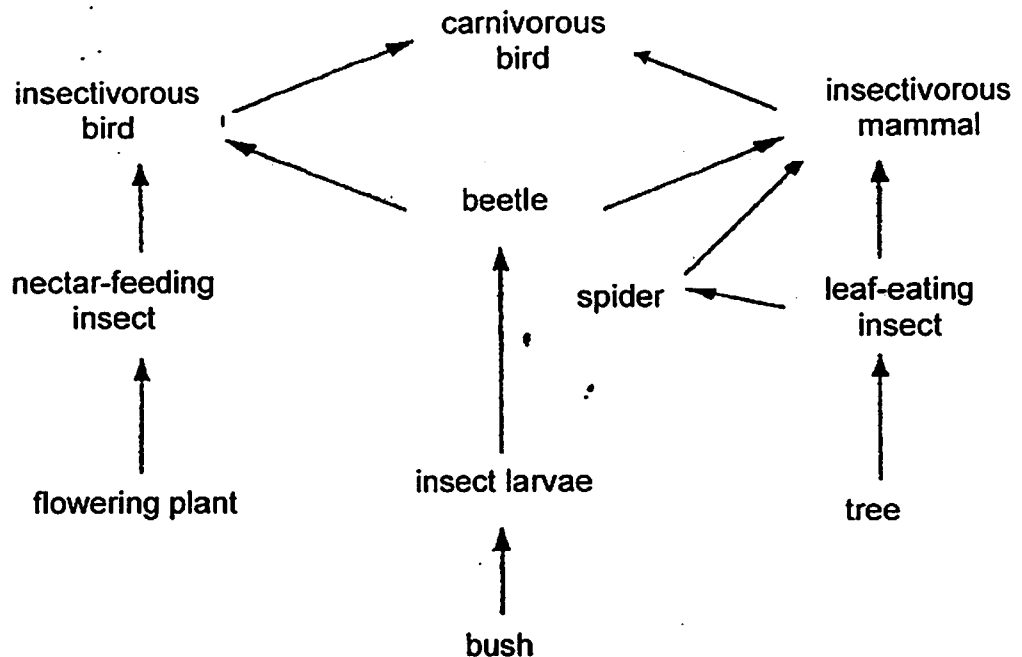
1. The figure below shows some organisms sealed in an aquarium.



What must be provided to keep the organisms alive for the longest possible time?

- A Carbon dioxide
- B Light energy
- C Mineral salts
- D Oxygen

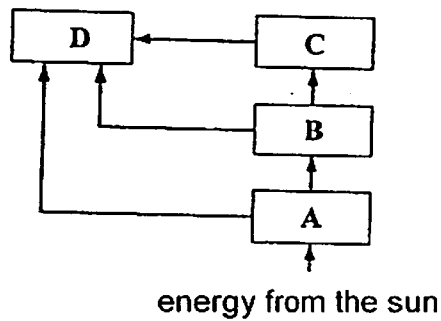
2. The diagram below shows part of a food web. Which organisms can be considered as secondary as well as tertiary consumers?



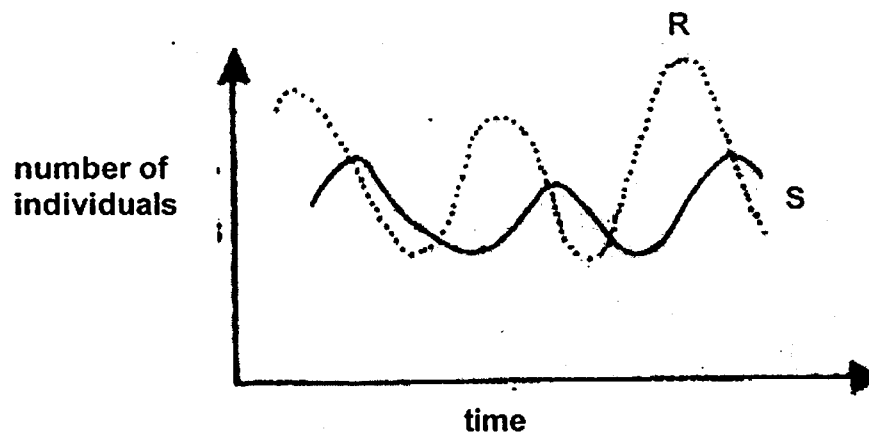
- A Insectivorous bird and beetle
- B Insectivorous mammal and beetle
- C Insectivorous bird and insectivorous mammal
- D Insectivorous bird and carnivorous bird

3

Questions 3 and 4 refer to the diagram below which represents the flow of energy in a typical ecosystem.



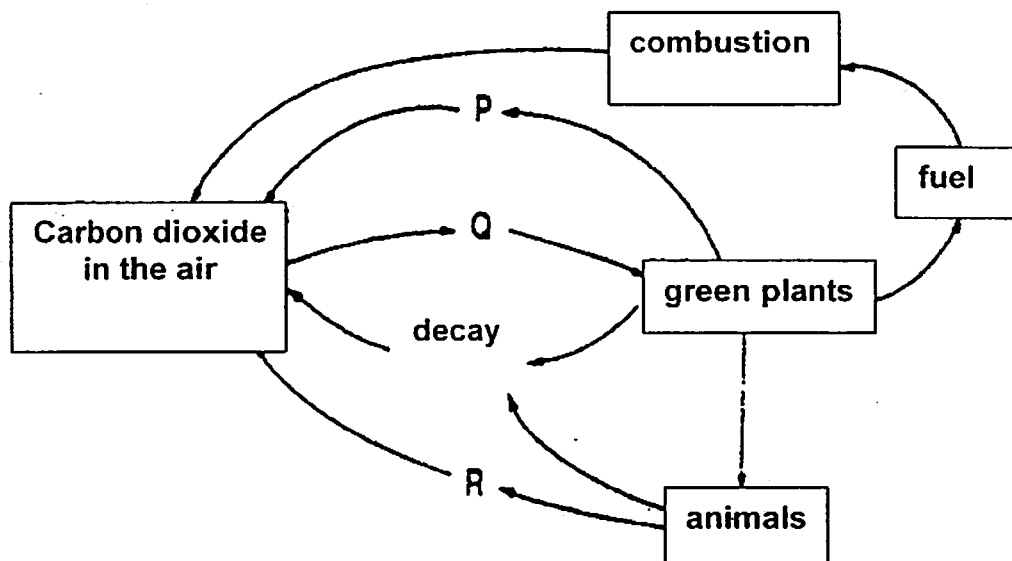
3. Which box represents the decomposers?
4. Which box represents the largest total biomass of living organisms?
5. On the graph below, the two curves represent the number of two different organisms R and S in the same food chain.



What do R and S represent?

	R	S
A	Producer	Predator
B	Primary consumer	Producer
C	Secondary consumer	Producer
D	Primary consumer	Secondary consumer

6. The diagram below represents the carbon cycle.

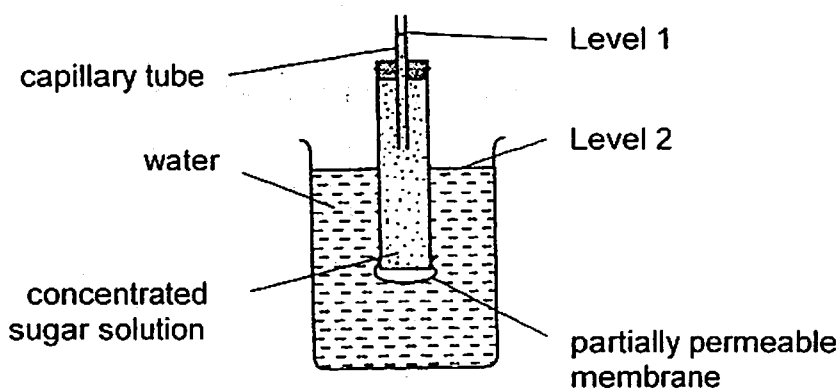


What are processes P, Q and R?

	P	Q	R
A	Photosynthesis	Respiration	Photosynthesis
B	Photosynthesis	Respiration	Respiration
C	Respiration	Photosynthesis	Respiration
D	Respiration	Photosynthesis	Decomposition

5

7. The diagram shows an apparatus used to investigate osmosis.



After 4 hours, which changes in liquid levels will occur and which molecules will move across the partially permeable membrane?

	Level 1	Level 2	Molecules that move
A	Decrease	Increase	Sugar
B	Decrease	Increase	Water
C	Increase	Decrease	Sugar
D	Increase	Decrease	Water

8. A Visking tubing containing a starch suspension and pink food dye is lowered into a beaker of water. Which of the following will occur as a result of diffusion?

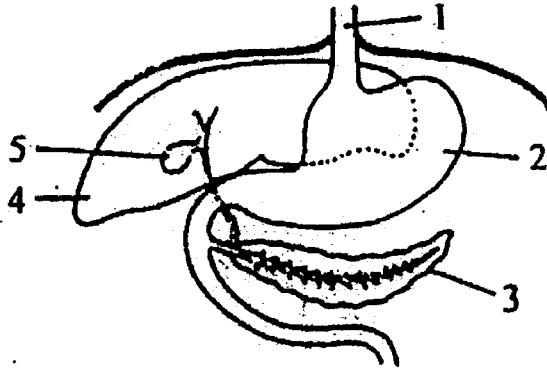
- I The water in the beaker will turn pink.
- II The Visking tubing will shrink as water leaves it.
- III The Visking tubing will swell as water enters it.
- IV The Visking tubing will shrink as starch leaves it.

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

9. A human red blood cell is placed in distilled water.
In which direction will water move and what is the effect on the red blood cell?

	Movement of water	Effect on the cell
A	Into the cell	Slight increase in size
B	Into the cell	Bursts
C	Out of the cell	Slight decrease in size
D	Out of the cell	Bursts

10. The figure shows part of the human alimentary canal. Which two structures produce substances involved in the digestion of fats?



- A (1) and (2)
 B (1) and (5)
 C (2) and (3)
 D (3) and (4)
11. What would happen if a person's gall bladder is removed?
- A Carbohydrate digestion would be reduced.
 B Fat digestion would be reduced.
 C Fat digestion would stop.
 D Protein digestion be reduced.

12. The secretions below are all active in the human alimentary canal.

- (1) Saliva
- (2) Gastric juice
- (3) Bile
- (4) Pancreatic juice
- (5) Intestinal juice

Which of these secretions contain the enzyme amylase?

- A (1) only
- B (1) and (4) only
- C (1) and (5) only
- D (2) and (5) only

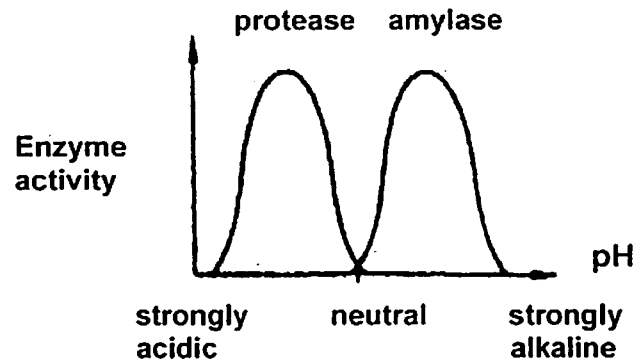
13. The table shows the protein, fat and carbohydrate content in 10 g of rice and steamed fish.

Food	Protein / g	Fat / g	Carbohydrate / g
Fish	1.6	0.005	0.0
Rice	0.6	0.1	8.7

What would be the main end-products of digestion of a meal of rice and steamed fish?

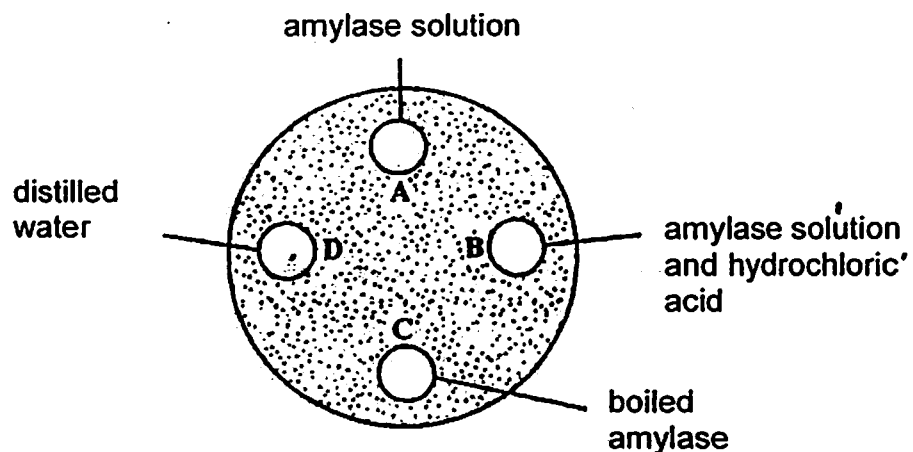
- A Amino acids and simple sugars
- B Amino acids and glycerol
- C Simple sugars and fatty acids
- D Simple sugars and glycerol

14. The diagram shows the effect of pH on the activity of two enzymes in the human digestive system. In which regions of the alimentary canal would the enzymes be most active?



	Protease	Amylase
A	Large intestine	Stomach
B	Small intestine	Large intestine
C	Stomach	Small intestine
D	Stomach	Large intestine

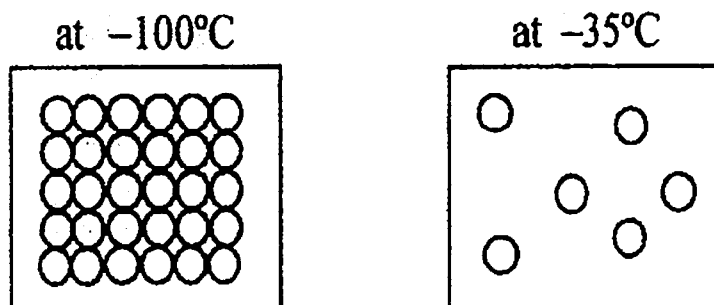
15. A dish was prepared with agar jelly containing starch. Four holes were cut out in the jelly and each hole was filled with substances as shown in the diagram below.
(Note: The amylase used is from the mouth.)



After 30 minutes, iodine solution was poured over the jelly. Which hole will be surrounded by the largest yellow-brown region?

16. At room temperature (30°C), mercury is a liquid while iron is a solid. Which of the following statements about mercury and iron is correct?
- A Mercury particles have more kinetic energy than iron particles.
 - B Iron particles have more kinetic energy than mercury particles.
 - C The melting point of mercury is higher than room temperature.
 - D The melting point of iron is lower than the melting point of mercury.
17. Which of the following statements correctly explains why solids cannot be compressed?
- A The forces of attraction between the particles in solids are very strong.
 - B The particles in solids are not vibrating enough.
 - C The particles in solids are very closely packed together.
 - D The particles in solids are in fixed positions.
18. Which of the following correctly describes 'condensation'?
- A As gas molecules lose energy to the surroundings, they move further apart, and the substance changes into the liquid state.
 - B As gas molecules lose energy to the cool surface they come in contact with, they move closer together, and the substance changes into the liquid state.
 - C As gas molecules gain energy from the warm surface they come in contact with, they move faster until they collide, causing the substance to change into the liquid state.
 - D As gas molecules gain energy from the surroundings, they move closer together and the substance changes into the liquid state.

19. The diagram shows the arrangement of particles in a substance at two different temperatures, -100°C and -35°C .



Which substance could the diagrams represent?

Substance	Melting point $^{\circ}\text{C}$	Boiling point $^{\circ}\text{C}$
A	-92	-39
B	-102	-45
C	-94	-20
D	-169	-104

20. Ammonium sulfate is a compound used in fertilisers and has the chemical formula $(\text{NH}_4)_2\text{SO}_4$.
How many elements and atoms does it have?

	Elements	Atoms
A	4	15
B	4	14
C	3	10
D	3	7

21. Which one of the following lists shows a mixture of two elements and two compounds?

- A Ar, O_2 , N_2 and He
- B H_2 , O_2 , N_2 and CO_2
- C H_2O , CO_2 , NH_3 and O_2
- D O_2 , N_2 , CO_2 and H_2O

22. Which of the following pairs of atoms have the same number of neutrons?

- A $^{15}_7\text{X}$ and $^{14}_7\text{Y}$
 B $^{23}_{11}\text{X}$ and $^{23}_{12}\text{Y}$
 C $^{14}_6\text{X}$ and $^{16}_8\text{Y}$
 D $^{235}_{92}\text{X}$ and $^{238}_{92}\text{Y}$

23. Which one of the following ions has the most shells that contain electrons?

- A Al^{3+}
 B N^{3-}
 C Li^{+}
 D S^{2-}

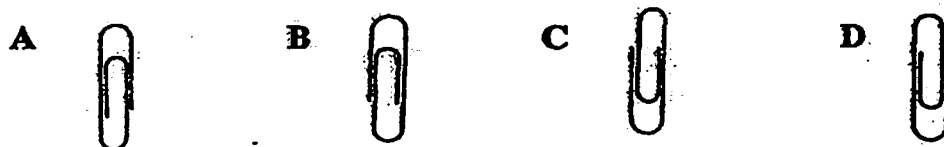
24. What is the atomic structure of the ion of Z in which Z^{2+} has a proton number of 38 and a nucleon number of 88?

- A 36 electrons, 38 protons and 88 neutrons
 B 36 electrons, 38 protons and 50 neutrons
 C 38 electrons, 40 protons and 50 neutrons
 D 38 electrons, 40 protons and 88 neutrons

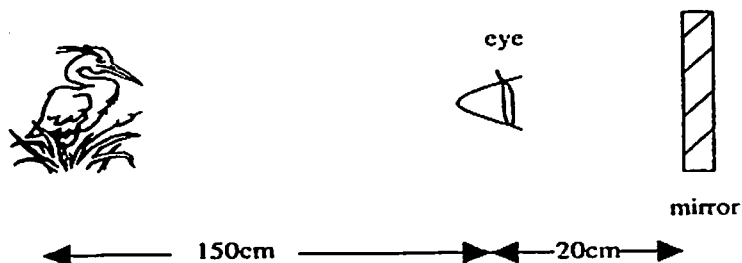
25. A paper clip is placed in front of a plane mirror as shown in the diagram.



Which of the diagrams show the correct image of the paper clip as seen in the plane mirror?

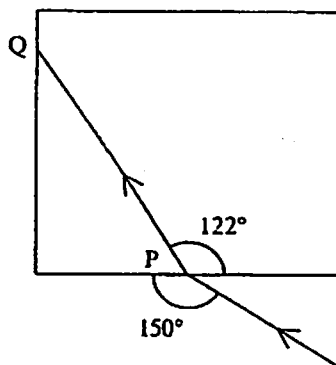


26. Julie is holding a plane mirror 20 cm in front of herself. She sees a bird that is 150 cm behind her.



What is the distance from her eyes to the image of the bird?

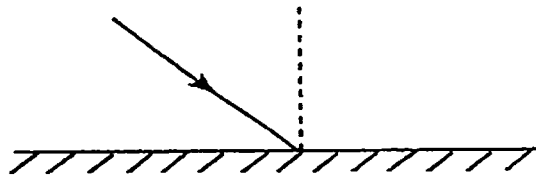
- A 150 cm
 - B 170 cm
 - C 190 cm
 - D 340 cm
27. A ray of light passes from air into a rectangular glass block as shown in the diagram below.



What is the angle of incidence and angle of refraction at point P?

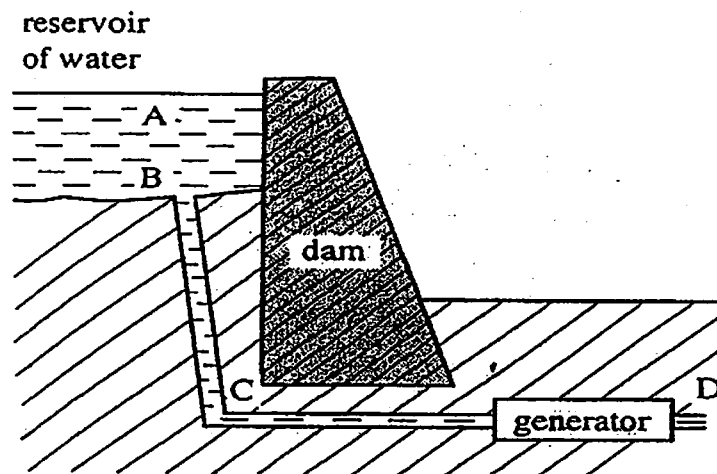
	Angle of incidence	Angle of refraction
A	150°	122°
B	60°	32°
C	60°	58°
D	30°	58°

28. The diagram shows a ray of light striking a plane mirror.



What must the angle of incidence be if the total angle between the incident and reflected ray is 80° ?

- A 40°
 - B 50°
 - C 80°
 - D 100°
29. The diagram shows part of a hydroelectric power station. At which point does water have the greatest gravitational potential energy?



30. Tim pushes a toy cart along a level road and lets it go. As the cart moves along the road, it starts slowing down. The biggest energy change is from.....
- A chemical energy to thermal energy
 - B chemical energy to kinetic energy
 - C kinetic energy to thermal energy
 - D thermal energy to kinetic energy

The Periodic Table of the Elements

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

*58-71 Lanthanoid series

†90-103 Actinoid series

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

Key	<div> <div>a</div> <div>X</div> <div>b</div> </div>	a = relative atomic mass X = atomic symbol b = proton (atomic) number
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The volume of one mole of any gas is 24 dm³ at room temperature and

Name: Reg. No. Class:



Founded 1842

St.Margaret's Secondary School

Mid-Year Examination 2012

LOWER SECONDARY SCIENCE

Secondary Two Express Paper 2 (70 marks)

9 May 2012

Duration: 2 Hours (For both Papers 1 and 2)

Total Marks: 100 (For both Papers 1 and 2)

Additional Materials: NIL

Instructions to candidates

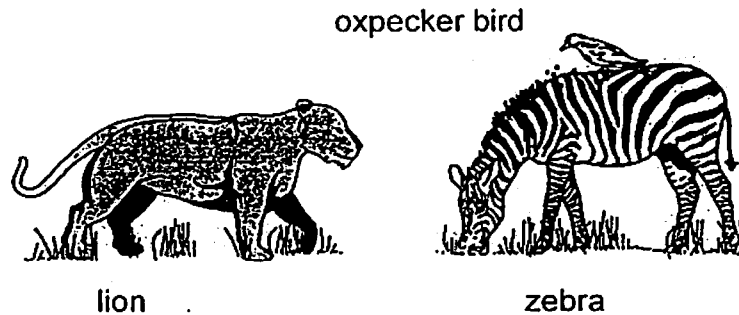
1. Write your name, register number and class at the top of the cover page.
2. Paper 2 consists of Section A and Section B.
Answer all questions in Section A in the spaces provided.
Answer any four questions in Section B in the spaces provided.
3. Marks to each question or part of a question are indicated in brackets [] at the end of the questions.
4. Calculators are allowed. For quantitative answers, all essential working must be clearly shown and appropriate units indicated.
Omission of working or incorrect use of units will result in the loss of marks
5. A copy of the Periodic Table has been printed on Page 14 of Paper 1.

Paper	Marks (Physics/ Chemistry)	Marks (Biology)
1 (30 mks)		
2-A (30 mks)		
2-B (40 mks)		
Total (100 mks)		

Section A (30 marks)

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

1. In an African safari, lions prey on zebras and zebras feed on grass. The zebras are often infested with ticks, which suck the zebra's blood. Ticks are also a source of food for the oxpecker bird..



Using the information provided

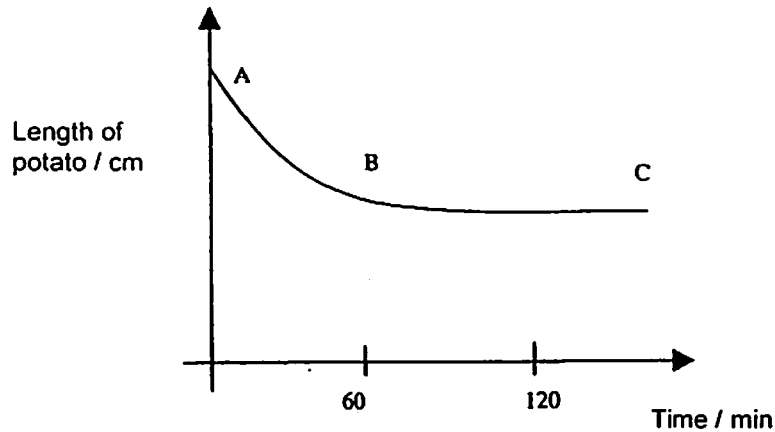
- a state the type of relationship between the

- (i) lion and the zebra:
- (ii) oxpecker and the zebra:
- (iii) ticks and the zebra: [3]

- b draw a food web involving all the organisms mentioned [2]

- c draw a pyramid of numbers showing four food links. [1]

2. A thin strip was cut from a peeled raw potato and soaked in concentrated sucrose solution for 2 hours. The length of the potato strip was measured over a period of time. The graph below shows the result.



- a Explain, in terms of potato cells, the shape of the graph from

- (i) A to B:

.....

.....

.....

[2]

- (ii) B to C:

.....

.....

.....

[2]

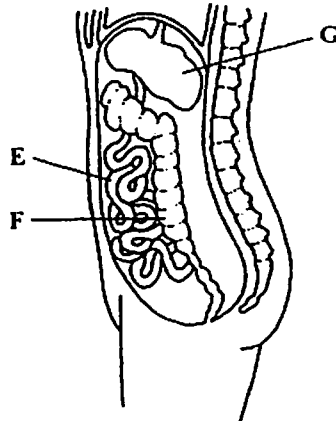
- b Why should the potato skin be removed before carrying out the experiment?

.....

.....

[1]

3. The figure shows the side view of the alimentary canal within a person's abdomen.



- a Some people experience a burning sensation known as 'heartburn' after eating certain types of food. Heartburn is caused by excess acid.

- (i) Which of the structures (E, F or G) in the human alimentary canal produces this acid?

[½]

Structure:

- (ii) Name the acid produced in this structure:

[½]

- (iii) What is the role of this acid in chemical digestion?

.....

[1]

- (iv) People who suffer from heartburn can relieve their pain by taking medicines known as antacids. Doctors usually recommend that patients chew the antacids before swallowing them. Suggest one reason why this is recommended.

.....

[1]

- b In which structure of the alimentary canal (E, F or G) is digestion completed?

Structure:

[½]

- c In the case of a person suffering from diarrhoea, which structure of the alimentary canal (E, F or G) is not functioning properly?

Structure:

[½]

4. Study the table of melting points and boiling points of the substances shown below and answer the questions that follow:

Substances	Chlorine	Sulfur dioxide	Ammonia	Butane
Melting point /°C	-101	-73	-77	-135
Boiling poing /°C	-35	-10	-33	-0.5

- a Which of these substances is a solid at -75°C ?
 [1]
- b Above what temperature do only two of the substances exist as solid?
 [1]
- c What would you expect to happen if a beaker containing liquid butane was placed in a bigger beaker of melting ice?

 [1]

5. The table below shows some information about atoms X and Y.

- a Complete the table by filling in the missing information.

Atoms	Ionic structure		
	Number of protons	Number of electrons	Symbol of ion
X	9	10	
Y		10	Y^{3+}

[2]

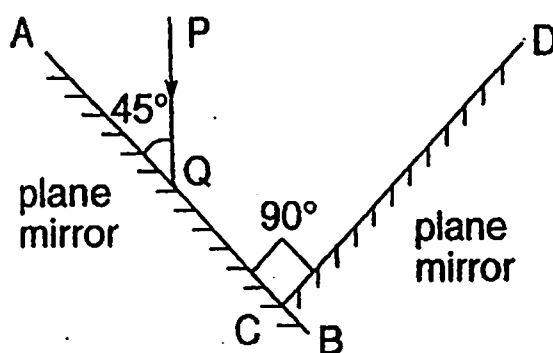
- b State the Group and Period on the Periodic Table that atoms X and Y belong to.

.....
 [2]

- c Aluminium chloride is a compound used in antiperspirants. If aluminium chloride is formed when aluminium and chlorine atoms combine in the ratio 1:3, write out the formula for aluminium chloride.

Formula for aluminium chloride: [1]

6. Two plane mirrors AB and CD are placed at 90° to one another as shown in the diagram below.

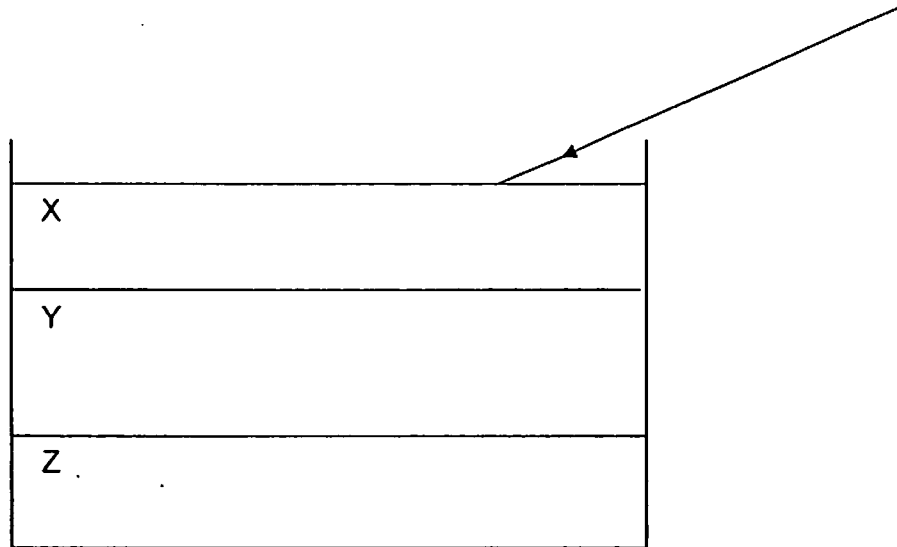


- a Complete the diagram by showing the path of ray PQ after reflection at mirrors AB and CD. [1]
- b What is the angle of reflection at mirror CD? [1]

..... [1]

7

7. The figure below shows a beaker containing three substances, X, Y and Z. A ray of light in air is incident on substance X.



The table below shows the densities of air, steel, oil and water.

	Air	Steel	Oil	Water
Density / kg/m^3	1.02	8 000	800	1 000

- a Referring to the information provided in the table, what are substances X, Y and Z?

Substance	Name of substance
X	
Y	
Z	

[2]

- b Complete the path of the light ray incident on X as it passes through the different substances until it emerges into the air again.

[3]

Section B (40 marks)

There are *five* questions in this Section.

You are to answer *any four* questions in the spaces provided.

- 8a. Explain why an image can be formed in a plane mirror but an image is not formed by light reflected from a piece of paper.

.....

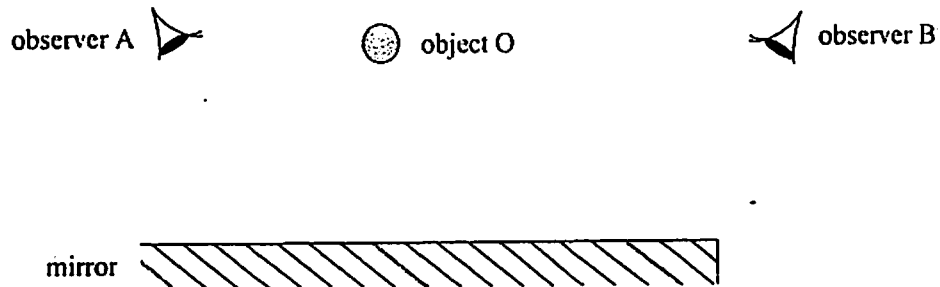
.....

.....

.....

[2]

- b The diagram below shows an object at O placed in front of a plane mirror. Two observers A and B are positioned as shown.

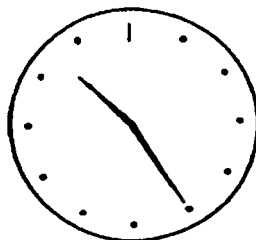


- (i) Mark on the diagram above, the position of the image of O and label it 'I'. [1]
- (ii) Draw one light ray from the object, reflecting from the mirror into the eye of Observer A. Hence show how Observer A is able to see the image at 'I'. [2]
- (iii) Show on the same diagram whether Observer B can see the image of the object. Can Observer B see the image of the object? [3]

.....

.....

- c If the Object O is a wall clock, and its image as seen in a plane mirror shows the time in the figure below,



state the actual time shown by the wall clock if the observation is made during the day?

[1]

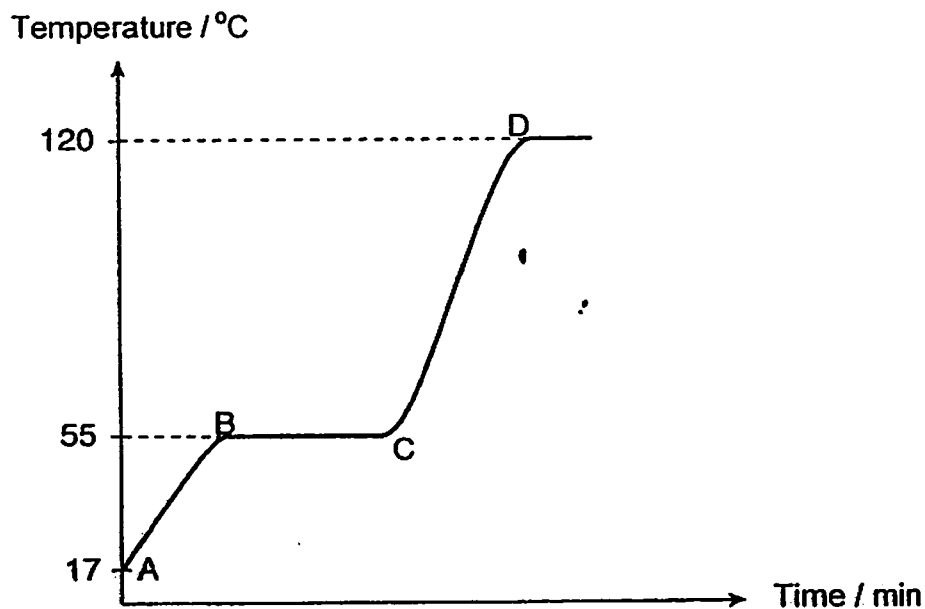
.....

- d Which characteristic of images formed by a plane mirror is evident in (8c) ?

[1]

.....

9. The graph below shows the temperature change during the heating of substance L, a solid.



a Write down the state substance L is in at the following stages on the graph:

(i) AB:.....

(ii) BC:.....

(iii) CD:.....

(iv) Beyond D: [2]

b What is the melting point and boiling point of substance L?

.....
..... [2]

c Describe how the behaviour of the particles in substance L will change in terms of their average kinetic energy, arrangement and forces of attraction if substance L is heated from C to D.

.....
.....
.....
.....
.....
..... [3]

d If substance L produces a scent while it is boiling, explain why the scent is stronger when one is nearer the boiling substance than when one is far away.

.....
.....
.....
.....
..... [3]

10a. The atoms of beryllium and magnesium are represented respectively by the symbols ${}^9_4\text{Be}$ and ${}^{24}_{12}\text{Mg}$.

(i) Write down the electronic configuration of an atom of magnesium.

..... [1]

(ii) In which group of the Periodic Table is magnesium placed?

..... [1]

(iii) How do the electronic structures of beryllium and magnesium indicate their group and period in the Periodic Table?

..... [2]

(iv) Draw the structure of the magnesium ion.

[1]

b. Indicate whether each of the following statements is True (T) or False (F) by writing the letters T or F. If the statement is False (F), re-write the statement, correcting the part(s) that are incorrect in the space provided.

(i)	In an atom, neutrons are negatively charged.	F
(ii)	Molecules are always made up of different atoms.	T
(iii)	Molecules of water expand when heated.	T
(iv)	An atom of iron (Fe) is bigger in size than an atom of sodium (Na).	T

Corrected statements:

.....

.....

.....

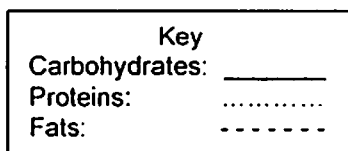
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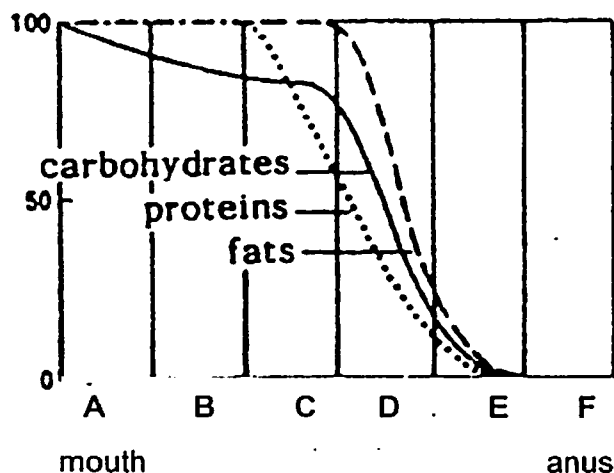
.....

[3]

11. The graph below shows the extent to which carbohydrates, proteins and fats are digested as food passes through the alimentary canal of man. The letters A to F represent successive parts of the alimentary canal. Use the graph to answer the questions below.



% of undigested molecules present



- a Define the term 'digestion'.

.....

 [1]

- b(i) Name two parts of the alimentary canal where physical digestion takes place.

.....
 [1]

- (ii) Explain how physical digestion in b(i) helps in chemical digestion.

.....

 [2]

- (iii) Explain why the percentage of undigested protein molecules suddenly decreases in Region C.

.....

.....

.....

.....

[2]

- (iv) Name Region D.
Explain what happens to the carbohydrates, proteins and fats present in the food we eat when they are passing through Region D.

.....

.....

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.....

.....

.....

.....

.....

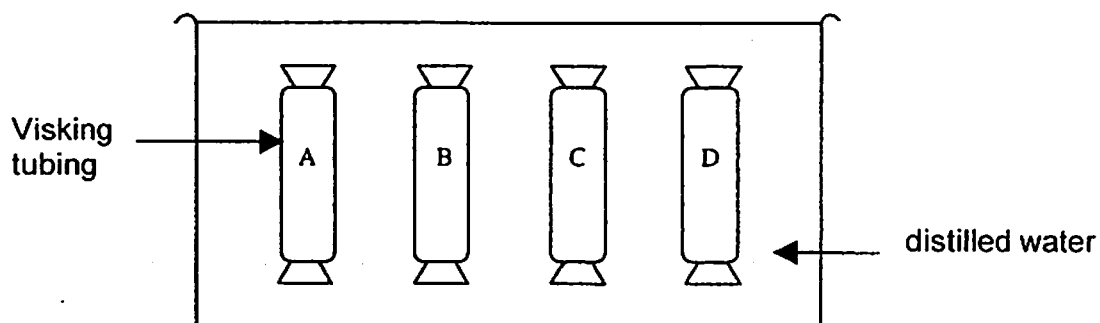
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.....

.....

[4]

12. The following experiment was set up to investigate osmosis. Four equally-sized Visking tubings were filled with equal amounts of different liquids, A, B, C and D. The tubings were weighed first before being submerged into a beaker of distilled water for 1 hour. The tubings were then weighed again.



- a The table below shows the masses of the Visking tubings before and after the experiment. Calculate the change in mass of each of the Visking tubings and record it in the table below.

Visking tubing with liquid	Mass of Visking tubing at the start /g	Mass of Visking tubing at the end /g	Change in mass of Visking tubing /g
A	20.0	21.2	
B	20.0	20.0	
C	20.0	24.9	
D	20.0	23.1	

[2]

- b Using the information in (a), match the Visking tubings A, B, C or D with the contents given in the table below.

Visking tubing contents at the start of the experiment	Visking tubing
Distilled water	
5% sucrose solution	
25% sucrose solution	
60% sucrose solution	

[2]

c Explain how you arrived at your answers for the Visking tubing containing

(i) distilled water

.....

.....

.....

.....

.....

.....

[2]

(ii) 60% sucrose solution

.....

.....

.....

.....

.....

.....

[2]

d Which apparatus used in the experiment represents the cell membrane? Give a reason for your answer.

.....

.....

[1]

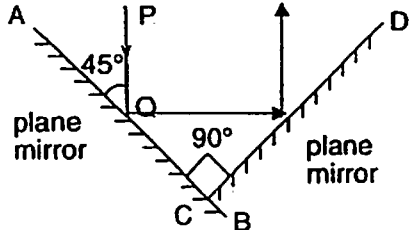
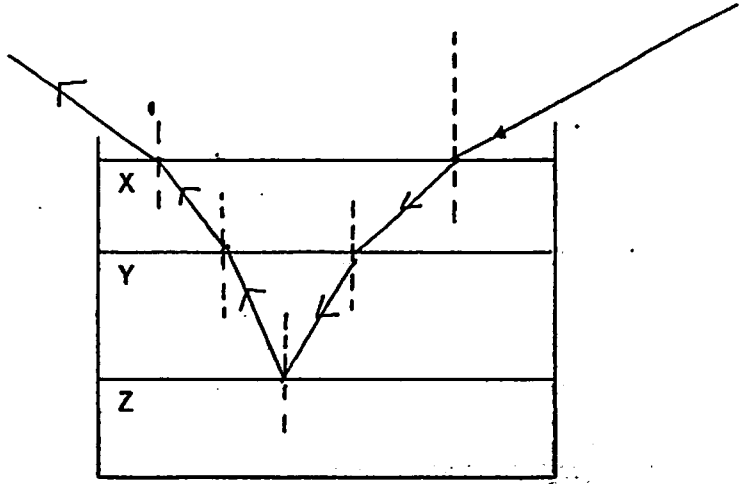
e Explain why plants die if too much fertilizer is added to the soil.

.....

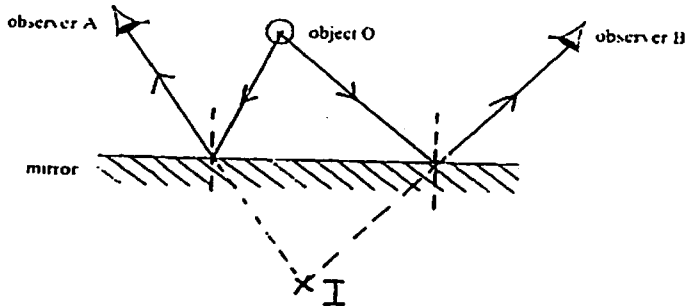
.....

[1]

			by osmosis															
2a (ii)	At BC, the length of the potato strip remained the same. The water potential in the cell and the sucrose solution has become equal. (1) There is no net movement of water (molecules) (1), causing the length of potato strip to remain unchanged.	2																
2b	The potato skin is a non-permeable to water (1/2) and will prevent osmosis (1/2) from taking place.	1																
3a (i)	Structure: G	½																
(ii)	Hydrochloric acid	½	No mks for wrong spelling															
(iii)	It provides an acidic medium for protease to work.	1																
(iv)	Chewing the antacid will increase the surface area of the antacid (1/2), which will help to speed up the neutralization of the excess acid(1/2) in the stomach.	1																
3b	Structure: E	½																
3c	Structure: F	½																
4a	Sulfur dioxide	1																
4b	Above -101°C	1	No unit for temp -minus ½															
4c	The butane will boil off.	1																
5a	<table border="1"> <thead> <tr> <th rowspan="2">Atoms</th><th colspan="3">Ionic structure</th></tr> <tr> <th>No. of protons</th><th>No. of electrons</th><th>Charge</th></tr> </thead> <tbody> <tr> <td>X</td><td>9</td><td>10</td><td>X⁻</td></tr> <tr> <td>Y</td><td>13</td><td>10</td><td>Y³⁺</td></tr> </tbody> </table>	Atoms	Ionic structure			No. of protons	No. of electrons	Charge	X	9	10	X ⁻	Y	13	10	Y ³⁺	1 1	
Atoms	Ionic structure																	
	No. of protons	No. of electrons	Charge															
X	9	10	X ⁻															
Y	13	10	Y ³⁺															
5b	Atom X belongs to Group VII and Period 2. Atom Y belongs to Group III and Period 3	1 1	Do not accept Group 7, Period II Do not accept Group 3, Period III															

5c	Formula for aluminium chloride: $AlCl_3$	1									
6 (a)		$\frac{1}{2}$ $\frac{1}{2}$	Correctly shows reflection at AB Correctly shows reflection at CD No directional arrows on rays : minus $\frac{1}{2}$ No normal: minus $\frac{1}{2}$								
(b)	Angle of reflection at CD: 45°	1									
7a	<table border="1"><thead><tr><th>Substance</th><th>Name of substance</th></tr></thead><tbody><tr><td>X</td><td>oil</td></tr><tr><td>Y</td><td>water</td></tr><tr><td>Z</td><td>lead</td></tr></tbody></table>	Substance	Name of substance	X	oil	Y	water	Z	lead	$1\frac{1}{2}$	($\frac{1}{2}$ mk for each correct answer)
Substance	Name of substance										
X	oil										
Y	water										
Z	lead										
7b		[3]	Shows ray bending towards normal at XY boundary ($\frac{1}{2}$) and YZ boundary ($\frac{1}{2}$) Shows ray reflected at Z & angle $i =$ angle r ($\frac{1}{2}$) Shows ray bending away from normal at ZY boundary ($\frac{1}{2}$) YX boundary ($\frac{1}{2}$) and boundary between X and air ($\frac{1}{2}$) No normal and No direction arrows on rays minus 1 for whole qn								

Section B (40 marks)

8a	Light striking a plane mirror results in regular reflection which enables an image to be formed. However, a piece of paper is not as smooth as it appears. When light strikes a piece of paper, it results in irregular reflection. Therefore no image is formed.	1 1	
8b (i) & (ii)		1 1 1	Correctly shows position of image (I) Correctly shows light ray from image to eye of observer A (reflected ray) and object to mirror (incident ray)
8b(iii)		2	Correctly shows light ray from image to eye of observer B (reflected ray) and object to mirror (incident ray)
	From the diagram, Observer B can see the image of the Object O	1	
8c	The actual time is 1.35 pm	1	
8d	The image is laterally inverted.	1	
9a (i)	AB: solid	½	
(ii)	BC: solid and liquid	½	
(iii)	CD: liquid	½	
(iv)	Beyond D: gas	½	
9b	Melting point: 55°C Boiling point: 120°C	1 1	
9c	As substance L is heated from C to D, the particles in L will gain energy and move faster. Their average kinetic energy will increase.(1) The forces of attraction between the particles will weaken (1) and their arrangement will gradually change from one that is orderly to one that is less orderly.(1)	3	

9d	When substance L is boiling, the particles are moving very rapidly. Many of the particles gain enough energy to overcome the attractive forces (1/2) between them and escape into the surrounding air (1/2) where they are able to move freely and randomly. The high concentration of the particles around the boiling substance (1) makes the scent stronger. As the particles diffuse (1/2) into the surrounding air, their concentration decreases.(1/2) Therefore, the scent will not be as strong to one who is far away.	3	
10a(i)	Electronic configuration of magnesium: 2,8,2	1	
(ii)	Group II	1	
(iii)	Magnesium has the electronic configuration of 2,8,2. Beryllium has the electronic configuration 2,2. (1/2) Both beryllium and magnesium have two electrons in their outermost shell and are therefore placed in Group II. (1/2) Magnesium has 3 electron shells and is placed in Period 3 (1/2) while beryllium has 2 electron shells is therefore placed in Period 2 (1/2)	2	
10a (iv)		1	Shows correct no of electrons (1/2) Shows correct no of electron shells with correct charge written outside bracket []
10b(i)	In an atom, neutrons are negatively charged: F	½	
(ii)	Molecules are always made up of different atoms: F	½	
(iii)	Molecules of water expand when heated: F	½	
(iv)	An atom of iron (Fe) is bigger than an atom of sodium (Na) : T	½	

	Corrected statements:		
	(i): In an atom, neutrons have no charge.	1	
	(ii): Molecules may be made up of the same atoms or different atoms.	1	
	(iii): Molecules of water do not expand when heated. It is the spaces between the molecules that increase when water is heated.	1	
11a	Digestion is the breaking down of large and complex food molecules into smaller, simpler molecules.	1	
11b(i)	Physical digestion takes place in the mouth, stomach or small intestine.	1	Accept any 2 (1/2 mk each) A: mouth C: stomach D: small intestine
11b(ii)	In the mouth, the teeth grind and the food into smaller pieces which increases the surface area for salivary amylase to act. This speeds up digestion of starch. In the stomach, the food is churned and broken up into smaller pieces which increases the surface area for proteases to act. This speeds up digestion of proteins. In the small intestine, bile emulsifies fats, breaking up fats into smaller oil droplets. This increases the surface area for lipase to act and speeds up digestion of fats.	1 1 1	Explains how mechanical digestion in the two parts mentioned in b(i) help in chemical digestion. (Max: 2 mks)
11b(iii)	Region C is the stomach.(1) The glands in the stomach produce protease (1/2), an enzyme which digests proteins (1/2).	2	
11b(iv)	Region D is the small intestine. The small intestine consists of enzymes such as pancreatic amylase, maltase, proteases and lipase. Carbohydrates, such as starch, will be digested by pancreatic amylase to form maltose.(1/2) The maltose will then be digested by maltase to form glucose.(1/2) Proteins will be digested by proteases (1/2) to form amino acids.(1/2) Fats will be digested by lipase (1/2) to form fatty acids and glycerol.(1/2)	1 1 1 1	

12a	A: +1.2 B: 0.0 C: +4.9 D: +3.1	2	½ mk for each correct answer No '+' : minus 1 for whole question.
12b	Distilled water: B 5% sucrose solution: A 25% sucrose solution: D 60% sucrose solution: C	2	½ mk for each correct answer
12c	Visking tubing B did not show any increase in mass, (1/2) which shows there was no net movement of water molecules.(1/2) Therefore, the contents in Visking tubing B and the surrounding liquid have equal water potential.(1/2) This means that Visking tubing B contains distilled water.(1/2)	2	
	Visking tubing C showed the greatest increase in mass.(1/2) This shows that the number of water molecules entering the Visking tubing was the greatest (1/2) among the four. Therefore the difference in water potential between C and the surrounding liquid must be the greatest.(1/2) This shows that Visking tubing C has the lowest water potential, which is 60% sucrose solution.(1/2)	2	
12d	The Visking tubing. The Visking tubing is partially permeable, and so is the cell membrane.	½ ½	
12e	Adding too much fertilizer to the soil will lower the water potential around the root hairs (1/2) of the plant. This will cause water to leave the cells of the root hairs by osmosis (1/2) and cause the plant to be dehydrated and eventually die.	1	

End of paper

The Periodic Table of the Elements

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

*58-71 Lanthanoid series

†90-103 Actinoid series

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

Key	<div> <div>a</div> <div>X</div> <div>b</div> </div>	a = relative atomic mass X = atomic symbol b = proton (atomic) number
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The volume of one mole of any gas is 24 dm³ at room temperature and



Marks
100

MID-YEAR EXAMINATION 2012

Name of Pupil : _____ ()
 Class : _____
 Subject : Science
 Level : Sec 2 Express
 Date : 9th May 2012
 Duration : 2 hour
 Setter : Miss Ariel Chan & Mr Jameson Kang

INSTRUCTIONS TO CANDIDATES

This paper consists of three sections.

Section A

Answer all the questions.

For each question, there are 4 possible answers. Choose the one you consider correct and record your choice in soft pencil on the separate Optical Answer Sheet.

Section B and Section C

Answer all the questions.

Write your answers in the spaces provided on the question paper.

If the numerical answer is not exact, express your answer to three significant figures.

This booklet and the Optical Answer Sheet are to be handed in separately.

INFORMATION FOR CANDIDATES

The intended marks for questions or parts of questions are shown in the brackets [].

A copy of the periodic table is printed on page 2.

Section A – Multiple Choice Questions [30 marks]

For each question, there are 4 possible answers. Choose the one you consider correct and record your choice in soft pencil on the separate Optical Answer Sheet.

- Which acid is found in our stomach which can help in digesting food?
 A nitric acid
 B sulfuric acid
 C ethanoic acid
 D hydrochloric acid
- Which of the following is true about ammonium hydroxide or aqueous ammonium?
 A It tastes sour.
 B It feels soapy.
 C Blue litmus paper will turn red.
 D It reacts with carbonates to produce carbon dioxide gas.
- The table shows the pH value of the soil suitable for growing crops. Which crop grows best in an alkaline soil?

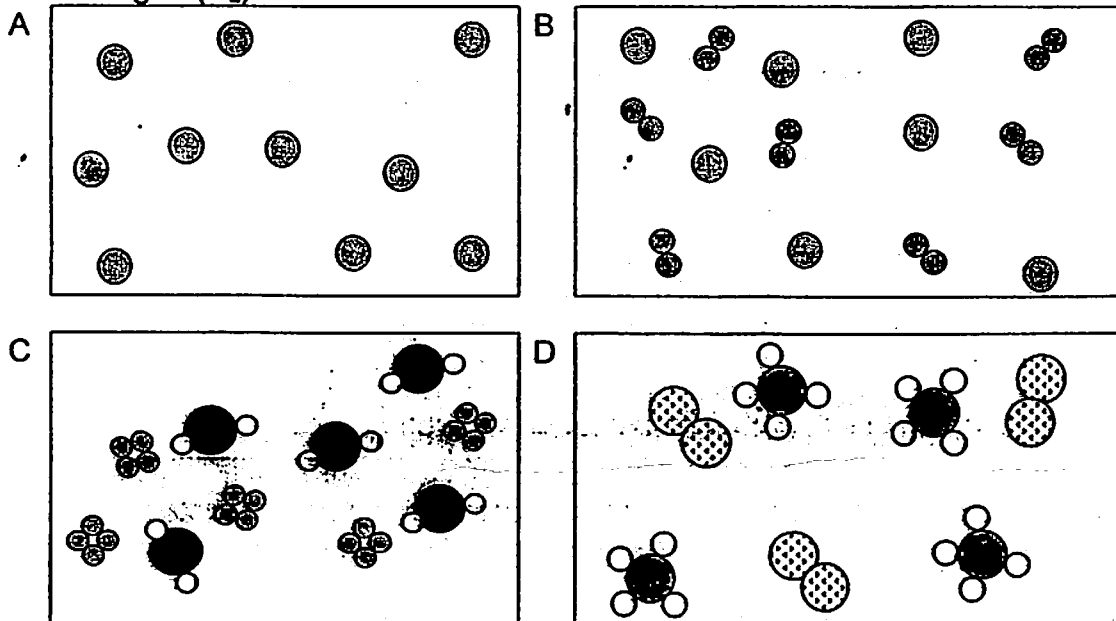
	crop	pH.
A	carrot	5.5 – 7.0
B	oats	4.5 – 6.5
C	potato	5.0 – 6.5
D	sugar beet	7.0 – 8.0

- Which of the following substances reacts with hydrochloric acid without producing any gas?
 A iron
 B magnesium
 C sodium hydroxide
 D sodium carbonate
- A solution with a pH of 1 is considered to be a _____.
 A weak acid
 B weak alkali
 C strong acid
 D strong alkali
- Accidental swallowing of alkali will NOT be treated by swallowing of an acid. This is because _____.
 A the salt formed by neutralisation is toxic
 B the inorganic acid may cause 'heartburn'
 C the acid produced by the stomach will neutralise the alkali
 D the acid is also corrosive and will cause further damage to the body

7. A vertical column in the Periodic Table is called a _____.
 A family
 B group
 C period
 D category
8. Which of the following atoms does NOT contain any neutrons?
 A ${}^1_1\text{H}$
 B ${}^4_2\text{He}$
 C ${}^{12}_6\text{C}$
 D ${}^{40}_{18}\text{Ar}$
9. Which of the following contains the least number of elements?
 A NaBr
 B MgCO_3
 C KMnO_6
 D CH_3COOH
10. How many protons, neutrons and electrons are in one atom of phosphorus?

	protons	neutrons	electrons
A	31	16	15
B	15	16	15
C	16	15	16
D	15	31	16

11. Which of the following diagrams shows a mixture of methane (CH_4) molecules and nitrogen (N_2) molecules?



12. Which of the following below shows a positive ion?

	protons	electrons	neutrons
A	11	10	11
B	10	10	11
C	10	11	11
D	11	11	10

13. Which of the following is an example of a suspension?

- A air
- B brass
- C Coca-Cola
- D calamine lotion

14. In an experiment, Tiger wanted to determine the solubility of different substances in the same volume of water. He obtained the following results.

Substances	Amount that dissolved in water
P	30 g
Q	45 g
R	8 g
S	14 g

Arrange the five substances in order of increasing solubility in water.

- A P, R, S, Q
- B Q, S, P, R
- C R, S, P, Q
- D S, R, P, Q

15. Which of the following statements about a beaker of saturated solution is correct?

- A A saturated solution will not allow light to pass through it.
- B A saturated solution will leave residue on the filter paper when filtered.
- C There will be no evenly distribution of colour and physical properties in a saturated solution.
- D There will be solute particles settling to the bottom of the beaker if additional solute is added after the point of saturation.

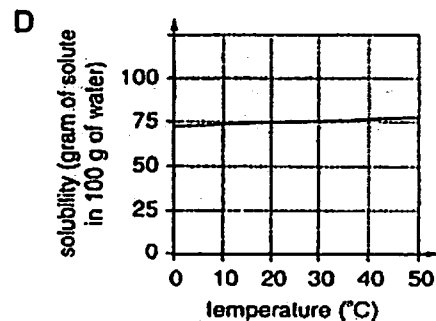
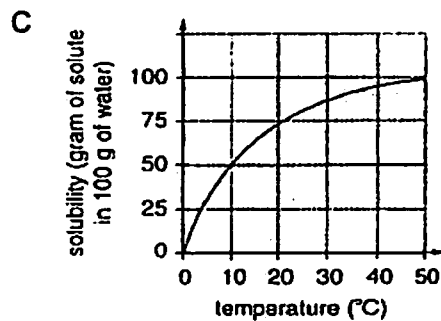
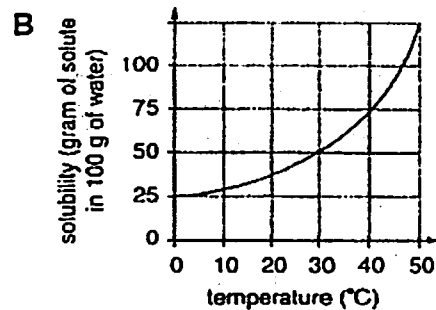
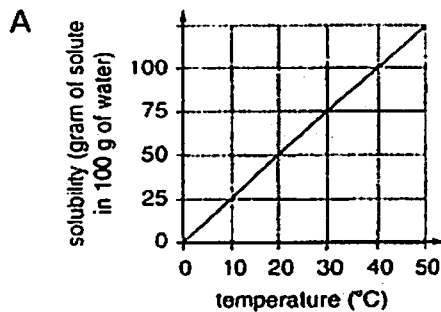
16. Carbon dioxide is dissolved in water to make fizzy drinks. Which of the following correctly describes carbon dioxide?

- A It is a solute.
- B It is a solvent.
- C It is a solution.
- D It is a suspension.

17. Which factor does NOT affect the solubility of a substance?

- A stirring
- B temperature
- C nature of solute
- D nature of solvent

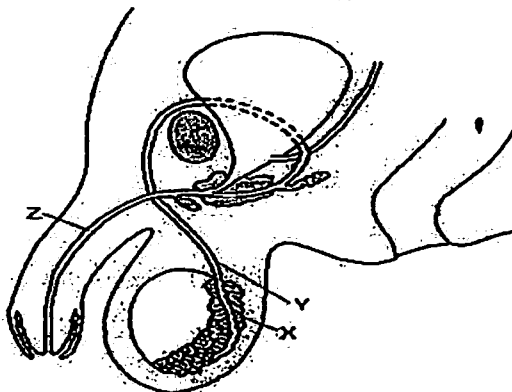
18. In which of the following solubility curves is the solubility least affected by temperature of the solvent?



19. Which of following correctly describes the passage of sperm when they are released from the penis?

- A vagina → cervix → uterus → fallopian tube
 B vagina → uterus → cervix → fallopian tube
 C cervix → vagina → uterus → fallopian tube
 D cervix → uterus → cervix → fallopian tube

20. What is the function of X?



- A stores sperms
 B holds testes outside body
 C produces sex hormones and sperms
 D transports sperms and urine at different times

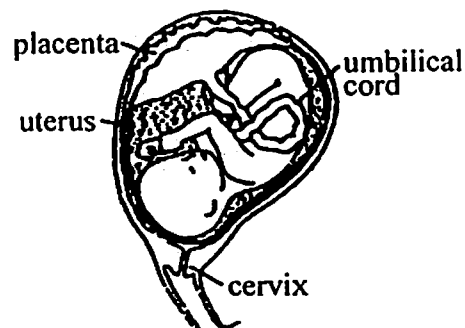
21. If a fertilized ovum divides into two separate cells and both implant themselves in the uterus, the mother will give birth to _____.
- A triplets
 - B Siamese twins
 - C identical twins
 - D non-identical twins

22. Which of the following changes take place when a boy reaches puberty?

- I. The hips become rounder and wider.
- II. The voice sounds deeper.
- III. The reproductive organ grows larger in size.

- A I and II
- B I and III
- C II and III
- D I, II and III

23. The diagram below shows a foetus before birth.



Which of the following is **NOT** a function of the umbilical cord?

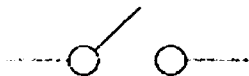
- A To supply oxygen to the foetus.
- B To protect the foetus from shock.
- C To remove waste products from the foetus.
- D To supply food and water from the mother to the foetus.

24. Which part of the female reproductive system is blocked by the intra uterine device?

- A cervix
- B uterus
- C vagina
- D fallopian tube

25. Which of the following symbols represents a measuring instrument?

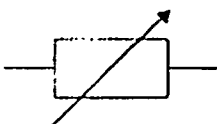
A



B



C



D



26. Which of the following shows the correct unit used for each variable?

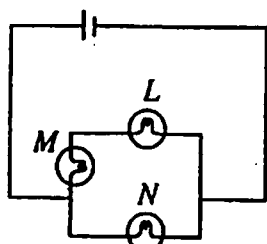
	current	voltage	resistance
A	A	V	Ω
B	V	A	Ω
C	A	Ω	V
D	Ω	V	A

27. Which of the following is a characteristic of current?

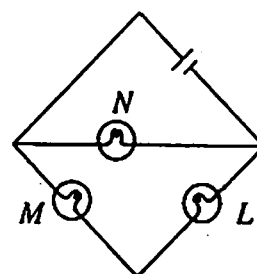
- A It increases with resistance.
- B It is the same across all parallel branches.
- C It flows from positive terminal to negative terminal of the battery.
- D It represents the work done in moving the electrons across the circuit.

28. Which of the following circuits will not light up, if light bulb L is not working?

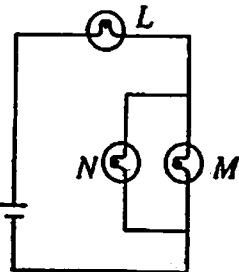
A



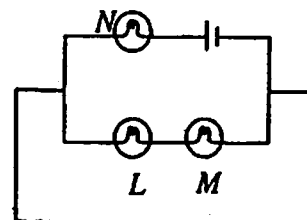
B



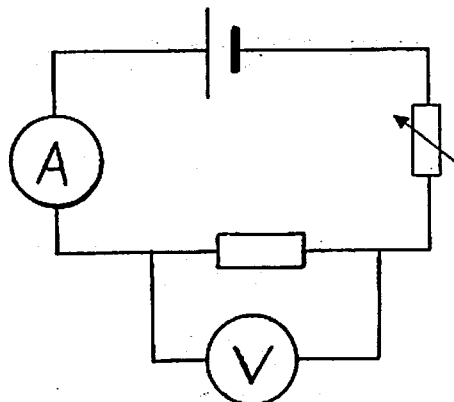
C



D

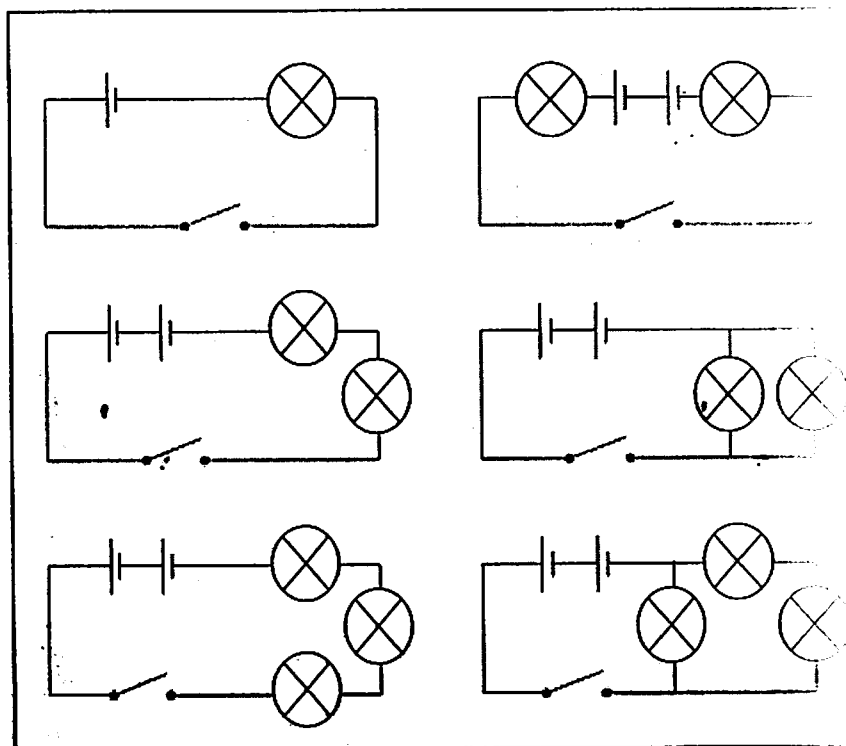


29. The following circuit shows the set-up of an experiment to investigate how the potential difference across the unknown resistor varies with different circuit currents.



What is the purpose of the variable resistor in the circuit?

- A to vary the current flowing in the circuit
 - B to increase the e.m.f of the circuit
 - C to measure current
 - D to fix the potential difference of the resistor
30. How many parallel circuits are shown in the following diagram?

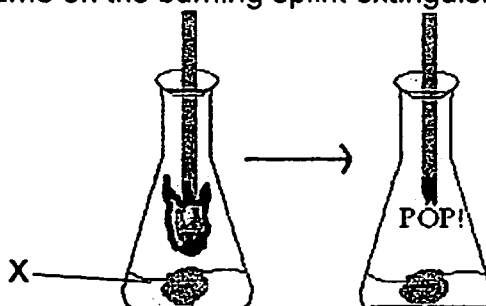


- A 1
- B 2
- C 3
- D 4

Section B – Structured Questions [40 marks]

Answer all the questions in the spaces provided.

1. (a) In an experiment, Sheryee mixed an unknown, X, into the dilute hydrochloric acid and a gas was formed. She used a burning splint to test the gas. The flame on the burning splint extinguished with a 'pop' sound.



- (i) What was the gas produced? [1]

- (ii) Suggest a possible identity for X. [1]

- (iii) Sheryee wanted to know the pH of the remaining solution in the flask. Suggest a test which she could use. Describe the expected observation. [2]

- (b) The following table shows the acidity or alkalinity of four brands of shower foam.

shower foam	pH	colour with universal indicator
A	3.5	??
B	5	yellow
C	7	??
D	8	blue

- (i) What is the colour of the universal indicator with shower foam A and C? [1]

A: _____

C: _____

- (ii) A chemical reaction occurs when A is mixed with D. Name this type of chemical reaction and state the products formed. [2]

chemical reaction: _____

products: _____

- (iii) When A is mixed with C, would you expect to see a change in the pH? Why? [2]

2. The diagram shows an outline of the Periodic Table with the letters representing the elements. Use the letters to answer the questions below. (The letters can be used once, more than once, or not at all).

A 10x10 grid representing a periodic table. The grid is divided into three main sections: a small section on the left (columns 1-2), a large central section (columns 3-10), and a small section on the right (columns 11-12). The labels are placed as follows:

- A**: Located in the top row, column 4.
- B**: Located in the top row, column 12.
- C**: Located in the second row, column 11.
- D**: Located in the third row, column 1.
- E**: Located in the third row, column 2.
- F**: Located in the fourth row, column 6.

- (a) State the letter(s) that is/are:

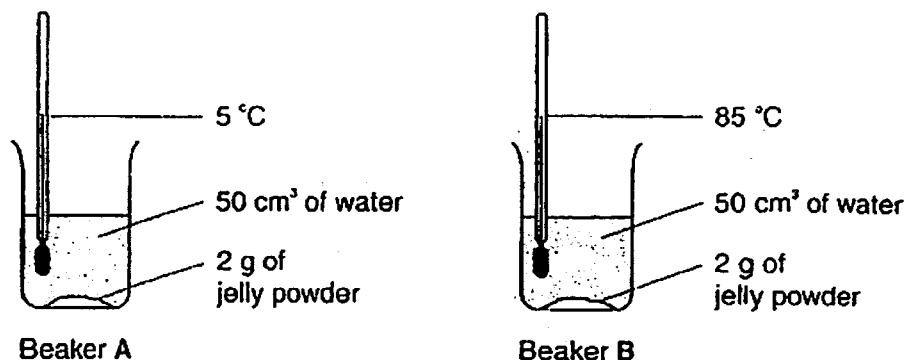
- (i) in Group 0: _____ [1]

- (ii) in the same period: _____ [1]

- (iii) able to form a negative ion: _____ [1]

- (b) Which element does A represent? _____ [1]

3. Tom conducted an experiment to investigate the solubility of jelly powder.



At the end of the experiment, Tom found out some powder in Beaker A but no trace of powder left in Beaker B.

- (a) Identify, and explain the following terms used in the experiment.

(i) solute: [2]

(ii) solvent: [2]

(b) Which factor is Tom investigating in this experiment? [1]

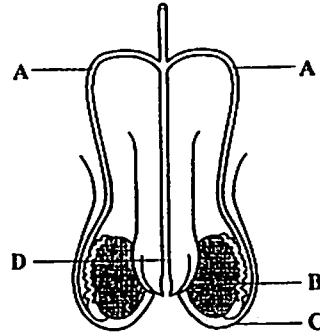
(c) State two ways Tom would confirm that the powder has completely dissolved in the solvent. [2]

(i) _____

(ii) _____

(d) What could Tom do to increase the rate of dissolving the powder? [1]

4. (a) The diagram shows the male reproductive system.



- (i) Name the parts labeled A, B, C and D. [4]

A: _____ B: _____

C: _____ D: _____

- (ii) What two fluids can pass through tube D? [1]

- (iii) Explain why cutting both tubes A would prevent a man from having children. [1]

- (iv) What is the name of the contraceptive method mentioned in part (iii)? [1]

- (b) The figure below shows a cross-section of a female reproductive system.



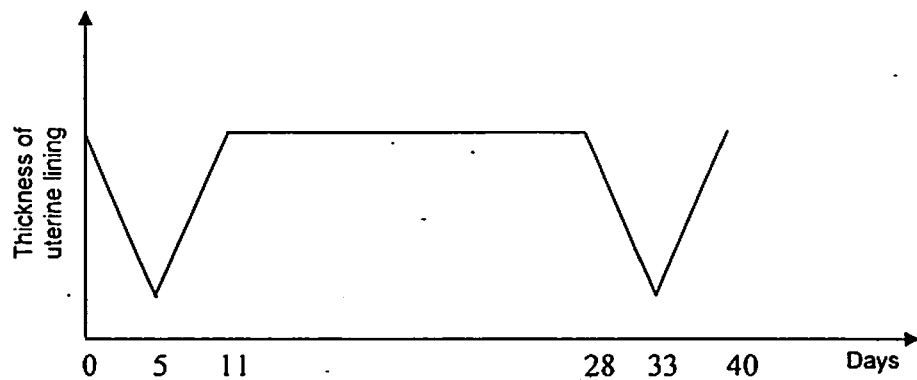
- (i) Name the structures labeled A to D. [4]

A: _____ B: _____

C: _____ D: _____

- (ii) Describe the function of B. [1]

- (c) The diagram below shows the thickness of the uterine lining of a woman over 40 days.



- (i) Suggest why there is a decrease in the thickness of the uterine lining from day 0 to 5. [1]

- (ii) Suggest why there is an increase in the thickness of the uterine lining from day 5 to 11. [1]

- (iii) From the graph above, suggest how long one menstrual cycle will last. [1]

5. Dave was given the following conditions. [4]
- (a) Light bulb A is in series to light bulb B.
 - (b) Light bulb C is in parallel to the other two bulbs.
 - (c) There is only one switch to control all the bulbs.
 - (d) There are two batteries to power the circuit.

Draw a labeled circuit diagram which fulfills all the above conditions.

Section C – Long Questions [30 marks]

Answer all the questions in the spaces provided.

1. (a) Patrick wanted to find out what egg shells consist of. He added dilute hydrochloric acid to some crushed egg shells. Carbon dioxide gas is produced from this reaction.
- (i) What can Patrick deduce about the egg shells? [1]
-
- _____
- (ii) Suggest how Patrick could test the presence of carbon dioxide. [2]
In your answer, describe his observations when carbon dioxide gas is present.
- _____
- _____
- (iii) Write the general word equation for the reaction above. [1]
- _____

- (iv) Name another substance which would have a similar reaction when added to dilute hydrochloric acid. [1]

- (b) Shao Ming tried to dissolve some iodine crystals in water, but found that they could not dissolve. He used alcohol instead and found that the iodine crystals dissolve readily in alcohol.

- (i) Based on the above observation, state a factor that affects the solubility of a substance. [1]

- (ii) Draw the hazard warning symbol which can be found on the bottle containing alcohol. [1]

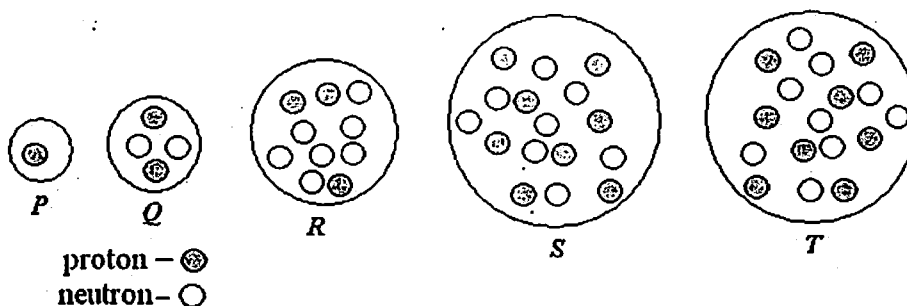
- (iii) He wanted to dissolve the iodine crystals in the alcohol as quickly as possible. Suggest three ways that he could do to increase the rate of dissolving the iodine crystals in alcohol safely. [3]

2. (a) ${}_{11}^{23}\text{X}$, ${}_{9}^{20}\text{Y}$ and ${}_{11}^{20}\text{Z}$ are three atoms. [2]

Fill up the number of electrons, protons and neutrons of the particles in the table below.

particle	number of		
	electrons	protons	neutrons
X^+		11	12
Y^-		9	
Z	11		9

- (b) The diagram shows the nuclei of five different atoms P, Q, R, S and T.



Choose from the letters P, Q, R, S and T to answer the following questions.

- (i) Which atom has a nucleon number of 4? [1]

- (ii) Which **two** atoms have 6 electrons in their outermost shell? [2]

- (iii) With the help of the Periodic Table, give the name of the elements represented by diagrams P and S. [1]

P: _____

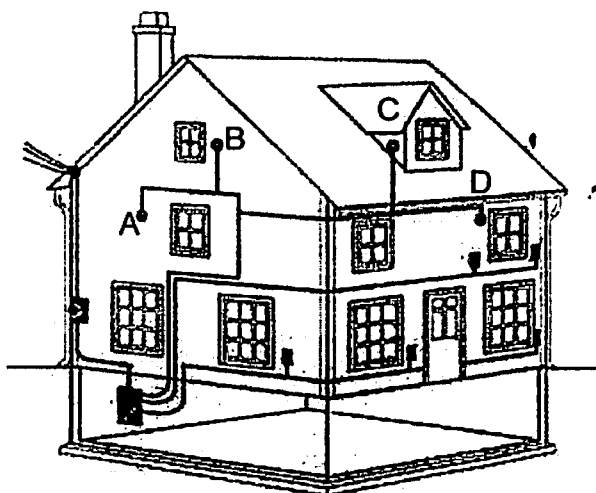
S: _____

- (c) (i) Explain why sulfur is found in Group VI and period 3 of the Periodic Table. [2]

- (ii) Write down the electronic configuration of sulfur. [1]

- (iii) Draw the electron arrangement of sulfur, showing all the electrons clearly. [1]

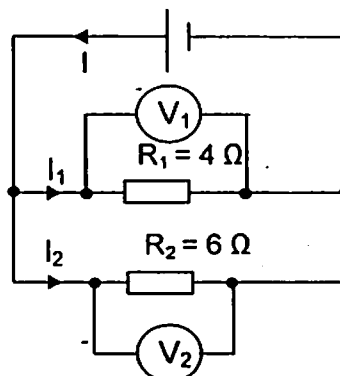
3. (a) The following diagram shows a typical wiring arrangement in a household.



- (i) How are the lighting points A, B, C and D arranged in the household? [1]

- (ii) Give two advantages of arranging the lights in the way mentioned in (i). [2]

- (b) Study the following circuit diagram.



- (i) If I_1 is 1.2 A, what is the potential difference across R_1 ? [2]
- (ii) State the electromotive force (e.m.f) of the circuit. [1]
-
- (iii) What is the value of circuit current I ? [2]

- (iv) If R_1 and R_2 are rearranged in series to each other, explain the change to the current I supplied by the battery.

[2]

~ End of Paper ~



Sec 2 Express Mid Year Exam 2012 Answers

Section A: MCQ

1. D	6. D	11. D	16. A	21. C	26. A
2. B	7. B	12. C	17. A	22. C	27. C
3. D	8. A	13. D	18. D	23. B	28. C
4. C	9. A	14. C	19. A	24. B	29. A
5. C	10. B	15. D	20. C	25. B	30. B

Section B: Short Ans

- 1ai) hydrogen gas [1]
 1aii) iron/magnesium or any acceptable metal [1]
 1aiii) Use pH paper/indicator or pH meter [1]
 pH paper/indicator will turn green or pH meter reading will be 7 [1]

- 1bi) A: orange [0.5]
 C: green [0.5]
 1bii) chemical reaction: neutralisation [1]
 Products: salt + water [1]
 1biii) No [1]
 C is neutral and will have no effect on A. [1]

- 2ai) B [1]
 2aii) E & C [1]
 2aiii) C [1]

- 2b) hydrogen [1]

- 3ai) jelly powder [1]
 It is the solid which will be dissolved in the substance [1]
 3aii) water [1]
 It is the liquid which will dissolve the solid [1]

- 3b) temperature of water [1]

- 3c) i) no solid is found at the bottom of the beaker [1]
 ii) no residue is left on the filter paper during filtration [1]

- 3d) introduce stirring [1]

- 4ai) A: sperm duct [1]
 B: penis [1]
 C: scrotum [1]
 D: urethra [1]

- 4aii) urine and sperm [1]

- 4aiii) It prevents the sperm from reaching the penis, thus he cannot make a woman pregnant. [1]

- 4aiv) vasectomy [1]

- 4bi) A: ovaries [1]
 B: uterus [1]
 C: cervix [1]
 D: vagina [1]

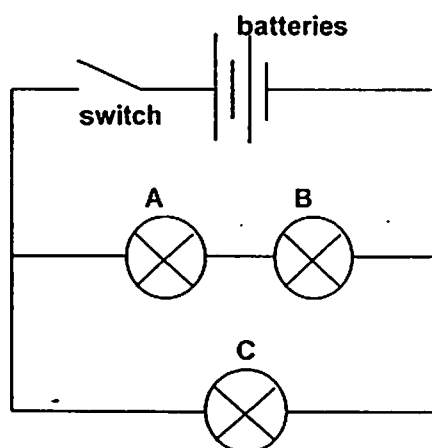
4bii) It is for the embryo to grow and develop. [1]

4ci) the woman is going through mensuration where by her uterine lining will be discharged as blood. [1]

4cii) the menstruation has stopped and the uterine lining is repairing itself, therefore it becomes thicker. [1]

4ciii) 28 days [1]

- 5) Correct use of symbols – [1]
 Labeling – [1]
 Each condition met – $[0.5] \times 4 = [2]$

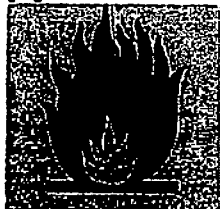


Section C: Essay Qn

- 1ai) The egg shells contain carbonates. [1]
 1aii) Patrick could bubble the gas through calcium hydroxide (limewater) [1]
 White precipitate would be seen if carbon dioxide is present. [1]
 1aiii) acid + carbonate \rightarrow salt + carbon dioxide + water [1]
 1aiv) marble chips/chalk/any carbonate [1]

1bi) the nature of the solvent [1]

1bii) [1]



- 1biii) 1. stir the mixture [1]
 2. crush the iodine crystals into smaller pieces [1]
 3. heat the alcohol over a water bath to increase its temperature. [1]

2a) [0.5 mark each blank]

particle	number of		
	electrons	protons	neutrons
X^+	10	11	12
Y^-	10	9	11
Z	11	11	9

2bi) Q [1]

2bii) S [1], T [1]

2biii) P: hydrogen [1]

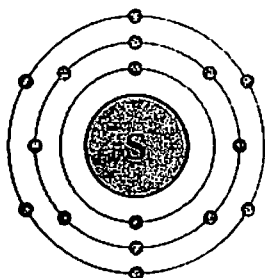
S: oxygen [1]

2ci) sulphur has 6 valence electrons [1]

And has 3 electron shells [1]

2cii) 2, 8, 6 [1]

2ciii) [1 mark], correct answer only



3ai) They are arranged in parallel. [1]

3aii) The lights will have the same brightness in each room. [1]

The lights in other rooms will continue to work even if one of the lights in a room is spoilt. [1]

3bi) 1 m for working, 1 m for ans. No/ wrong unit minus 0.5m

$$V = RI = 4 \times 1.2 [1] = 4.8 \text{ V} [1]$$

3bii) 4.8V [1]

3biii) 1 m for working, 1 m for ans. No/ wrong unit minus 0.5m

$$I_2 = V_2/R_2 = 4.8/6 [1] = 0.8 \text{ A} [1]$$

3biv) The current I will decrease [1] as the total resistance will increase [1] when the resistors are arranged in series.