

Name:	Index Number:	Class/LG:
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YIO CHU KANG SECONDARY SCHOOL

END-OF-YEAR EXAMINATION 2024

SECONDARY ONE



SCIENCE_G3

1 hour 30 minutes

Additional Materials:
Optical Answer Sheet (OAS)

1 October 2024
(Tuesday)

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class on the cover page.

Write in dark blue or black pen.

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

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

SECTION A: Multiple Choice Questions

This section consists of **fifteen** multiple choice questions. Answer **all** questions.

For each question there are four possible answers **A, B, C** and **D**.

Choose the one you consider correct and record your answer in soft pencil in the separate OAS.

A mark will not be deducted for a wrong answer.

SECTION B: Structured Questions

This section consists of structured questions. Answer **all** questions.

Write your answers in the spaces provided.

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

The use of an approved scientific calculator is expected, where appropriate.

A copy of the Periodic Table is printed on page 24.

For Examiner's Use

Section A	/ 15
Section B	/ 65
Total	/ 80

Setter: Mrs Chua Xiao Yun

This document consists of **21** printed pages and **3** blank pages.

SECTION A: Multiple Choice Questions [15 marks]

Answer **all** questions in soft pencil on the separate OAS.

1 Which of the following is **not** a responsible application of scientific knowledge?

- A** the use of antibiotics to treat bacterial infection
- B** the use of banned drugs in sports to improve performance
- C** the use of solar energy to generate electricity
- D** the use of vehicles to go from one place to another

2 What are the physical properties associated with plastic materials?

- A** brittle, flexible and elastic
- B** poor conductors of heat, easily moulded and strong
- C** shiny, does not corrode and has low density
- D** strong, transparent and has high melting point

3 Two properties of four substances, **W**, **X**, **Y** and **Z** are shown in the table below.

substance	melting point / °C	electrical conductivity	
		solid	liquid
W	1100	good	good
X	1234	nil	good
Y	2027	nil	nil
Z	– 15	nil	nil

Which of the following substances is most likely a metal?

- A** Substance **W**
- B** Substance **X**
- C** Substance **Y**
- D** Substance **Z**

4 Which of these substances would you be able to conclude that it is an element?

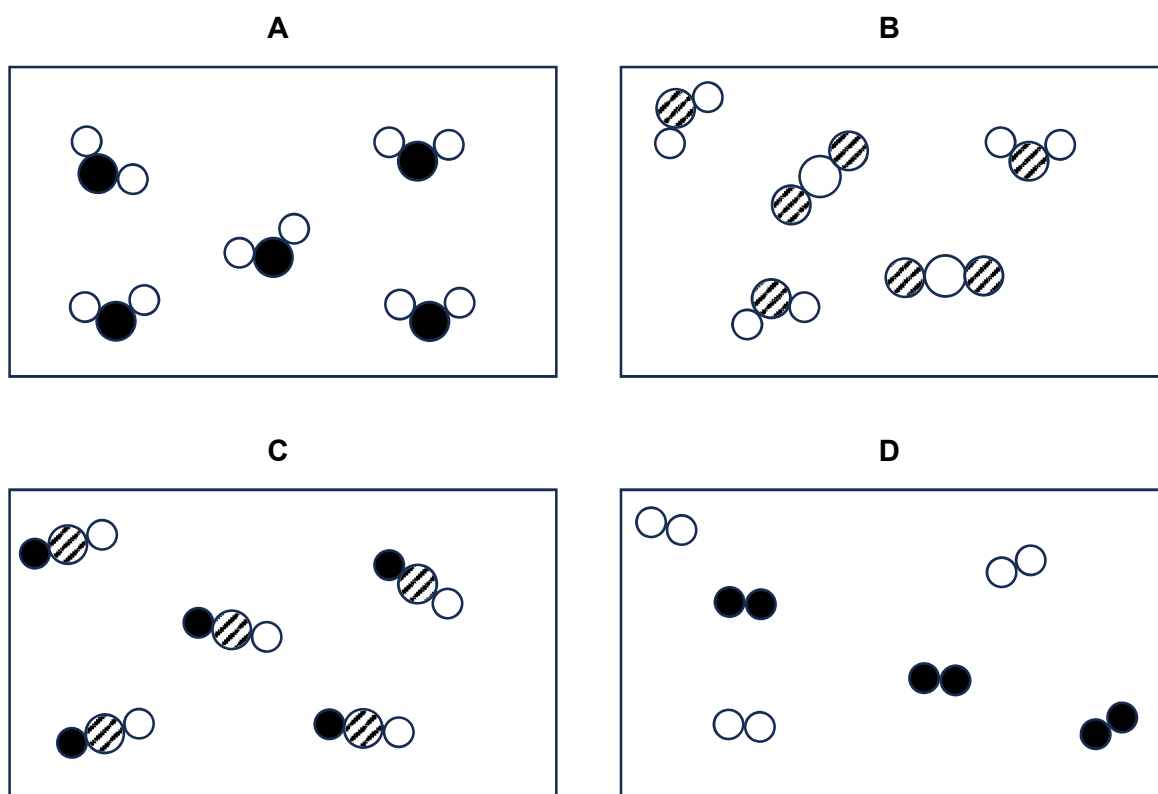
- A** A shiny liquid which is a good conductor of electricity.
- B** A shiny solid which cannot be broken down into simpler substances.
- C** A white powder which breaks down and gives off a colourless gas on heating.
- D** A yellow powder which burns to produce a colourless acidic gas.

5 Which of these factors would cause a substance to dissolve faster?

- I stirring
- II using a smaller volume of solvent
- III using smaller size of the substance

- A I only
- B I and III
- C II and III
- D all of the above

6 Which diagram correctly represents a mixture containing two different compounds?



7 Some copper(II) sulfate salt has been mixed with chalk. Copper(II) sulfate is soluble in water but chalk is insoluble in water.

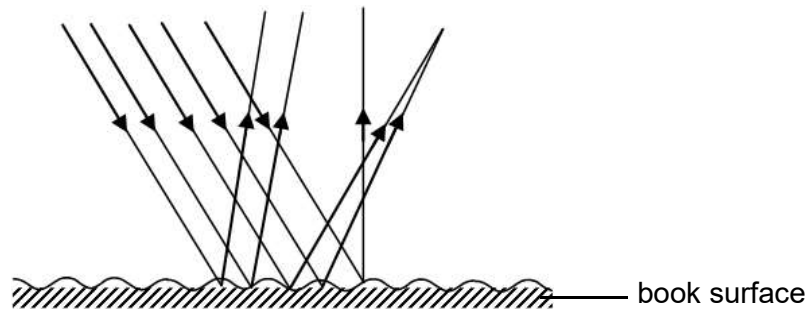
What is the correct order for carrying out the stages needed to separate the mixture using water as a solvent?

- A dissolving in water → evaporating → filtering
- B dissolving in water → filtering → evaporating
- C filtering → dissolving in water → evaporating
- D filtering → evaporating → dissolving in water

- 8 A petri dish contains a blackish-green powder. When a magnet is placed near the petri dish, black particles are observed to move towards the magnet while the green powder remains at the same position.

Based on these observations, what can we conclude about the black particles and green powder?

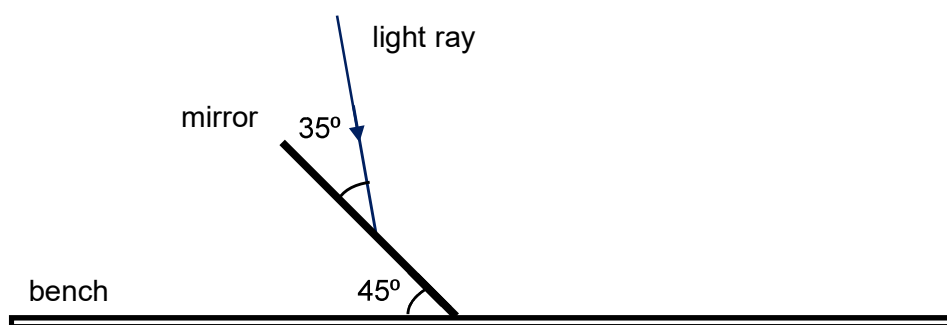
- A The black particles and green powder are not chemically combined.
 - B The black particles and green powder are present in a fixed ratio.
 - C The black particles and green powder cannot be separated by chemical means.
 - D The black particles and green powder must be two different elements.
- 9 The diagram shows how a beam of parallel rays bounces off a book surface.



Which statement about the reflection is correct?

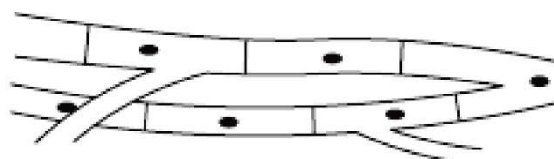
- A The angles of incidence are the same for all rays.
- B The angle of incidence is equal to the angle of reflection for each ray.
- C The angles of reflection are the same for all rays.
- D This is an example of regular reflection.

- 10 A ray of light is shone at a plane mirror tilted at an angle of 45° to the bench.



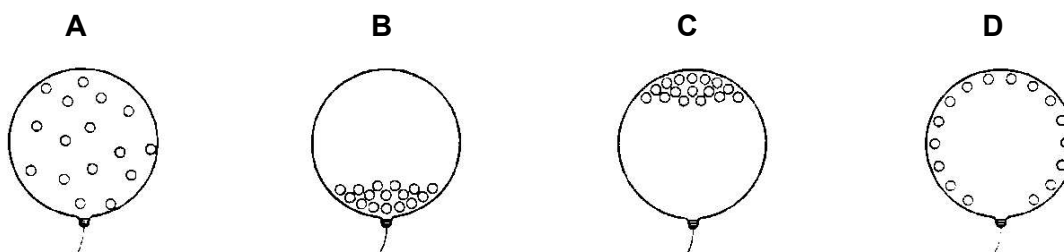
What is the angle of reflection?

- A 35°
 - B 45°
 - C 55°
 - D 90°
- 11 The figure below shows a group of heart muscle cells.



Which level of organisation is most accurately depicted in the figure?

- A cell
 - B organ
 - C system
 - D tissue
- 12 Which diagram shows the arrangement of particles inside a balloon filled with helium gas?



- 13** "Solids have a fixed volume."

Which of the following best explains the above statement?

- A** Solid particles are arranged in an orderly manner.
- B** Solid particles are packed closely together with little empty spaces in between.
- C** Solid particles vibrate in their fixed positions.
- D** There are strong attractive forces between the particles of solids.

- 14** The liquid level in a thermometer rises when it is placed in a beaker of warm water.

Which of the following changes takes place in the liquid of the thermometer at a higher temperature?

- I** The particles become further apart.
- II** The particles expand in sizes.
- III** There is an increase in number of particles.

- A** I only
- B** I and II only
- C** I, II and III
- D** II and III only

- 15** The chemical formula for the compound calcium carbonate is CaCO_3 .

What are the elements present in calcium carbonate?

- A** calcium and carbon dioxide only
- B** calcium and cobalt only
- C** calcium, carbon and oxygen only
- D** calcium, copper and oxygen only

SECTION B: Structured Questions [65 marks]
 Answer **all** questions in the spaces provided.

- 16** For a fundraising event, a few groups of students contributed gliding toys which they designed and constructed on their own.

The groups were provided with six different materials of the same size. They had to determine the material that can stay the longest in the air. One of the groups planned and carried out the following procedure stated in Fig. 16.1 and recorded their data in Table 16.2.

Group members' names: Amelia, Belinda, Caden, David

Our project journal _____ Date: 17 May 2024

Venue: Classroom

Aim: To determine which material can stay the longest in the air.

Procedure:

1. Measure 1.0 m height from the ground. Mark the height with a masking tape. The material will be released and allowed to fall to the ground from this height.
2. Hold the material (cellophane) at the marking.
3. Start the stopwatch as the material is released and stop the stopwatch when the material touches the floor. This is to measure the timing.
4. Repeat Step 3 twice.
5. Record the results and calculate the average time taken in Table 16.2.
6. Repeat steps 2 to 5 for the other five materials given.

Fig. 16.1

Table 16.2

materials	first timing / s	second timing / s	third timing / s	average time taken / s
cellophane	1.25	1.22	1.25	
felt	1.15	1.16	1.17	1.16
aluminium foil	1.04	1.02	1.03	1.03
cloth	1.16	1.17	1.15	1.16
paper	1.21	1.22	1.20	
styrofoam	0.59	1.00	0.58	0.59

- 16 (a)** Complete Table 16.2 by calculating the average time. [2]
- (b)** Explain why the students measured the timing three times for each material and calculated the average time taken.
-
- [1]
- (c)** State the variable that is changed in the experiment.
-
- [1]
- (d)** State **one** variable that should be kept constant in the experiment.
-
- [1]
- (e)** Which is the **best** material that should be chosen to construct the gliding toy?
- Explain your answer.
-
-
- [2]

[Total: 7]

- 17 To differentiate a fresh egg from a stale one, the eggs can be placed into different beakers of water as shown in Fig. 17.1. This is because as an egg rots, its density decreases.

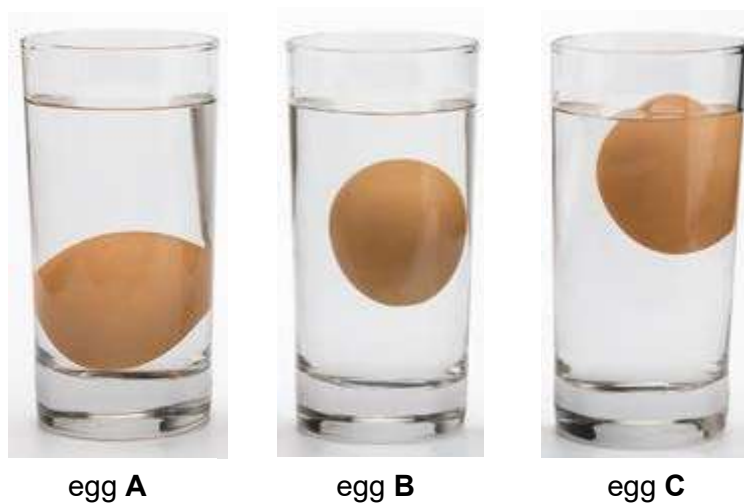


Fig. 17.1

- (a) Define “density”.

.....
 [1]

- (b) Arrange the eggs from the *least fresh* to the *freshest*.

..... [1]

- (c) An egg has a volume of 40 cm^3 . The density of a fresh egg is 1.1 g/cm^3 .

Calculate the mass of a fresh egg.

mass = g [2]

- 17 (d) When an egg turns rotten, gas escapes from it.

Suggest why a rotten egg floats in water.

.....
 [2]

- (e) A 100 cm^3 sample of salt water from the Dead Sea has a mass of 0.124 kg.

Calculate the density of the salt water.

density = g/cm^3 [2]

- (f) The same student suggests putting eggs **A**, **B** and **C** into the salt water from the Dead Sea to differentiate the fresh egg from the rotten egg.

Will the student's suggestion work? Explain your answer.

.....
 [2]

[Total: 10]

- 18 A student investigated the solubility of three solutes, **P**, **Q** and **R** that dissolved in 20 cm³ of three different solvents, **X**, **Y** and **Z** at room temperature.

The student then plotted a bar graph to show the solubility of the solutes in the different solvents. Fig. 18.1 shows an incomplete bar graph to describe the mass of three solutes **P**, **Q** and **R** that can dissolve in 20 cm³ of three different solvents, **X**, **Y** and **Z** at room temperature.

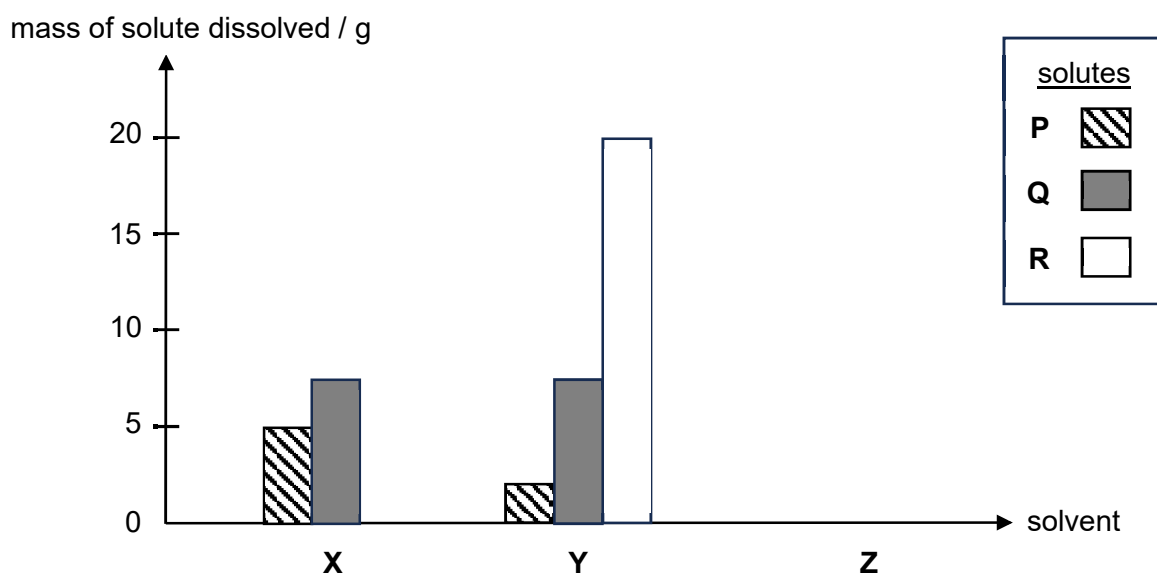


Fig. 18.1

- (a) The student recorded the following masses of the solutes that can dissolve in 20 cm³ of solvent **Z**:
- 10 g of solute **P**
 - 0 g of solute **Q**
 - 5 g of solute **R**

Complete the bar graph in Fig. 18.1 to show the mass of three solutes **P**, **Q** and **R** that can dissolve in 20 cm³ of solvent **Z** at room temperature. [2]

- (b) Define “solute”.

..... [1]

- (c) Which solute **P**, **Q** or **R** is most soluble in solvent **Y**?

..... [1]

- 18 (d) Solute **P** and solute **R** are accidentally mixed together.

Briefly describe how you would separate and obtain solutes **P** and **R**.

.....
.....
.....
.....
.....
.....
.....
.....
..... [3]

- (e) Jason's shirt was accidentally stained with solute **R**.

- (i) Which solvent is best used to remove the stain?

..... [1]

- (ii) Suggest **one** method that Jason can use to remove the stain more quickly.

.....
..... [1]

[Total: 9]

- 19 Fig. 19.1 shows the experimental set-up for a separation technique in the laboratory.

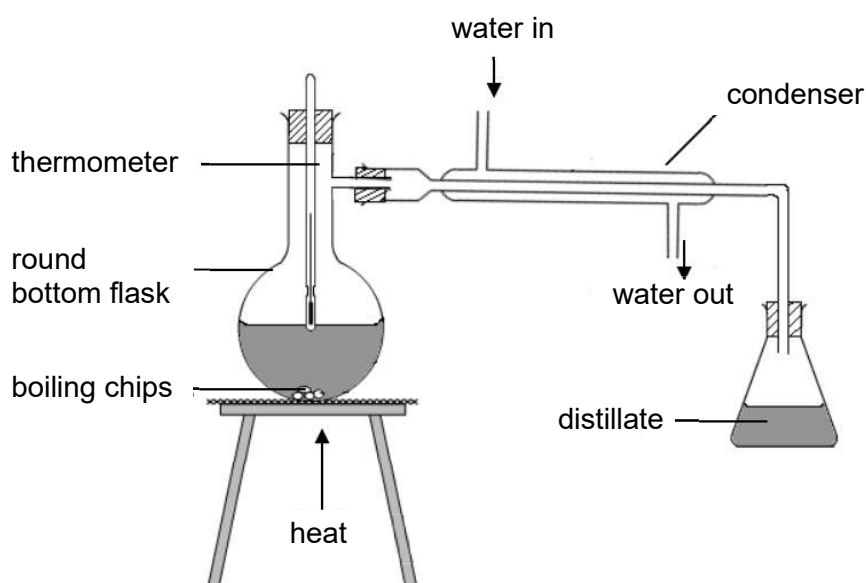


Fig. 19.1

- (a) State the name of the separation technique in Fig. 19.1.

..... [1]

- (b) Identify **two** mistakes present in the experimental set-up in Fig. 19.1.

mistake 1:

.....

mistake 2:

.....

..... [2]

- (c) State **two** separation techniques that are used to separate impurities from treated used water in NEWater plants.

.....

..... [2]

[Total: 5]

- 20 Jennifer is standing in front of a wide plane mirror as shown in Fig. 20.1.

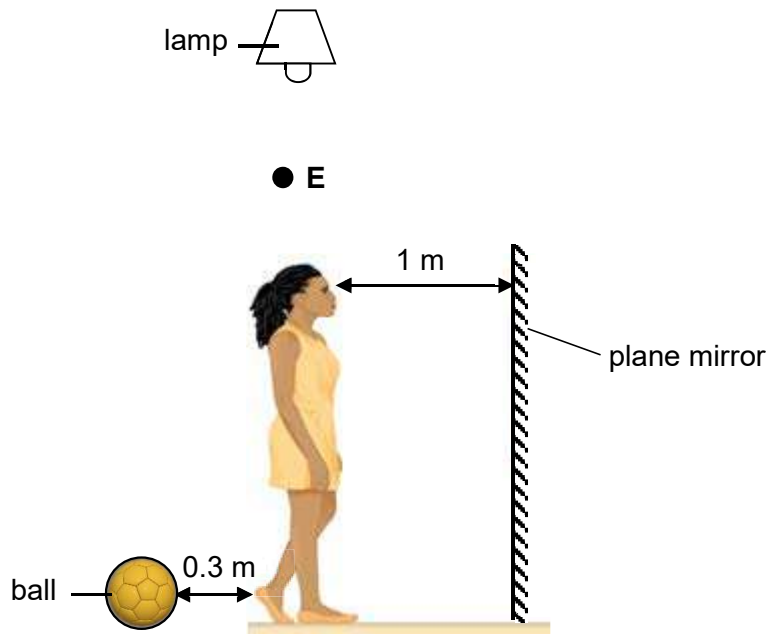


Fig. 20.1

- (a) Jennifer could not see the images of the objects placed above point E.

Given a convex mirror and a concave mirror, state **and** explain which type of mirror she should use in order to see the image of the lamp.

.....

.....

.....

..... [2]

- (b) Given that Jennifer is 1 m away from the mirror and there is a ball which is 0.3 m behind her.

Calculate the distance between Jennifer and the image of the ball.

distance = m [1]

- 20 (c)** State **two** characteristics of the image formed on a plane mirror.

1

2 [2]

[Total: 5]

- 21** Fig. 21.1 shows how an archer fish catches an insect above the water by shooting a jet of water to knock down the insect.

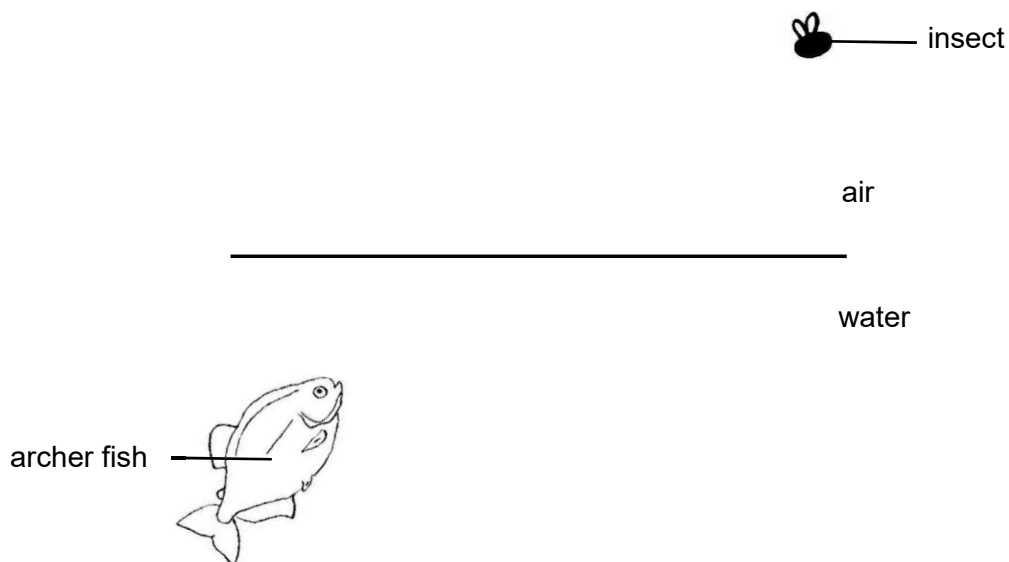


Fig. 21.1

- (a) On Fig. 21.1, draw a ray diagram to show the path of a ray of light from the insect to the fish. [1]
- (b) Based on the light ray drawn in part (a), draw the apparent position of the insect, from the archer fish's point of view in Fig. 21.1. [1]

[Total: 2]

22 Fig 22.1 shows the structure of a cell.

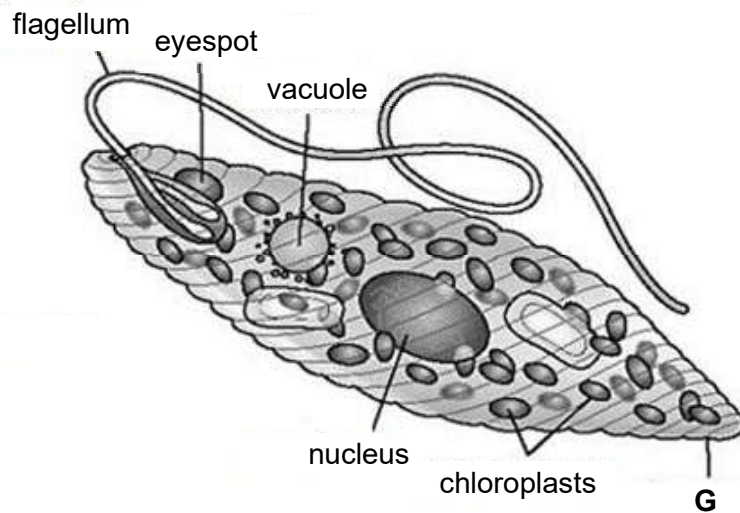


Fig. 22.1

(a) Identify and state the function of structure **G**.

.....
 [2]

(b) Explain how this cell could be considered both a plant cell and an animal cell.

.....

 [2]

(c) A student commented that the cell can move by itself. With reference to Fig. 22.1, suggest why the statement is made.

.....
 [1]

(d) State **one** structural difference in the root hair cell and red blood cell that is different from a typical plant and animal cell, respectively.

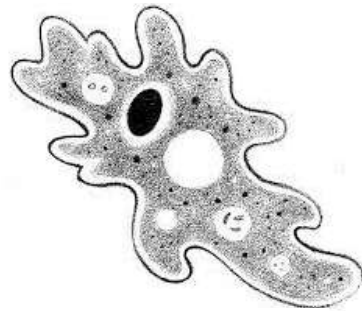
root hair cell:

.....

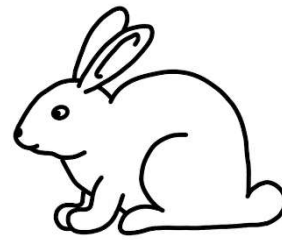
red blood cell:

..... [2]

- 22 (e) Fig. 22.2 shows two different organisms, **J** and **K**.



organism **J**



organism **K**

Fig. 22.2

State whether division of labour takes place in the organisms.

Explain your answer.

.....

.....

.....

.....

..... [2]

[Total: 9]

- 23 Firefighters categorise fire into three classes as follows:

Class **L** : solids like wood, paper or coal on fire
 Class **M** : liquids like petrol, kerosene or oil on fire
 Class **N** : gases like natural gas or carbon monoxide on fire

Table 23.1 shows four substances **S**, **T**, **U** and **V** with their melting and boiling points.

Table 23.1

substance	melting point / °C	boiling point / °C
S	-73	-10
T	1083	2595
U	17	118
V	-117	78

- (a) At room temperature (25 °C), state the class of fire that substances **S** and **T** belong to.

S

T

[2]

- 23 (b) Fig. 23.2 shows the arrangement of particles in substance **U** at 50 °C.

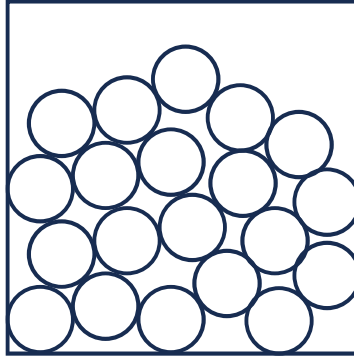


Fig. 23.2

In Fig. 23.3, draw the arrangement of particles in substance **U** at the temperatures given.

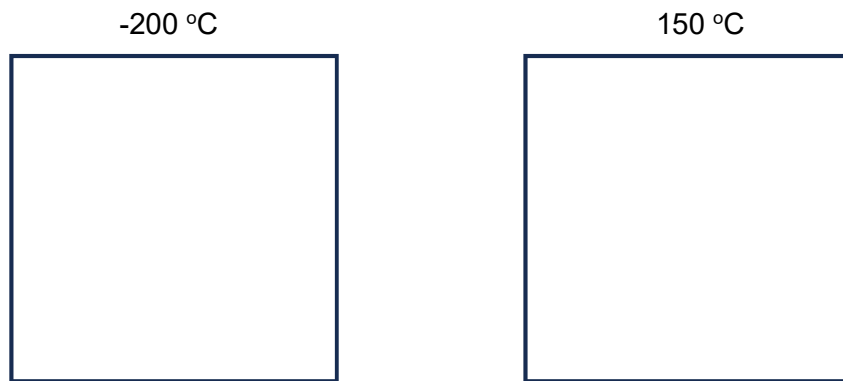


Fig. 23.3

[2]

- (c) Describe the changes to the arrangement of the particles in substance **V** as it is cooled from room temperature (25 °C) to -130 °C.

.....

.....

.....

.....

.....

.....

..... [2]

[Total: 6]

24 Fig. 24.1 shows the present model of an atom of an element.

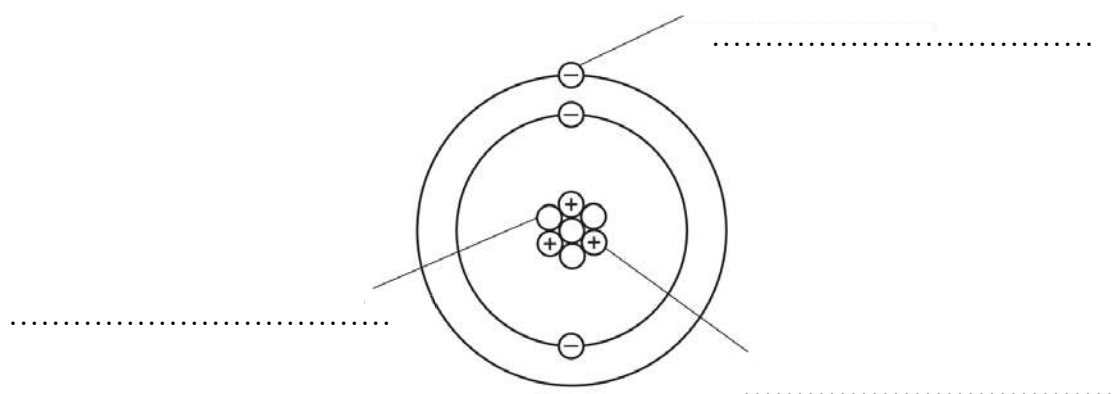


Fig. 24.1

(a) Label the sub-atomic particles shown in Fig. 24.1. [3]

(b) Use the Periodic Table to identify the element in Fig. 24.1. Explain your answer.

identity of element in Fig 24.1:

explanation:

..... [2]

(c) In 1904, J.J. Thomson suggested a model of the atom. He called this the 'plum pudding' model. The model of an atom of silicon is shown in Fig. 24.2.

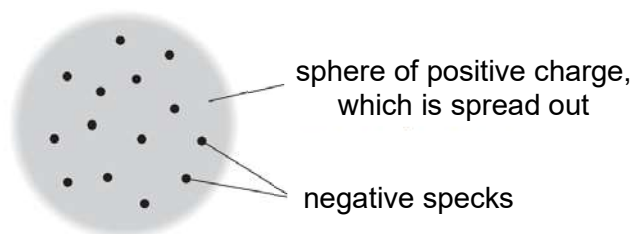


Fig. 24.2

(i) Describe **one** similarity between the 'plum pudding' model and the present model of an atom.

.....
 [1]

- 24 (c) (ii) Describe **two** differences between the 'plum pudding' model and the present model of an atom.

.....

.....

..... [2]

[Total: 8]

- 25 (a) Using the shaded circle, '●', to represent each atom of oxygen and the unshaded circle, '○', to represent each atom of sulfur, draw the molecular diagrams to represent oxygen gas (O_2) and sulfur dioxide gas (SO_2) in Table 25.1.

Table 25.1

chemical formula	molecular diagram
O_2	
SO_2	

[2]

- (b) With reference to the chemical formulae of oxygen and sulfur dioxide, state **two** differences between a molecule of sulfur dioxide and a molecule of oxygen.

.....

.....

..... [2]

[Total: 4]

END OF PAPER

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The Periodic Table of Elements

Group													
1	2											13	
Key proton (atomic) number atomic symbol name relative atomic mass						1 H hydrogen 1							
												5 B boron 11	
												13 Al aluminium 27	
3 Li lithium 7	4 Be beryllium 9												
11 Na sodium 23	12 Mg magnesium 24	3	4	5	6	7	8	9	10	11	12		
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium —	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	
55 Cs caesium 133	56 Ba barium 137	57–71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	
87 Fr francium —	88 Ra radium —	89–103 actinoids	104 Rf rutherfordium —	105 Db dubnium —	106 Sg seaborgium —	107 Bh bohrium —	108 Hs hassium —	109 Mt meitnerium —	110 Ds darmstadtium —	111 Rg roentgenium —	112 Cn copernicium —		

lanthanoids

57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium —	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	
89 Ac actinium —	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium —	94 Pu plutonium —	95 Am americium —	96 Cm curium —	97 Bk berkelium —	98 Cf californium —	99 Es einsteinium —	

actinoids





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2024 Secondary 1 G3 EOY Marking Scheme

Section A [15 marks]

Question	Answer	Question	Answer	Question	Answer
1	B	6	B	11	D
2	B	7	B	12	A
3	A	8	A	13	B
4	B	9	B	14	A
5	B	10	C	15	C

Section B [65 marks]

16a	$(1.24+1.22+1.25)/3 = 1.24$ $(1.21+1.22+1.20)/3 = 1.21$	1 1
16b	The timing is measure three times and average timing calculated to get an accurate reading/ accurate results.	1
16c	type of materials	1
16d	Any 1 of the following: 1. Height the material is released 2. size of material 3. location or environment of the experiment 4. The person who released the materials 5. The timer using the stopwatch	1
16e	Cellophane. It stays in the air longest / the time taken to fall is the longest.	1 1
Total: 7		

17a	Density is the mass per unit volume of an object or substance.	1
17b	C, B, A	1
17c	40×1.1 $= 44\text{g}$	1 1
17d	When gas escapes, the mass decreases causing m/v or density to decrease. So the density is smaller than water. Hence, it floats.	1 1
17e	$0.124 \times 1000 = 124\text{ g}$ or Mass / volume $= 124 / 100$ $= 1.24\text{ g/cm}^3$	1 1
17f	No will not work. Density of all 3 eggs smaller than that of the Dead Sea. Hence, all three eggs will float in the salt water.	1 1
Total: 10		

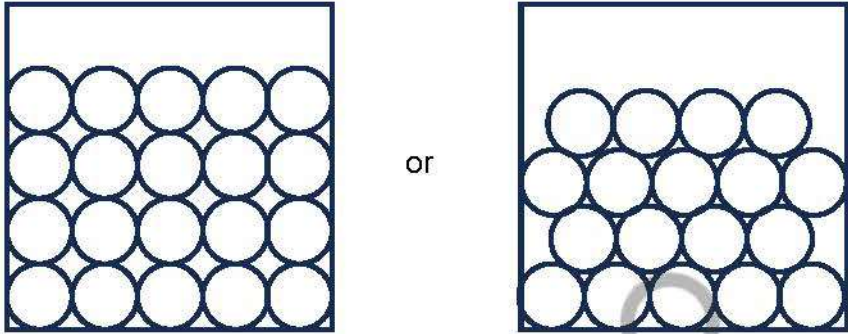
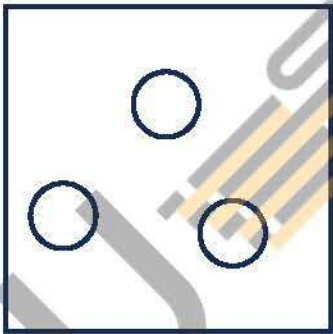
18a	mass of solutes dissolved / g <table border="1"> <caption>Data from Bar Chart</caption> <thead> <tr> <th>Solute</th> <th>Solvent X (g)</th> <th>Solvent Y (g)</th> <th>Solvent Z (g)</th> </tr> </thead> <tbody> <tr> <td>P (hatched)</td> <td>5</td> <td>2</td> <td>10</td> </tr> <tr> <td>Q (solid grey)</td> <td>7</td> <td>7</td> <td>0</td> </tr> <tr> <td>R (white)</td> <td>0</td> <td>20</td> <td>5</td> </tr> </tbody> </table> 2 marks for all P Q R correct 1 mark for 2 correct	Solute	Solvent X (g)	Solvent Y (g)	Solvent Z (g)	P (hatched)	5	2	10	Q (solid grey)	7	7	0	R (white)	0	20	5	
Solute	Solvent X (g)	Solvent Y (g)	Solvent Z (g)															
P (hatched)	5	2	10															
Q (solid grey)	7	7	0															
R (white)	0	20	5															
18b	A solute is the <u>solid / substance</u> that is <u>dissolved</u> in a solvent.	1																
18c	Solute R	1																
18d	<u>Add solvent X</u> and stir to dissolve P in the mixture. <u>Filter</u> to obtain solute R . <u>Evaporate</u> the filtrate to obtain solute P .	1 1 1																
18ei	Solvent Y	1																
18ei i	Use a warmer solvent Y OR heat up solvent Y	1																
Total: 7																		

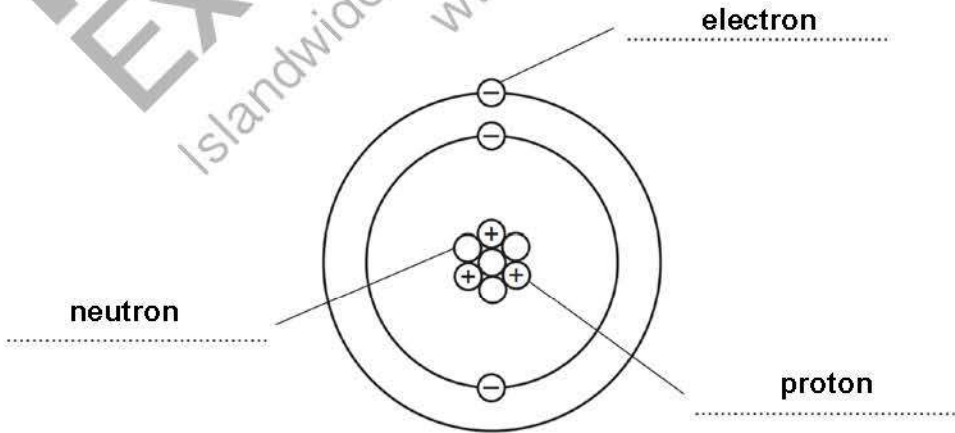
19a	Distillation	1
19b	Any two of the following: - The bulb of the thermometer should be above and next to the spout of the round bottom flask. - The Liebig condenser should tilt downwards into the conical flask. - Water in the Liebig condenser should enter from the lower inlet and flow out from the higher outlet. - The conical flask should not have a stopper.	1 1
19c	Microfiltration / filtration reverse osmosis	1 1
Total: 5		

20a	convex mirror ; It gives a <u>larger/ wider</u> field of view ;	1 1
20b	$1\text{ m} + 1\text{ m} + 0.3\text{ m} = 2.3\text{ m}$	1
20c	- upright ; - laterally inverted ; - virtual ; - distance of the image from the mirror is same as the distance of the object from the mirror ; or object distance is the same as image distance - equal in size ;	1 1
Total: 5		

21		
21a	Full solid lines with arrow. Correct bending.	1
21b	Dotted line <u>above</u> .	1
Total: 2		

22a	G is the cell membrane. G controls the flow of substances entering and leaving the cell.	1 1
22b	Can be considered a plant cell because it contains chloroplast OR contains only 1 vacuole. Can be considered an animal cell because it does not have a cell wall. OR has a flagellum/ the cell can move.	1 1
22c	The cell has a flagellum.	1
22d	Root hair cell, any 1 of the following: 1. Long and narrow protrusion or extension 2. Lack of chloroplast Red blood cell, any 1 of the following: 1. No nucleus 2. Biconcave in shape	1 1
22e	Division of labour takes place in K only. Since K is multicellular, work is divided among the different cells to perform different tasks efficiently.	1 1
Total: 9		

23a	S: Class N T: Class L	1 1
23b	at -200°C  or at 150°C  1m to neat and orderly arrangement in solid 1m to far apart arrangement in gas	1 1
23c	Substance V changes from liquid to solid when cooled from room temperature to -130°C. The arrangement of the particles changes <u>from closely packed in a disorderly manner [1] when at room temperature to very closely packed in an orderly manner [1] at 130°C.</u> Or particles pulled much closer to one another. And becomes more orderly arranged.	1 1 1 1
Total: 6		

24a	 1 mark each blank	3
24b	identity: lithium / Li explanation: The atom has three protons.	1 1

24ci	In both models, there are positive and/or negative particles/charges present in the atom.	1
24ci	The <u>positive charge for the plum pudding model is spread out</u> in the atom but in the present idea the <u>positive charge is only in the nucleus</u> . The <u>negative specks for the plum pudding model is littered throughout the atom</u> but in the present idea the <u>negative electrons are found in the shells</u> around the nucleus.	1 1
Total: 8		

25a	chemical formula	molecular diagram	
	O ₂		1
	SO ₂	  either 1 (2 shaded circles and 1 unshaded circles touching)	1
25b	A molecule of oxygen is made up of atoms of one element/the same type, whereas sulfur dioxide is made up of atoms of two different elements/different types. Oxygen molecule is made up of only two atoms while sulfur dioxide is made up of three atoms.		1
			1
Total: 4			