



PEICAI SECONDARY SCHOOL

SECONDARY ONE G3

END OF YEAR EXAMINATION 2024

CANDIDATE
NAME

CLASS

REGISTER NUMBER

SCIENCE

2 October 2024

1 hour 30 minutes

Candidates answer on the Question Booklet.

Additional materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write your name, class and register number on all the work you hand in.
Write in dark blue or black pen in the spaces provided on the Question Paper.
You may use a soft pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, glue or correction fluid.

Section A

There are **twenty** questions in this Section. 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 provided. Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

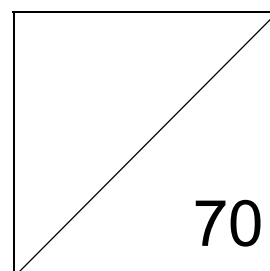
Section B and Section C

Answer **all** questions.

Write your answers in the spaces provided on the question paper.
If working is needed for any question, it must be shown with the answer.

You are allowed to use a calculator.
A copy of the Periodic Table is provided on page 26.

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 70.



This document consists of **25** printed pages and **1** blank page.

Setter: Ms Han Lijun

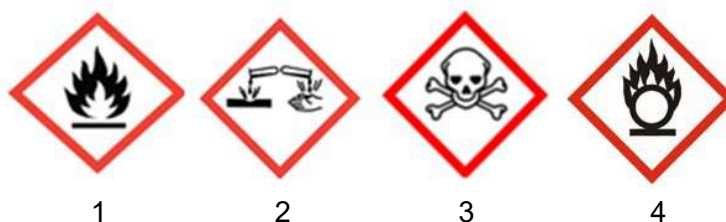
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Section A

- 1 There are four investigation topics for a study on exercise habits.
- 1 investigating the average duration of an exercise session
 - 2 investigating the frequency of exercise per week among young adults
 - 3 investigating the mental health benefits of exercise
 - 4 investigating the reasons that motivate people to exercise

Which pair of investigations will require the collection of qualitative data?

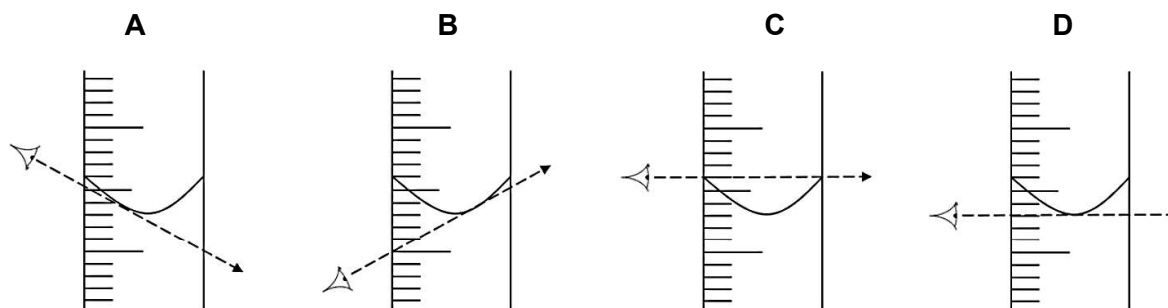
- A** 1 and 2
B 1 and 4
C 2 and 3
D 3 and 4
- 2 A compound, named benzene, is a liquid at room temperature. It catches fire easily and its vapour is toxic.



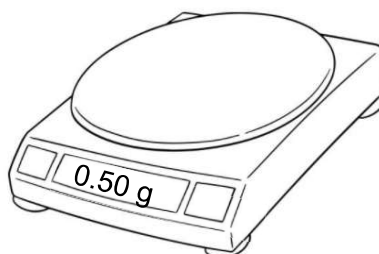
Which hazard symbols will be found on a bottle of benzene?

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

- 3 Which position of the eye will result in an accurate reading of the volume of liquid?



- 4 A student measures the mass of an object on an electronic balance. The electronic balance shows a reading of 0.50 g before she put the object on it.



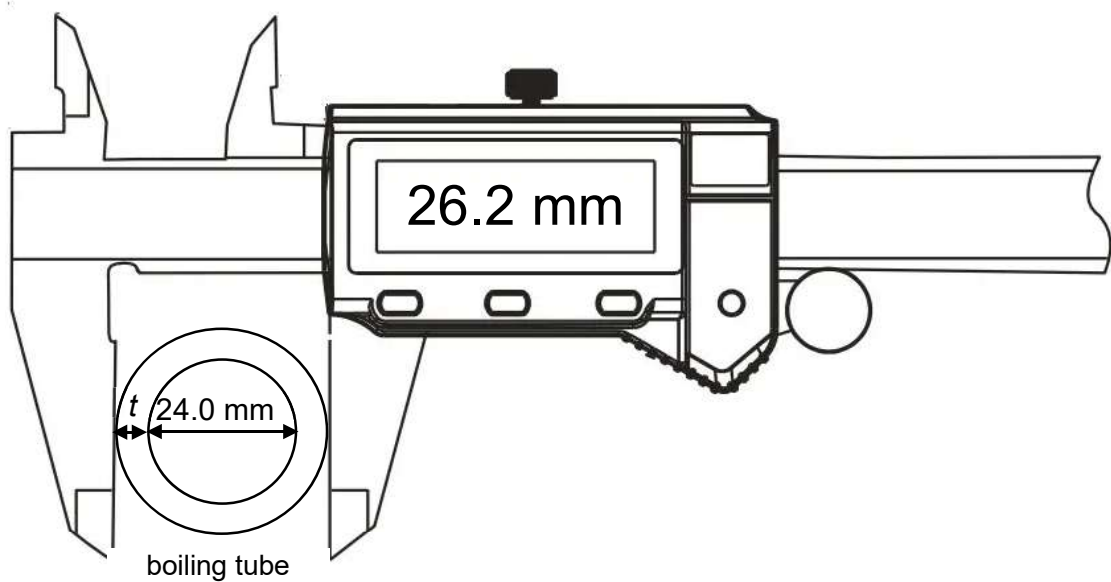
What is the type of error shown?

- A consistent parallax error
- B consistent zero error
- C unpredictable parallax error
- D unpredictable zero error

[Turn over

- 5 A set of digital calipers is used to measure the external diameter of the boiling tube.

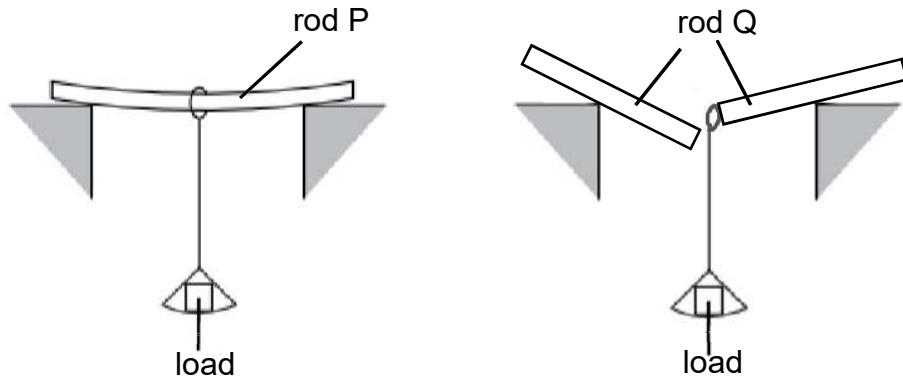
The glass boiling tube has an external diameter of 26.2 mm and an internal diameter of 24.0 mm.



What is the thickness (t) of the glass wall of the boiling tube?

- A 1.1 mm
- B 2.2 mm
- C 24.0 mm
- D 26.2 mm

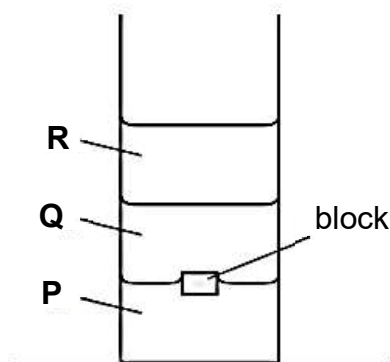
- 6 A load is placed on two rods, P and Q, made from different materials. Rod P sags a little when the load is placed on it while rod Q breaks into two pieces.



Which conclusion is correct about the two rods?

- A Rod P is denser than rod Q.
 - B Rod P is harder than rod Q.
 - C Rod P is stronger than rod Q.
 - D Rod Q is more flexible than rod P.
- 7 Three liquids, P, Q and R, have different densities and do not mix. The liquids are placed in a measuring cylinder and allowed to settle.

A small block is then dropped into the measuring cylinder and comes to rest as shown.



Which statement about the density of the block is correct?

- A The block has the same density as Q.
- B The density of the block is greater than the density of P.
- C The density of the block is greater than the density of R.
- D The density of the block is less than the density of Q.

[Turn over

- 8 A student conducted a series of experiments on different solids and made observations.

solid P	Solid P is made up of two colours: white and green. When water was added, only the white particles dissolved. The green particles remained at the bottom of the beaker.
solid Q	Solid Q has a silvery and shiny appearance. When it is heated at a high temperature, it melts into a silver liquid at a fixed temperature.
solid R	Green solid R has a fixed composition by mass. When electricity is passed through R, a colourless gas and a black solid is produced.
solid S	Solid S conducts electricity well and can be found in the Periodic Table. When S is heated strongly in the air, it reacts with oxygen to form only one substance.

Which solid, P, Q, R or S is a compound?

- A** P
B Q
C R
D S
- 9 An equal amount of sugar is added to equal volume of identical solvents under different conditions.

In which setup would sugar dissolve the fastest?

	temperature of solvent / °C	size of sugar
A	20	large piece
B	20	small pieces
C	80	large piece
D	80	small pieces

- 10 Which two separation techniques are used to purify sewage water to obtain NEWater?
- A** distillation and chromatography
B distillation and filtration
C microfiltration and evaporation
D microfiltration and reverse osmosis

- 11** A student wants to separate a mixture of iron powder, salt, water and sand.

- 1 chromatography
- 2 filtration
- 3 magnetic separation
- 4 evaporation

What is the correct sequence of steps the student can take to obtain the iron powder, salt and sand separately?

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

- 12** A mirror shop had two requests for mirrors to be made:

Customer 1: I need a personal mirror that allows me to examine the details of my teeth while in the toilet.

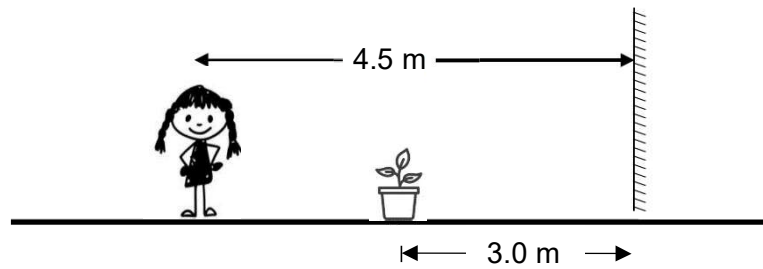
Customer 2: I need a mirror that allows me to see around blind corners at a road junction.

What type of mirror would be most suitable for each customer?

	customer 1	customer 2
A	concave	concave
B	concave	convex
C	convex	concave
D	convex	convex

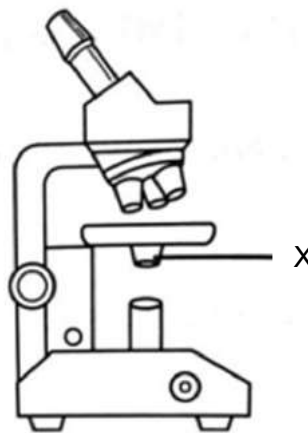
[Turn over

- 13 The diagram shows the positions of a girl and a pot of plant in front of a plane mirror.



What is the distance from the girl to the image of the pot of plant?

- A 1.5 m
 - B 6.0 m
 - C 7.5 m
 - D 9.0 m
- 14 The diagram shows a microscope.



Which statement correctly describes the function of part X.

- A allows adjustments to the position of the stage to obtain a sharper focus
- B controls the amount of light entering the lens
- C moves the stage up and down to obtain a clear image
- D provides light to the eye

- 15** Haemophilia is a genetic disorder that is passed down from one generation to the next. The blood of a person suffering from haemophilia does not clot normally.

How is this disorder passed down from the parent to the child?

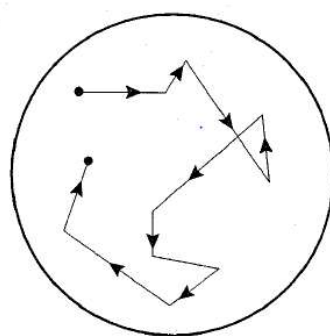
- A** DNA in the cell membrane is passed on from parent to child.
- B** DNA in the cytoplasm is passed on from parent to child.
- C** DNA in the nucleus is passed on from parent to child.
- D** DNA in the vacuole is passed on from parent to child.

- 16** The heart is made up of muscles, nerves and other structures. The function of the heart is to pump blood through the circulatory system.

Which row best describes the heart, muscles and nerves?

	heart	muscles	nerves
A	organ	cell	tissue
B	organ	tissue	tissue
C	tissue	cell	cell
D	tissue	tissue	cell

- 17** Pollen grains in a transparent box of water are observed using a microscope. One pollen grain is seen to move around as shown.



What does this experiment demonstrate about water molecules?

- A** They are in constant and random motion.
- B** They can be seen through a microscope.
- C** They move because of collision with pollen grains.
- D** They move more quickly when they are heated.

[Turn over

- 18 Which row shows the relationship between the energy of the particles and the space between the particles?

	energy of particles	space between particles
A	decreases	increases
B	decreases	remains the same
C	increases	increases
D	increases	remains the same

- 19 Which row correctly shows the electrical charges of electron, proton and neutron?

	electron	neutron	proton
A	negative	neutral	positive
B	negative	positive	positive
C	neutral	positive	negative
D	positive	neutral	negative

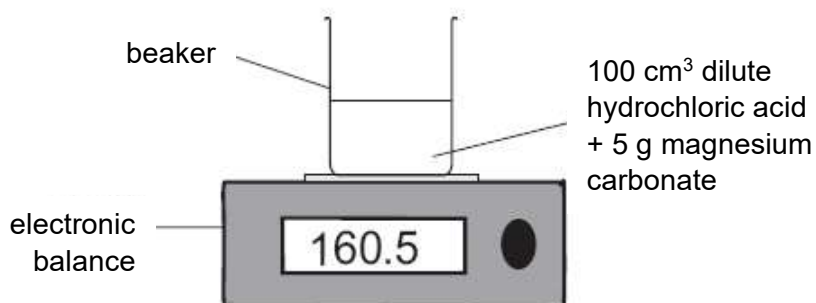
- 20 How many elements are there in NH_4NO_3 ?

- A** 2
B 3
C 4
D 9

Section B

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

- B1** The experiment below is carried out to determine the conditions that could affect the results of the experiment. A solid substance, magnesium carbonate and dilute hydrochloric acid are added together in each experiment. The reaction produces a gas which escapes from the beaker, resulting in a loss in mass. The contents in the beaker are weighed after 10 minutes.



The results of the experiment are shown in Table B1.1.

Table B1.1

experiment	temperature of acid / °C	mass of contents and beaker after 10 minutes / g
1	25.0	158.3
2	35.0	155.1
3	45.0	152.6
4	55.0	151.8
5	65.0	150.3

(a) Identify

(i) the independent variable

..... [1]

(ii) the dependent variable

..... [1]

(ii) two control variables

1

2

[2]

[Turn over

- (b) (i) Calculate the mass of gas that escaped from the beaker after 10 minutes when 45.0 °C dilute hydrochloric acid is used.

mass of gas = g [1]

- (ii) With reference to the results in Table B1.1, deduce the relationship between the temperature of acid used and the rate of reaction.

.....

..... [1]

- (c) The experiment was conducted again, with more changes in the factors affecting the rate of reaction shown in Table B1.2.

Table B1.2

experiment	form of magnesium carbonate	concentration of acid	temperature of acid / °C
A	lump	dilute	20
B	lump	dilute	15
C	powder	concentrated	25
D	powder	dilute	20
E			

- (i) Student **X** is investigating the effect of the form of magnesium carbonate on the rate of reaction.

Select the experiments that he should use for comparison. Explain your answer.

.....

..... [2]

- (ii) Student **Y** is studying the effect of acid concentration on the results of the reaction using experiments **C** and **E**.

List the factors for experiment **E** in Table B1.2. [2]

- (d) The measurements taken by the two students, **X** and **Y**, for one of the experiment are shown in Table B1.3.

Table B1.3

student	mass of contents and beaker after 10 minutes / g		
	reading 1	reading 2	reading 3
X	153.4	149.2	150.7
Y	147.9	148.2	147.1

Which student obtained more precise readings? Explain your answer.

.....

.....[1]

[Total: 11]

- B2** Electricians use a method called soldering to make connections between wires in electrical circuits.

The figure shows a soldering tool being used to **heat and melt** a piece of solder. The melted solder is dripped onto connecting points to connect it to other wires so that **electricity can be conducted** in the circuit board.

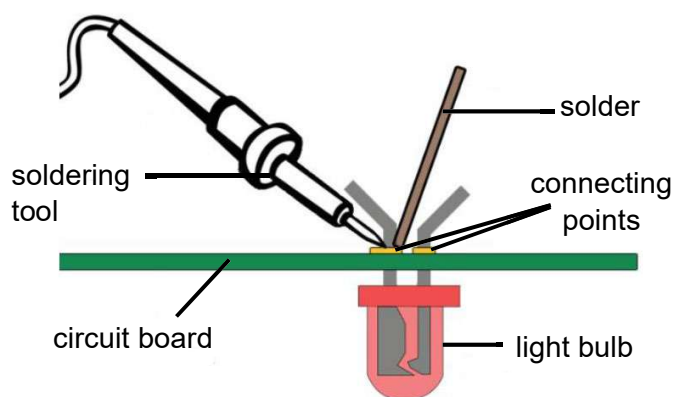


Table B2.1 shows the melting points of some materials.

Table B2.1

materials	melting point / °C
iron	1536
copper	1083
mercury	-38.4
mixture of tin and lead	188
glass fibre	1125
acrylic (plastic)	235

- (a) State another property, other than melting point, that must be considered when deciding which material can be used to make solder.

..... [1]

- (b) The soldering tool can reach a maximum temperature of 300 °C.

Using the information in Table B2.1, state the material that is the most suitable to make solder. Explain your answer.

..... [2]

[Total: 3]

- B3** Fig. B3.1 shows a 6.5 cm long cylindrical block of copper with a cross-sectional base area of 16 cm^2 . The mass of the block is 930 g.

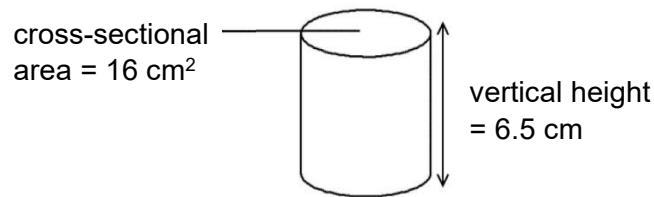


Fig. B3.1

- (a) Given that the volume of cylinder = cross-sectional area $\times$ vertical height, calculate the density of the copper block in Fig. B3.1.

density of copper block = g/cm^3 [3]

- (b) The cylinder is sliced into three unequal pieces, **P**, **Q** and **R** shown in Fig. B3.2.

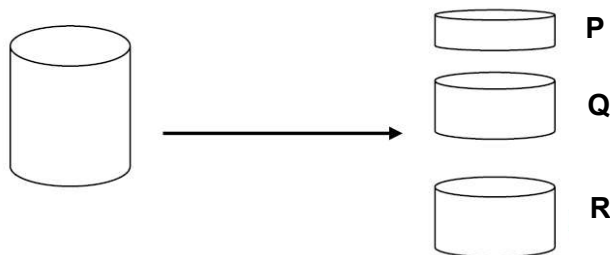


Fig. B3.2

State the density of **P**, **Q** and **R** in Fig. B3.2.

density of **P** = g/cm^3

density of **Q** = g/cm^3

density of **R** = g/cm^3 [1]

[Total: 4]

[Turn over

- B4** The melting points and boiling points of three substances, **X**, **Y** and **Z**, are shown. The physical state of each substance at 25 °C is also indicated.

substance	physical state at 25 °C	melting point / °C	boiling point / °C
X	gas	-56	A
Y	solid	78	152
Z	liquid	B	88

- (a) Using the information in the table, **circle** the correct options for the two statements.

The value of **A** is less than 25 °C / more than 25 °C.

The value of **B** is less than 25 °C / more than 25 °C. [1]

- (b) When substance **Y** is heated from 25 °C to 50 °C, the density of **Y** decreases.

Explain, using ideas from Particulate Nature of Matter, why the density of **Y** decreases when heated.

.....

 [2]

- (c) Draw the arrangement of particles in substance **Y** at 25 °C.



[1]

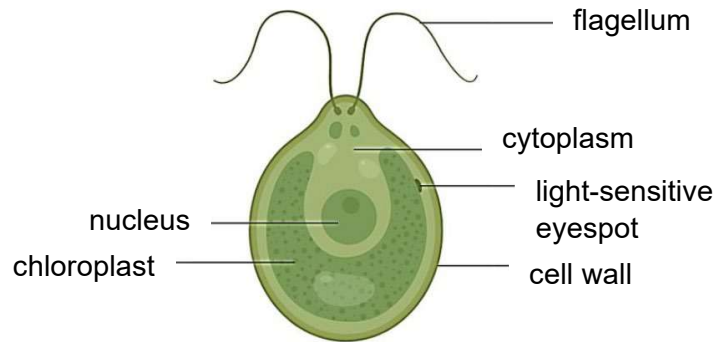
- (d) Describe the changes to the movement and arrangement of the particles in substance **Y** as substance **Y** is heated from 140 °C to 160 °C.

movement

 arrangement
 [2]

[Total: 6]

B5 *Chlamydomona* is a unicellular plant-animal which is usually found in ponds.



- (a) With reference to the model of a typical plant cell, give **two** reasons why the *Chlamydomonas* can be considered a plant cell.

.....

 [2]

- (b) The *Chlamydomonas* can move by itself like an animal due to its flagellum, but it does not need to feed on other organisms to survive.

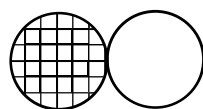
Suggest why, unlike typical animal organisms, the *Chlamydomonas* does not need to survive without feeding on other organisms.

.....
 [1]

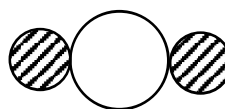
[Total: 3]

B6 When drawing molecular diagrams, atoms of different elements are shaded differently.

The diagrams show the molecular diagrams used to represent nitrogen monoxide (NO) and water (H₂O).

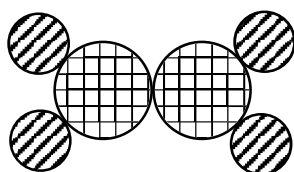


NO

H₂O

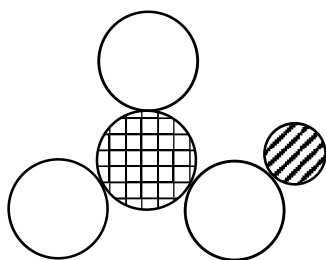
(a) State the chemical formulae of the following molecules.

(i)



chemical formula [1]

(ii)



chemical formula [1]

(b) In the box, draw the molecular diagram for ammonia (NH₃).

You only need to draw **one molecule**.



[1]

[Total: 3]

Section C

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

- C1** A food scientist uses paper chromatography to identify the food colourings, **X**, **Y** and **Z**, used in cake icing **A** and cake icing **B**.

Alcohol is used as the solvent for this experiment.

Fig. C1.1 shows an incomplete chromatogram obtained.

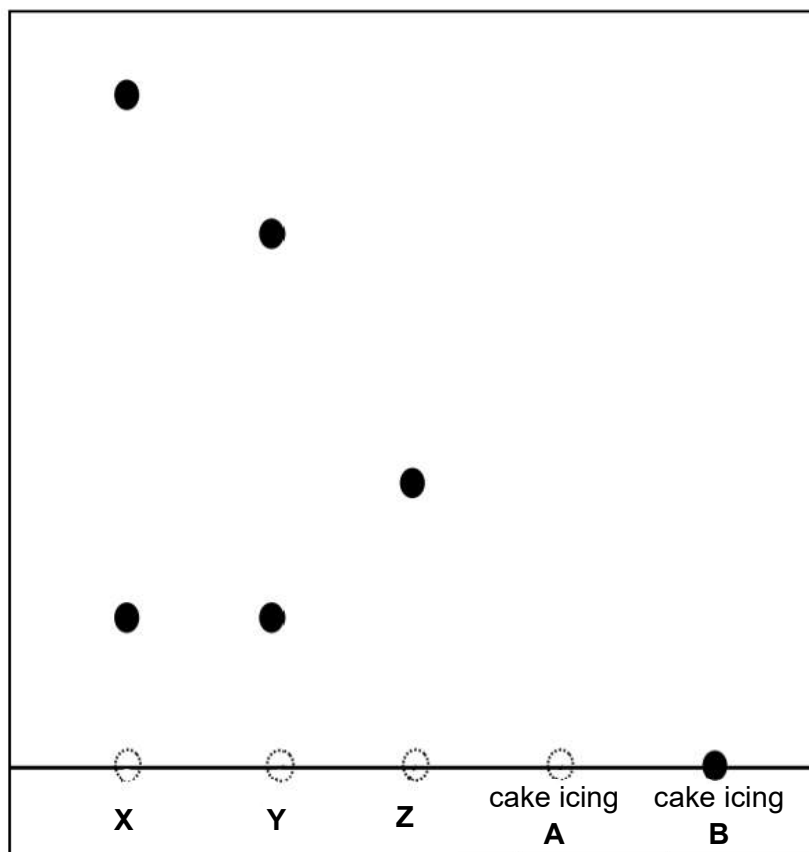


Fig. C1.1

- (a) Cake icing **A** contains food colourings **X** and **Y**.

Draw the expected results for cake icing **A** in Fig. C1.1

[1]

- (b) From the chromatogram result in Fig. C1.1, cake icing **B** cannot be separated into its food colourings.

Suggest one modification the food scientist can make to his experiment to determine the food colourings found in cake icing **B**.

.....

.....[1]

[Turn over

- (c) Food colourings **X**, **Y** and **Z** were heated to gaseous state. The molecular structures of the particles in the three food colourings were then analysed.

Fig. C1.2 shows the molecular structure of food colouring **X**.

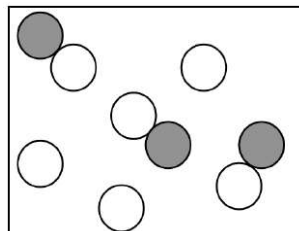


Fig. C1.2

Diagrams **P**, **Q**, **R** and **S** show the molecular structure of four other substances.

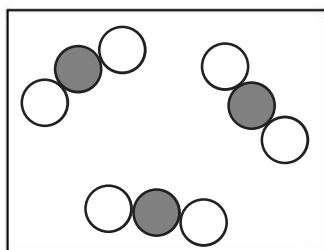


diagram P

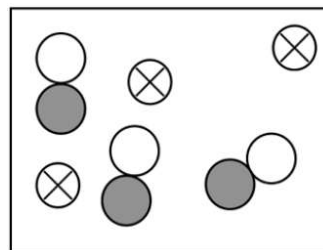


diagram Q

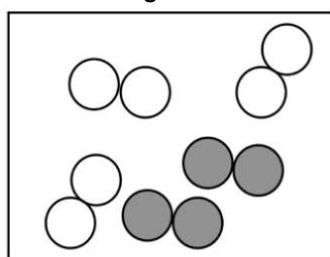


diagram R

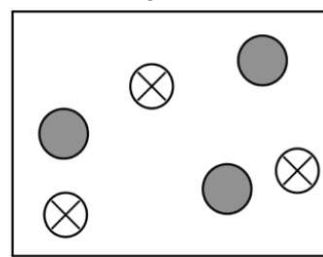


diagram S

Which diagram best represents food colouring **Y** and **Z**? Explain your answer.

Y

explanation

.....

Z

explanation

.....

[4]

[Total: 6]

C2 A student views the image of a wooden block in the plane mirror in Fig. C2.1.

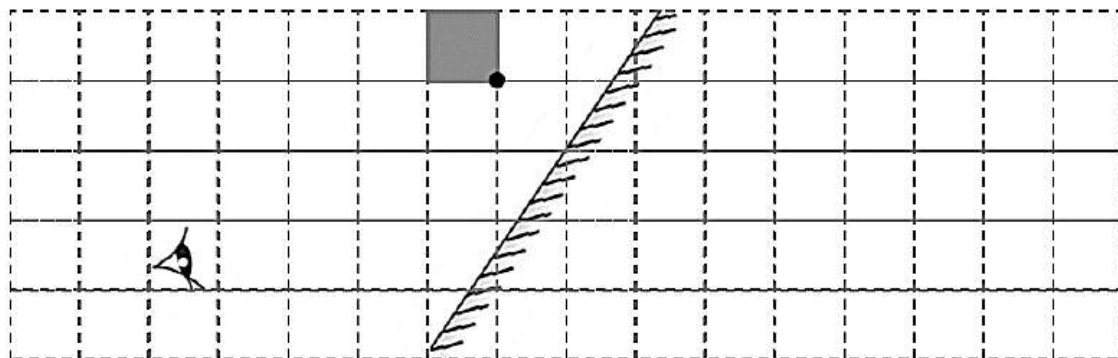


Fig. C2.1

- (a) (i) On Fig. C2.1, draw the image of the wooden block, and label it I. [1]
- (ii) Complete the ray diagram in Fig. C2.1. Draw the light ray to demonstrate how the dot at the corner of the wooden block is seen by the student. [2]
- (b) A wooden block with the alphabet **B** is placed in front of a plane mirror in Fig. B5.2.

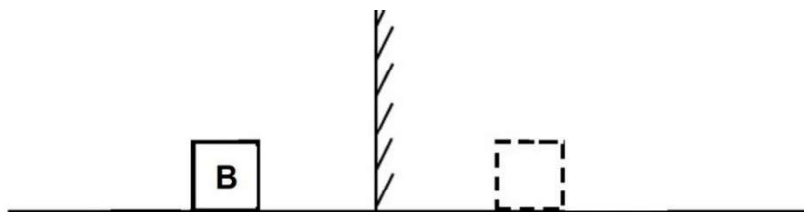
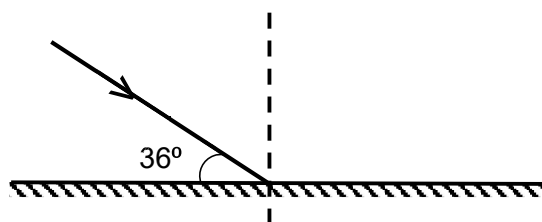


Fig. B5.2

- Draw the image of the alphabet **B** in the image of the block in Fig. B5.2 [1]
- (c) A light ray hits the mirror as shown in the diagram (not drawn to scale).



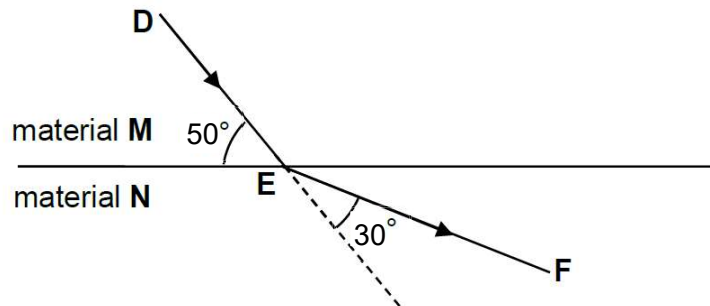
Calculate the angle of reflection.

angle of reflection = ° [1]

[Total: 5]

[Turn over

- C3** The diagram (not drawn to scale) shows a light ray passing through from material **M** to material **N**. The light ray took the path from point **D** to **E** and then to **F**.



- (a) State the angle of incidence at point **E**.

angle of incidence = ° [1]

- (b) Calculate the angle of refraction at point **E**.

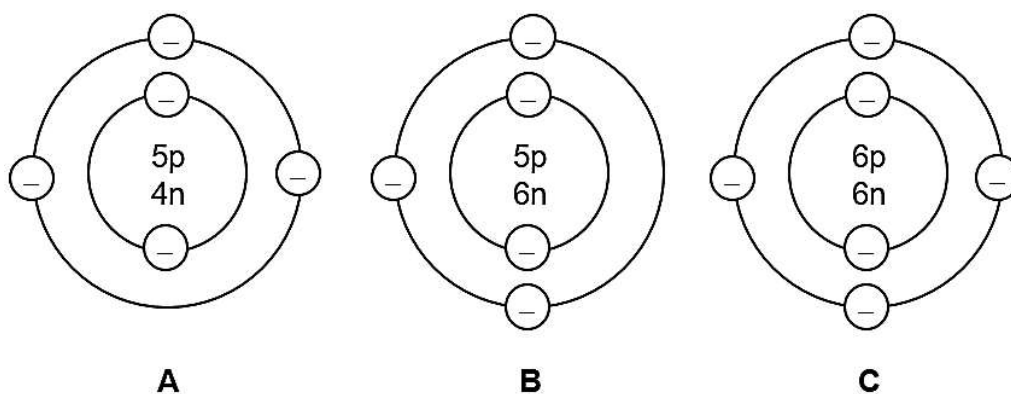
angle of refraction = ° [1]

- (c) Determine which material, **M** or **N**, has a higher optical density. Explain your answer.

.....
 [1]

[Total: 3]

(c) The structures of three atoms, **A**, **B** and **C** are shown.



<u>Key</u> p: proton n: neutron $\ominus$: electron
--

(i) With reference to the Periodic Table on Page 26, state the identity of atom **A**.

..... [1]

(ii) Which atom, **B** or **C**, is the same element as **A**? Explain your answer.

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

[Total: 6]

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Data Sheet

The Periodic Table of Elements

Group														
1	2											13		
						1 H hydrogen 1								
Key proton (atomic number) atomic symbol name relative atomic mass														
3 Li lithium 7	4 Be beryllium 9											5 B boron 11		
11 Na sodium 23	12 Mg magnesium 24											13 Al aluminium 27		
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 162
actinoids	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 -

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).
 The Avogadro constant, $L = 6.02 \times 10^{23} \text{ mol}^{-1}$.





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**PEICAI SECONDARY SCHOOL
SCIENCE DEPARTMENT
RESULT ANALYSIS AND MARKING SCHEME**

Year:	2024
Paper:	1G3 Science EOY

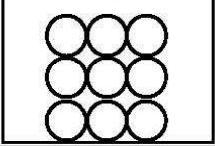
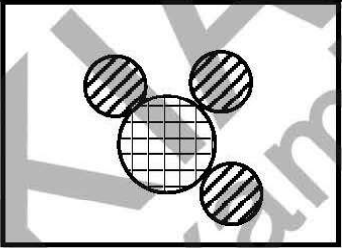
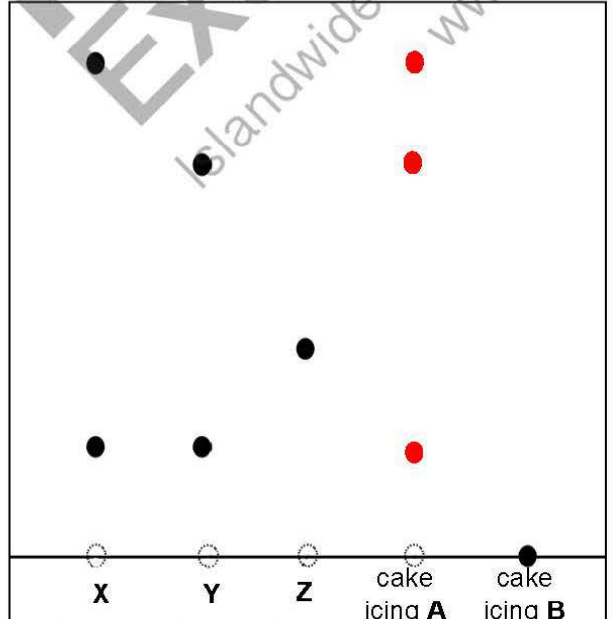
MCQ Answers

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

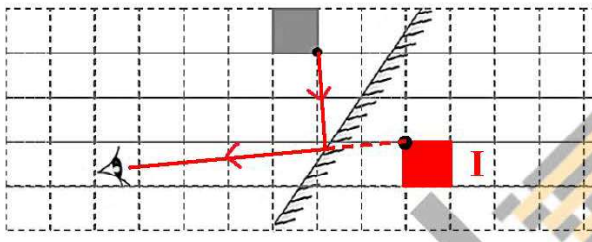
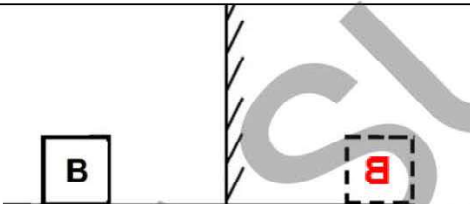
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SCIENCE DEPARTMENT
RESULT ANALYSIS AND MARKING SCHEME**

Q	Suggested Answer	Marks
B1ai	Temperature of acid	1
B1aii	Mass of contents and beaker	1
B1aiii	Any 2: - Volume of acid - Mass of magnesium carbonate - Concentration of acid - Beaker used	2
B1bi	$160.5 - 152.6 = 7.9$	1
B1bii	The higher the temperature of acid used, the faster the rate of reaction.	1
B1ci	A and D <u>Only the form of magnesium carbonate is different.</u> / <u>The concentration of acid and temperature of acid are kept constant.</u>	1 1
B1cii	powder; dilute; 25	1m dilute 1m 25 & powder
B1d	Student Y Results obtained are closer to each other.	1
B2a	electrical conductivity	1
B2b	alloy of tin and lead it is a good conductor of electricity, and the melting point is below 300 °C.	1 1 both reasons
B3a	volume = $16 \times 6.5 = 104 \text{ cm}^3$ density = $\frac{\text{mass}}{\text{volume}}$ $\frac{930}{104} = 8.94 \text{ g/cm}^3$ (3 s.f.)	1 1 1
B3b	ALL 8.94 g/cm ³	1
B4a	less than 25 °C less than 25 °C	Both 1
B4b	<u>mass remains constant / does not change,</u>	1 1

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Q	Suggested Answer	Marks
	<u>particles gain heat / thermal energy and move further apart / distance between particles increase, causing volume to increase</u>	
B4c		1
B4d	movement: particles changed from sliding past each other to moving freely in any direction. arrangement: particles changed from being packed closely to far apart.	1 1
B5a	Both have <u>chloroplast</u> . Both have <u>cell wall</u> .	1 1
B5b	It has <u>chloroplast</u> , which allows it to <u>make its own food</u> .	1
B6ai	N_2H_4 / H_4N_2	1
B6aia	NO_3H / NHO_3 / HNO_3 / HO_3N / O_3NH / O_3HN	1
B6b		1
C1a		1m - all 3 spots

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Q	Suggested Answer	Marks
C1b	Change the solvent / type of solvent	1
C1c	Y: diagram Q From the chromatogram, Y is a mixture and contains 1 of the substance found in X. Z: diagram P Z is a pure substance as there is only 1 spot on the chromatogram.	1 1 1 1
C2ai C2aii		1m image 1m light rays 1m direction of arrows
C2b		1
C2c	54°	1
C3a	40°	1
C3b	40° + 30° = 70°	1
C3c	M. Light ray bends away from normal when travelling from M to N, which means that the speed of light increases in N, and N is less optically dense than M.	1
C4a	Metals: M and O Non-metals: L, N, P, Q	2m – 6 correct 1m – 4-5 correct 0m – 0-3 correct
C4b	Number of protons = 35 Number of neutrons = 44	1 1

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Q	Suggested Answer	Marks
C4d	Boron	1
C4di	B Both have the same number of protons.	1

