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Name:	()	Class:	Teaching Group:
 <p>GREENDALE SECONDARY SCHOOL End-of-Year Examination 2022</p> <p>SCIENCE</p> <p>Secondary 1 Express 30 September 2022 2 hours</p> <p>Additional Materials: Multiple Choice Answer Sheet</p>			

READ THESE INSTRUCTIONS FIRST

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

The use of an approved scientific calculator is expected, where appropriate.
 You may lose marks if you do not show your working or if you do not use appropriate units.

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 Multiple Choice Answer Sheet.

Sections B

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

A copy of the Periodic Table is printed on page 26.
 At the end of the examination, fasten all work securely together.
 The number of marks is given in brackets [] at the end of each question or part question.

For Examiner's Use	
Section A	/ 30
Section B	/ 50
Total	/ 80

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

[Turn over

Section A

Answer **all** questions.

1 The statements describe data.

- I The flower petals are pink.
- II The lemon is sour.
- III The number of people tested positive for Covid-19 went up to 100 today.
- IV The speed of the car is 90 km/h.

Which are examples of quantitative data?

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

2 A student is using an electronic balance to measure the mass of an object. She notices that the balance shows a reading of 0.55 g when nothing is placed on it.

Which row correctly describes the error observed?

	type of error	description
A	parallax error	consistent
B	parallax error	unpredictable
C	zero error	consistent
D	zero error	unpredictable

3 Pluto was declared as the ninth planet from the Sun in 1930.

Beginning in the 1990s, its status as a planet was questioned following the discovery of several objects of similar size. This prompted the International Astronomical Union (IAU) to formally define the term 'planet'.

The IAU downgraded the status of Pluto to that of a dwarf planet in 2006 as it did not meet the criteria of clearing its neighbouring region of other objects.

Which statement **best** illustrates the case study of Pluto?

- A** Science is a human endeavour which is open to changes.
- B** Scientific knowledge is derived from systematic experimentation.
- C** Scientific knowledge is reliable and durable.
- D** There are harmful consequences to technological applications to society.

4 Which of the following is **not** a laboratory rule for handling chemicals?

- A Keep chemical containers closed after use.
- B Return unused chemicals to their original containers.
- C Wash your hands thoroughly with water after handling the chemicals.
- D Wear safety goggles when heating or mixing chemicals.

5 Substance Y is a flammable vapour at room temperature and stored in a pressurised aerosol can. It can irritate the eyes, nose and throat after prolonged exposure.

Which hazard symbols should be printed on the aerosol can containing Y?



I



II



III



IV

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

6 Which statements describe a non-luminous flame produced using a Bunsen burner?

- I It is blue in colour.
- II It is formed when the air-hole is open.
- III It is hotter than a luminous flame.
- IV It is unsteady.

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

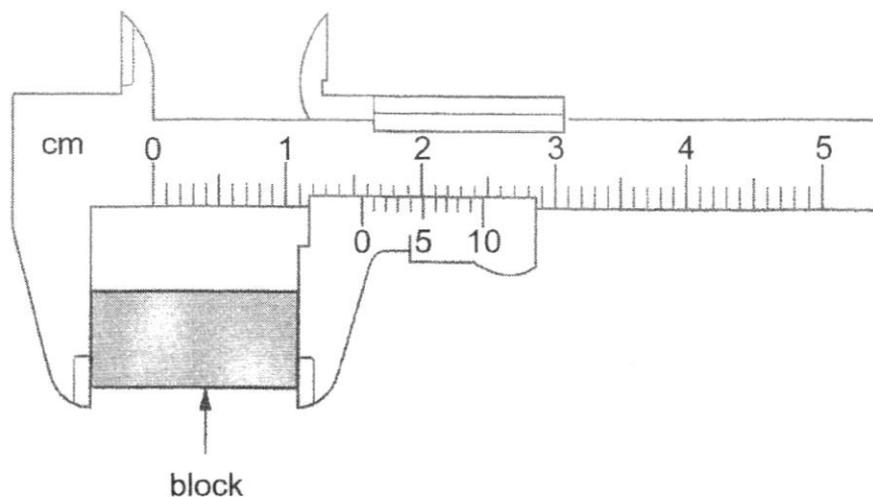
7 Tungsten is a metal that is used to make the filament in a light bulb.

Which physical properties determine its usage in the making of the filament in the light bulb?

- I high boiling point
- II high electrical conductivity
- III high melting point

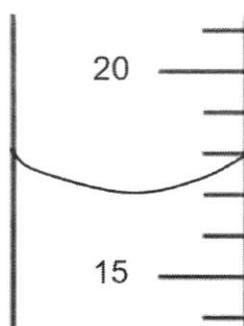
- A I and II B I and III C I, II and III D II and III

- 8 The diagram shows the positions of the scales on a vernier caliper when it is used to measure the length of a block.



What is the reading shown?

- A 1.16 cm B 1.56 cm C 1.66 cm D 2.10 cm
- 9 What is the volume of the liquid in the measuring cylinder?



- A 17.0 cm³ B 18.0 cm³ C 22.0 cm³ D 22.5 cm³
- 10 Substances X and Y are combined to produce Z, which has different chemical and physical properties as compared to X and Y.

What is Z?

- A compound
 B element
 C solution
 D suspension

11 Oil-based paints dissolve in thinner.

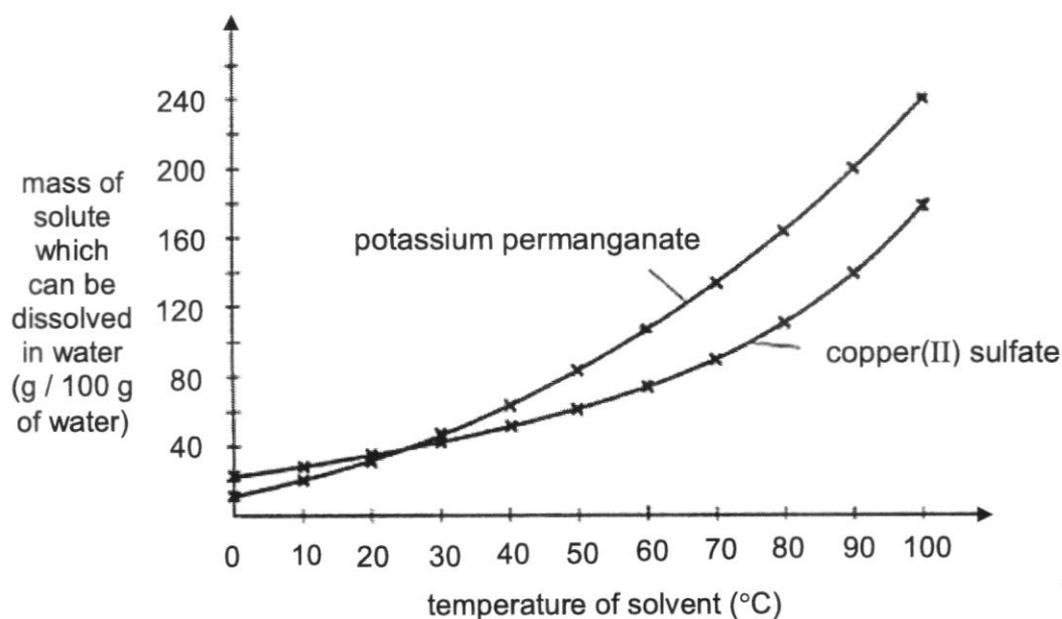
What do the paints act as?

- A a solute
- B a solution
- C a solvent
- D a suspension

12 What is the total number of atoms in $\text{CH}_3\text{CO}_2\text{H}$?

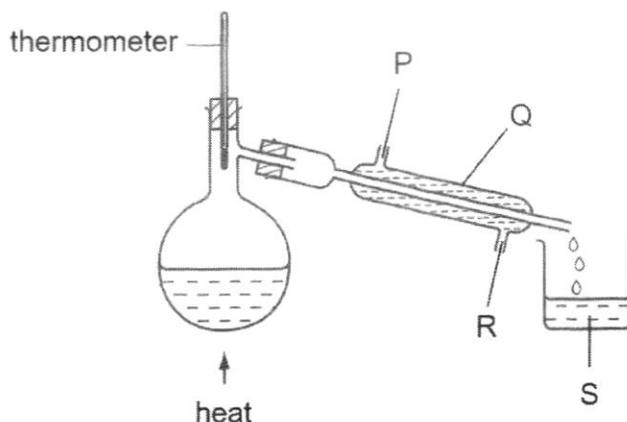
- A 3
- B 5
- C 8
- D 10

13 Which statement about the solubility curves of potassium permanganate and copper(II) sulfate is **incorrect**?



- A Copper(II) sulfate is more soluble than potassium permanganate at 0 °C.
- B Potassium permanganate is more soluble than copper(II) sulfate at 60 °C.
- C There is a common temperature where the solubility of both solutes is the same.
- D The solubility of potassium permanganate is half of that of copper(II) sulfate at 50 °C.

14 The diagram shows a distillation set-up.



Which row shows the correct labels?

	P	Q	R	S
A	water in	condenser	water out	filtrate
B	water in	fractionating column	water out	distillate
C	water out	condenser	water in	distillate
D	water out	fractionating column	water in	filtrate

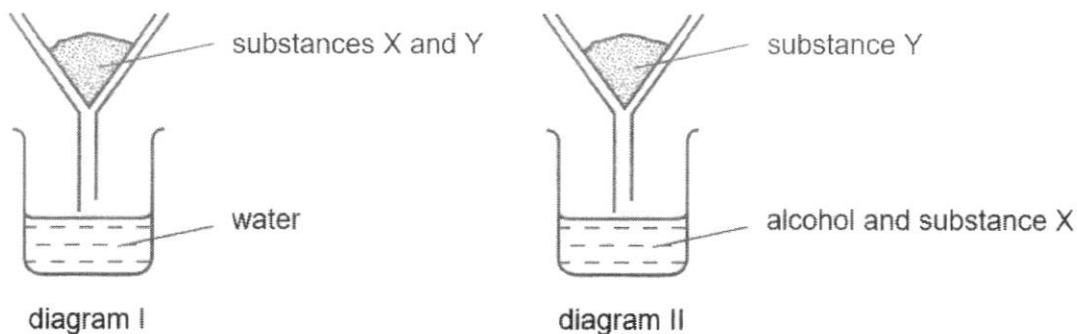
Recall [HSS 2021 1E EOY P1 Q12]

15 Four different separation techniques are used to separate different mixtures.

Which row is correct?

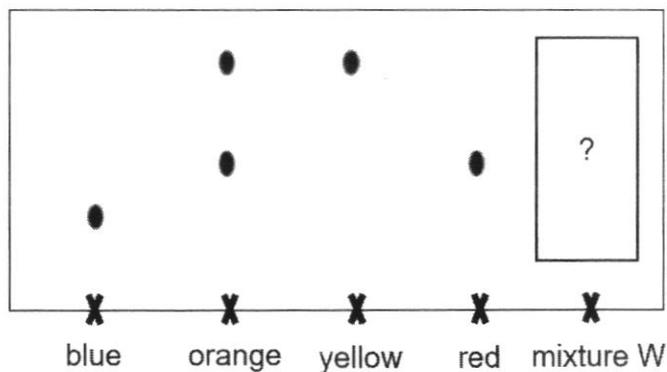
	separation technique	type of mixture
A	chromatography	sugar and water
B	distillation	aluminium and iron
C	evaporation	alcohol and petrol
D	filtration	sand and alcohol

- 16 A mixture containing substances X and Y is placed in different solvents. The mixture is then filtered using filter paper. The results of the filtration are shown in diagrams I and II.



Which statement **cannot** be concluded from the experiment?

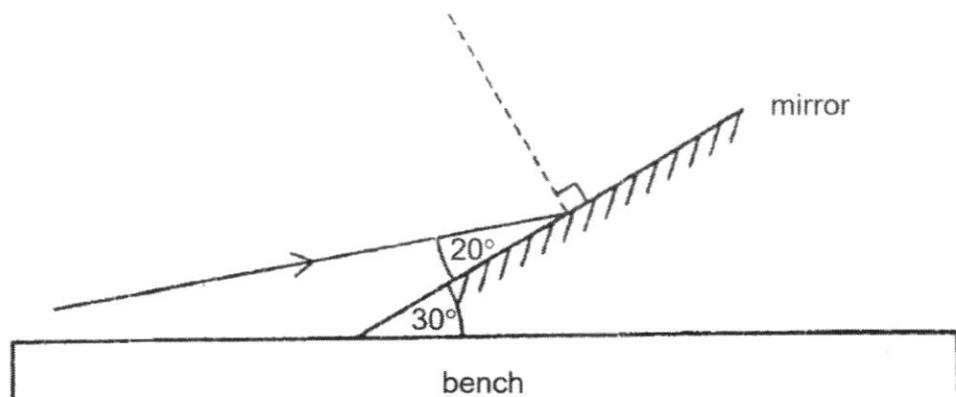
- A Alcohol cannot dissolve substance Y.
 - B Substance X is soluble in alcohol.
 - C Substance Y forms a solution in alcohol.
 - D Substance Y is insoluble in both water and alcohol.
- 17 The chromatogram obtained from four different coloured inks is shown.
Mixture W contains all four inks.



How many spots would there be on the chromatogram for mixture W?

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

- 18 A mirror is tilted at an angle of 30° to the bench. A ray of light is directed so that it hits the mirror at an angle of 20° to the surface of the mirror.



What is the angle of reflection?

- A 20° B 30° C 60° D 70°
- 19 Which object makes use of convex mirrors?
- A car headlight
B car rear mirror
C cosmetic mirror
D dentist mirror
- 20 Which is a harmful effect of visible light?
- A discolouration of paintings
B global warming
C skin cancer
D sunburn

- 21** Which statement explains why we can see a non-luminous object?
- A** The object absorbs all the light that falls onto it.
B The object emits light that falls onto our eyes.
C The object reflects the light that falls onto it into our eyes.
D The object refracts the light that falls onto it into our eyes.
- 22** Which statement states the benefit of division of labour in multicellular organisms?
- A** All the cells perform the same task to improve efficiency.
B Different processes can take place simultaneously.
C It reduces the need to grow more cells to complete the tasks.
D Other specialised cells can modify and perform functions of cells that die.
- 23** Which row lists the level of organisation in an organism from the simplest to the most complex?

	simplest → complex			
A	cells	organs	organ systems	tissues
B	cells	tissues	organs	organ systems
C	organ systems	organs	tissues	cells
D	tissues	cells	organs	organ systems

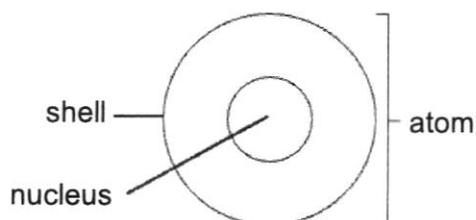
- 24** Which change occurs when a gas is compressed?
- A** change in the distance between particles
B change in the mass of particles
C change in the shape of particles
D change in the size of particles

- 25 Under standard conditions, a pure sample of sulfur has a melting point of 115 °C and boiling point of 444 °C.

At which temperature do the sulfur molecules have the least attractive forces between them?

- A gas at 444 °C
 - B liquid at 118 °C
 - C liquid at 444 °C
 - D solid at 112 °C
- 26 Which statement **best** explains why an aerosol can should not be heated in a fire?
- A The gas inside the can would compress greatly when heated and would cause the can to explode.
 - B The gas inside the can would expand greatly, causing the gas particles to hit the walls of the can at high speeds, causing the can to explode.
 - C When heated, the attractive forces of the gas particles in the can become weaker and will move closer to one another and experience a change of state.
 - D When heated, the gas particles are able to move more rapidly and quickly and hence will diffuse out of the can rapidly through the opening.
- 27 Which statement about molecules is true?
- A Molecules are made up of two or more atoms chemically combined.
 - B Molecules are only present in compounds.
 - C Molecules are the smallest particles of an element.
 - D Molecules must be made up of different types of atoms chemically combined.

- 28 A negatively charged particle has 17 protons, 18 electrons and 20 neutrons.



What is the total number of sub-atomic particles found in the nucleus?

- A 35
- B 37
- C 38
- D 55

29 An element R is found directly below element Q in the Periodic Table.

Which statements about elements Q and R are true?

- I They have similar chemical properties.
- II They have the same number of electron shells.
- III They have the same number of electrons in their outermost electron shell.

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

30 The table shows the number of protons, neutrons and electrons in two atoms X and Y.

atom	protons	neutrons	electrons
X	6	6	6
Y	7	6	7

A researcher writes the following statements about the atoms.

- I X and Y are atoms of the same element.
- II X and Y are electrically neutral.
- III X and Y have the same chemical symbol.
- IV X and Y have the same mass number.

Which statements are correct?

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

Section B

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

- 1 The hair colour of a brand of doll can change colour temporarily when immersed in water.

A student conducted a series of experiments with one of these dolls. The steps of the experiment are outlined as follows:

- 1) Measure 50 cm³ of water. Pour the water into a beaker. Ensure that the temperature of water is kept at 30 °C.
- 2) Immerse the hair of the doll into the beaker of water. Measure the time taken for the hair of the doll to change colour completely.
- 3) Remove the doll from the water and allow the hair to return back to its original colour fully.
- 4) Repeat steps 1 and 2, using the same doll but different temperatures of water at 40 °C, 50 °C, 60 °C and 70 °C respectively.

The results of the student's experiments are shown in Table 1.1.

Table 1.1

temperature of water/ °C	time taken for hair to change colour/ s
30	21
40	15
50	10
60	6
70	3

- (a) (i) State the dependent variable of this investigation.

..... [1]

- (ii) State one variable that was kept constant for the investigation.

..... [1]

- (b) (i) State a possible conclusion based on the results in Table 1.1.

.....
 [1]

- (ii) The student most likely formed his own hypothesis before coming to a conclusion at the end of his experiments.

Based on your own understanding, suggest one difference between a hypothesis and a conclusion.

.....
 [1]

- (c) Name the instruments the student could have used to measure time and volume of water for this experiment.

instrument to measure time [1]

instrument to measure volume of water [1]

- (d) The student's friends, Yong and Hock, also tried out the same experiment but they used water at 20 °C. Each of them repeated the experiment twice to obtain three sets of time measurements.

Table 1.2 shows their results.

Table 1.2

student	time taken for hair to change colour/ s		
	reading 1	reading 2	reading 3
Yong	32	34	35
Hock	40	50	45

- (i) Whose readings were more precise? Explain your answer.

.....
 [1]

- (ii) Explain why it is **not** possible to tell which student's readings were more accurate.

.....
 [1]

[Total: 8]

- 2 A shopkeeper placed two identical and uniform blocks of cheese on a measuring instrument as shown in Fig. 2.1.

Each block of cheese measures 2 cm × 5 cm × 10 cm.

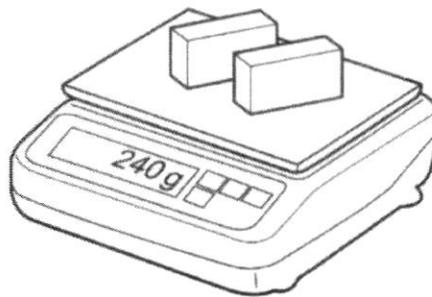


Fig. 2.1

- (a) Name the measuring instrument in Fig. 2.1.

..... [1]

- (b) Calculate the density of cheese in g/cm^3 .

density = g/cm^3 [2]

- (c) One block of cheese was cut into three equal pieces as shown in Fig. 2.2.

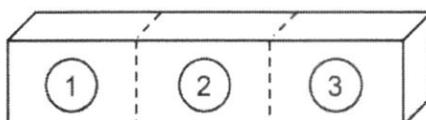


Fig. 2.2

- (i) State the density of one piece of cheese.

density = g/cm^3 [1]

- (ii) One piece of cheese was accidentally dropped into a glass of milk with a density of 1.026 g/cm^3 .

Predict if the cheese would float or sink in the glass of milk.

..... [1]

[Total: 5]

3 (a) In Fig. 3.1, **A**, **B**, **C**, **D**, **E** and **F** represent the particles in different substances.

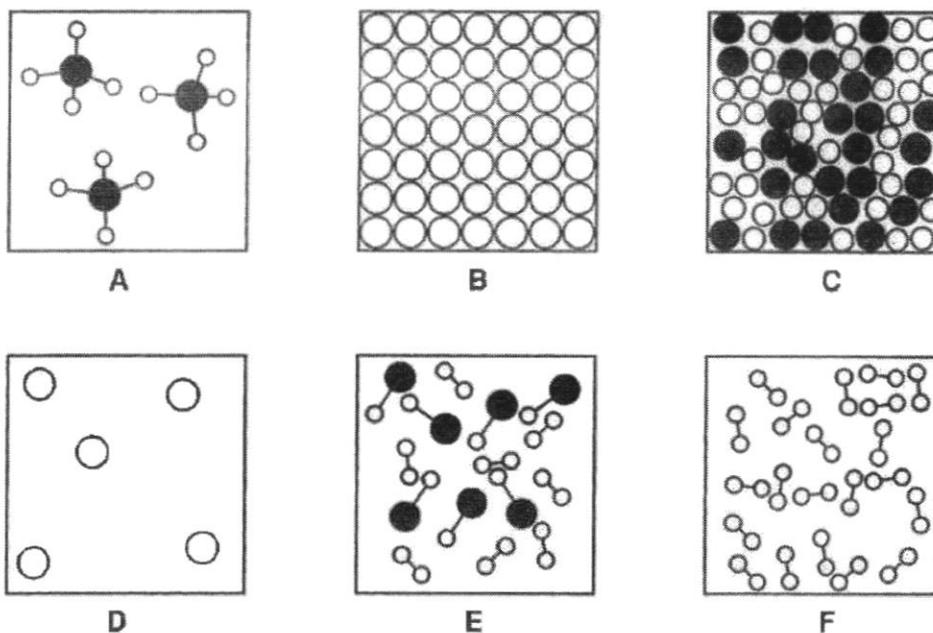


Fig. 3.1

Which one of **A**, **B**, **C**, **D**, **E** and **F** *best* represents?

- | | | | |
|-------|--|-------|-----|
| (i) | a compound only | | [1] |
| (ii) | a mixture of an element and a compound | | [1] |
| (iii) | a mixture of elements | | [1] |

- (b) A student conducted an experiment to investigate the rate of dissolving 15 g of salt in 50 cm³ of water. She set up four different beakers with different conditions and stirred the contents at the same rate. The results are shown in Table 3.1.

Table 3.1

beaker	temperature of water/ °C	particle size of salt	time taken for 15 g of salt to dissolve/ s
1	28	small	94
2	28	big	218
3	50	big	145
4	50	small	65

- (i) From the results in Table 3.1, state what the student can conclude about the **rate** of dissolving salt in beakers 1 and 2.

.....
 [1]

- (ii) Temperature of water can also affect the rate of dissolving salt in water.

By selecting a set of two beakers from Table 3.1, state what the student can conclude about the relationship between temperature and rate of dissolving salt in water.

beaker and beaker

.....
 [2]

- (iii) Describe how the student can modify the experiment to find out if ethanol is a better solvent to dissolve salt faster compared to water.

.....

 [2]

[Total: 8]

4 Table 4.1 shows the solubility of four substances, **A**, **B**, **C** and **D** in water.

Table 4.1

substance	solubility in water/ g cm ⁻³
A	2.48
B	0.00
C	3.05
D	1.63

A mixture containing substances **A**, **B**, **C** and **D** are separated using chromatography. The set-up is shown in Fig. 4.1.

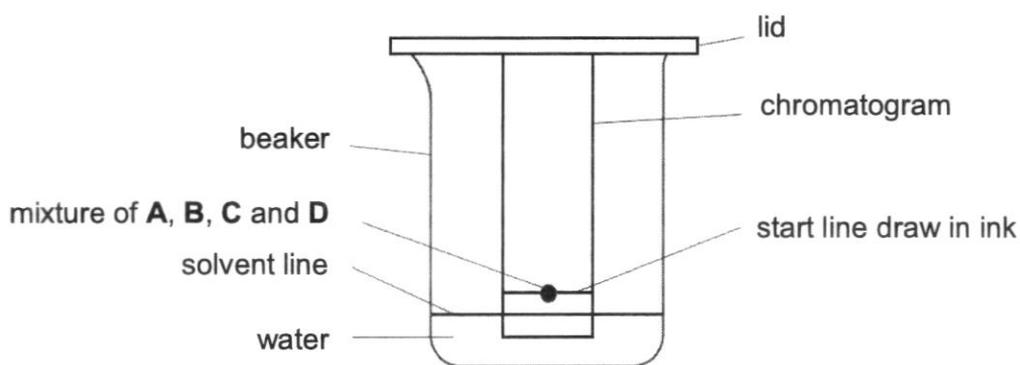


Fig. 4.1

(a) Identify a mistake found in the set-up and explain why this mistake resulted in the failure of the separation technique.

.....

..... [1]

- (b) Given that the mistake in (a) is corrected, sketch how the results of this separation technique will look like at the end of 15 minutes in Fig. 4.2. Label the positions of substances **A**, **B**, **C** and **D** clearly. [2]



Fig. 4.2

[Total: 3]

- 5 (a) Fig. 5.1 shows the position of the eye of two observers, X and Y, a plane mirror and an object A.

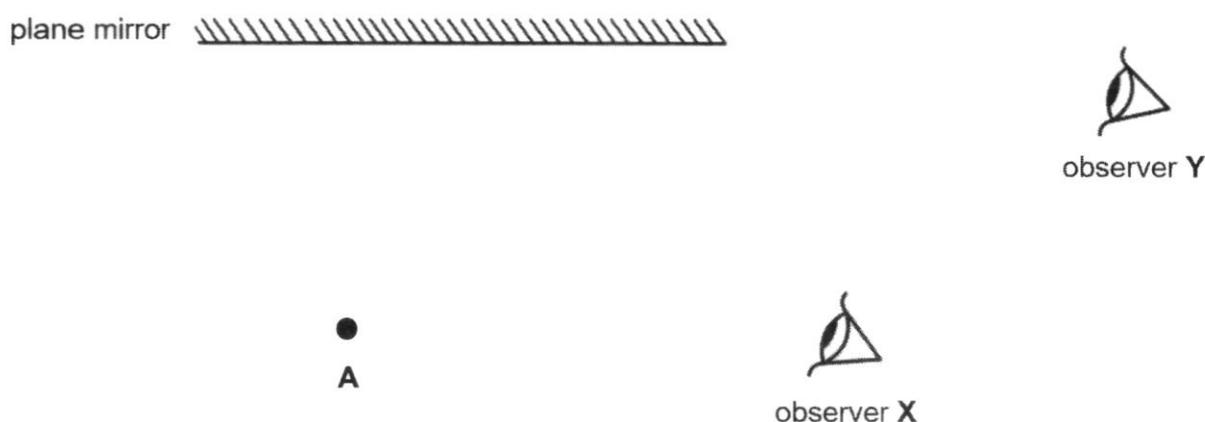


Fig. 5.1

- (i) On Fig. 5.1, draw the image of object **A** in the plane mirror. Label the point as **A'**. [1]
- (ii) On Fig. 5.1, complete the ray diagram by drawing a single light ray to show that observer **X** is able to see object **A** in the plane mirror. [2]
- (iii) Explain why observer **Y** in Fig. 5.1 is unable to see the image of object **A** in the plane mirror.

 [1]
- (iv) Suggest a type of mirror which can replace the plane mirror such that observer **Y** can see the image of object **A** in the mirror.
 [1]

- (b) White light, when incident on a glass prism, undergoes dispersion as shown in Fig. 5.2.

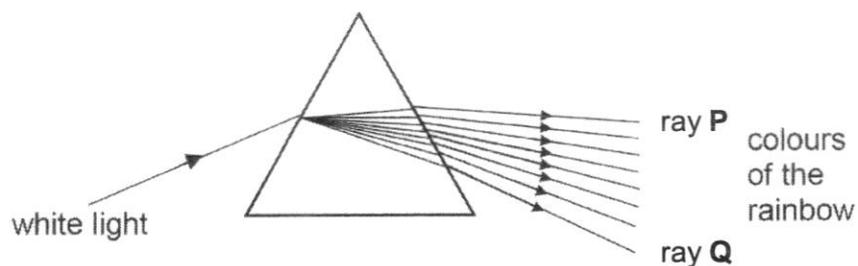


Fig. 5.2

State the colours of rays **P** and **Q**.

ray **P**

ray **Q** [1]

- (c) The speed of light in a material **W** is estimated to be 2 900 000 m/s. It is known that material **W** has a lower optical density than another material **V**.

Compare the speed of light in material **V** with the speed of light in material **W**.

.....

..... [1]

[Total: 7]

6 Fig. 6.1 shows the cell membrane of a root hair cell.

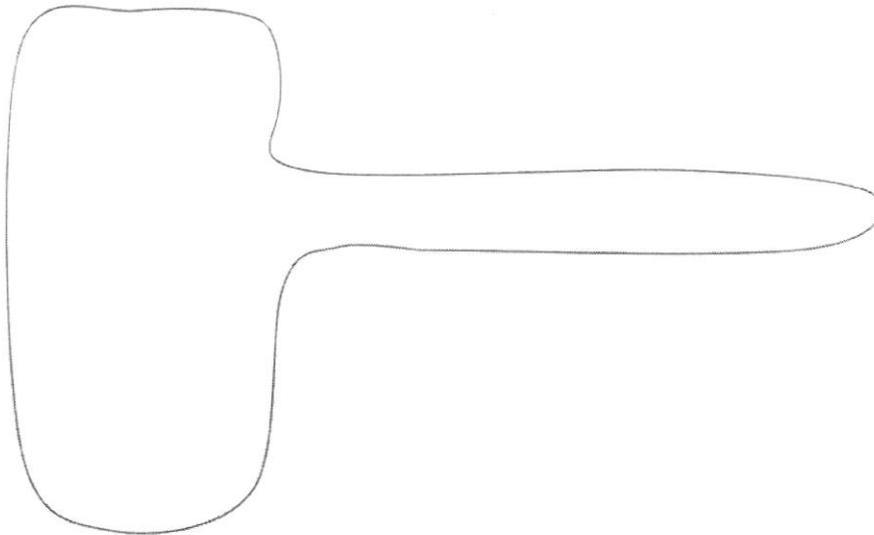


Fig. 6.1

(a) Complete Fig. 6.1 to show the cell structures that are found only in a root hair cell. [3]

(b) Describe how the structure of a root hair cell helps in its function.

.....
.....
.....
..... [2]

[Total: 5]

7 (a) Fig. 7.1 shows labelled arrows illustrating the changes in matter.

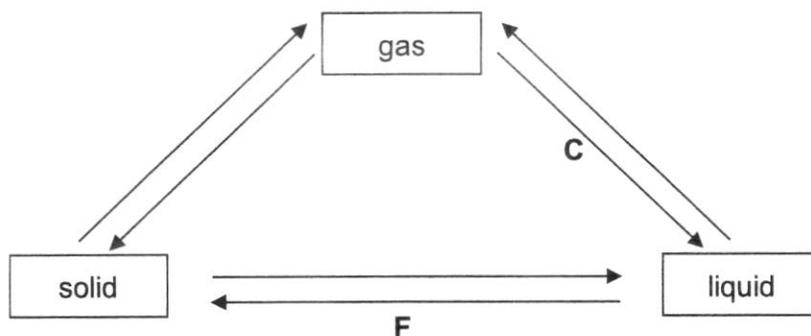


Fig. 7.1

- (i) State the process that occurs at F.
 [1]
- (ii) State one similarity between processes C and F.

 [1]

(b) The melting and boiling points of various substances are shown in Table 7.1.

Table 7.1

substance	melting point / °C	boiling point / °C
A	-219	-183
B	- 95	56
C	37	382
D	-105	20

- (i) Determine the physical state of **A** at -170 °C. [1]
- (ii) Using the idea of particulate nature of matter, describe the arrangement of particles of substance **C** at 20 °C.

 [2]

[Total: 5]

- 8 (a) Complete Table 8.1 by filling in the sub-atomic particles found in an atom and their mass and relative charge.

Table 8.1

sub-atomic particle	mass	relative charge
	1	
		0

[3]

- (b) Table 8.2 gives some information for the atom of an element **X** found in the Periodic Table.

Table 8.2

symbol of element	nucleon number	number of protons	number of neutrons	number of electrons	electronic configuration
X					2.8.1

- (i) Complete Table 8.2 by filling in the blanks. [2]
- (ii) Draw the electronic structure of the atom of element **X** in the space provided.

[1]

- (iii) Circle the term which describes element **X**.

metallic / non-metallic

[1]

- (c) In the early 1900s, the scientist, J.J. Thomson imagined the structure of the atom to be like a plum pudding.

Fig. 8.1 shows Thomson's plum pudding model of the atom. With the advancement of technology, scientists have refined the model of the atom and named it the planetary model.

Fig. 8.2 shows the planetary model of the atom.

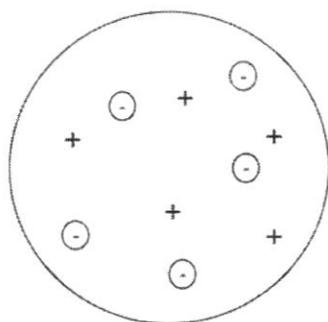


Fig. 8.1

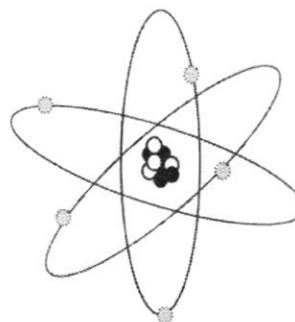


Fig. 8.2

- (i) Describe one way in which the plum pudding model of the atom is similar to the planetary model of the atom.

.....
 [1]

- (ii) Describe one way in which the plum pudding model of the atom is different from the planetary model of the atom.

.....

 [1]

[Total: 9]

END OF PAPER

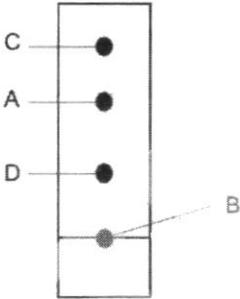
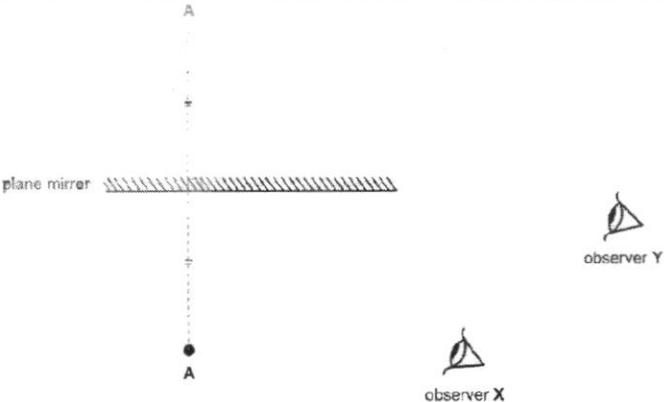
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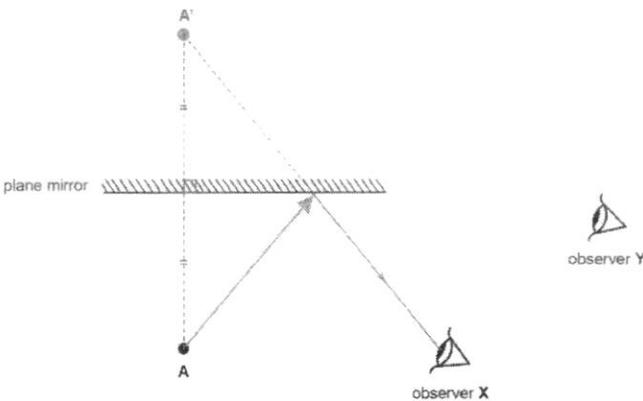
Section A

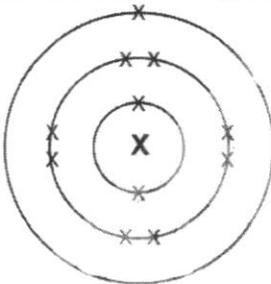
1	2	3	4	5	6	7	8	9	10
D	C	A	B	C	B	D	B	A	A
11	12	13	14	15	16	17	18	19	20
A	C	D	C	D	C	C	D	B	A
21	22	23	24	25	26	27	28	29	30
C	B	B	A	A	B	A	B	C	C

Section B

Qn	Answers	Mark
1(a)(i)	time taken for hair to change colour ;	[1]
1(a)(ii)	any one <ul style="list-style-type: none"> • volume of water used • brand / type of doll used ; 	[1]
1(b)(i)	the higher the temperature AND the faster the hair changes colour / the shorter the time taken for the hair to change colour ;	[1]
1(b)(ii)	a hypothesis is not based on experimental evidence / a hypothesis is a prediction but a conclusion is based on experimental evidence OR a hypothesis is formed before the experiments are conducted but a conclusion is formed after experiment is conducted ;	[1]
1(c)	instrument to measure time: (digital) stopwatch ; instrument to measure volume of water: measuring cylinder ;	[2]
1(d)(i)	Yong AND his results are much closer to one another than Hock's results ;	[1]
1(d)(ii)	we do not know what is the true / definite / actual value of time taken for hair to change colour ;	[1]
		[8]
2(a)	electronic balance ;	[1]
2(b)	volume of one block of cheese = $2 \times 5 \times 10 = 100 \text{ cm}^3$; $\rho = m / v$ = $120 / 100$ = 1.2 g / cm^3 ;	[2]
2(c)(i)	1.2 g / cm^3 ;	[1]
2(c)(ii)	the cheese sank to the bottom in the glass of milk ;	[1]
		TOTAL [5]

Qn	Answer	Mark
3(a)(i)	A ;	[1]
3(a)(ii)	E ;	[1]
3(a)(iii)	C ;	[1]
3(b)(i)	as the <u>particle</u> size of salt decreases, rate of dissolving salt increases ;	[1]
3(b)(ii)	Beakers 1 & 4 OR Beakers 2 & 3 ; as the temperature of water increases, rate of dissolving salt increases ;	[2]
3(b)(iii)	change liquid / solvent to ethanol and repeat the steps described in (b) ; compare time taken for salt to dissolve in ethanol with that of water ;	[2]
TOTAL		[8]
4(a)	start line drawn in ink AND ink might be soluble in water / dissolve in water and interfere with the chromatogram result WTTE ;	[1]
4(b)		[2]
TOTAL		[3]
5(a)(i)		[1]

Qn	Answer	Mark
5(a)(ii)		[2]
5(a)(iii)	there are no light rays that are reflected on the mirror from the object that would land on observer Y's eyes WTTE	[1]
5(a)(iv)	convex mirror ;	[1]
5(b)	ray P red AND ray Q violet ;	[1]
5(c)	speed of light in material V is lower than that of material W RA ;	[1]
TOTAL		[7]
6(a)	correct drawing of cell wall ; (large central) vacuole ; nucleus ;	[3]
6(b)	has a long and narrow protrusion / extension OR elongated extension/protrusion ; to increase <u>surface area</u> for faster rate of absorption of water and mineral salts / ions ;	[2]
TOTAL		[5]
7(a)(i)	freezing ;	[1]
7(a)(ii)	any one: <i>macroscopic</i> <ul style="list-style-type: none"> • (thermal) energy / heat is released / given out / lost (to the environment) • Cooling process • Involve a change in state <i>microscopic</i> <ul style="list-style-type: none"> • particles have less (thermal) energy / heat • particles lose energy • particles move slower • the forces of attraction between particles increases • the distance / space between particles is decreases / closer 	[1]
7(b)(i)	gas ;	[1]

Qn	Answer	Mark												
7(b)(ii)	<u>Very closely packed</u> ; <u>orderly arranged</u> ;	[2]												
TOTAL		[5]												
8(a)	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>subatomic particles</th> <th>mass</th> <th>relative charge</th> </tr> </thead> <tbody> <tr> <td>proton</td> <td>1</td> <td>+1</td> </tr> <tr> <td>electron</td> <td>$\left(\frac{1}{1840}\right)$</td> <td>-1</td> </tr> <tr> <td>neutron</td> <td>1</td> <td>0</td> </tr> </tbody> </table>	subatomic particles	mass	relative charge	proton	1	+1	electron	$\left(\frac{1}{1840}\right)$	-1	neutron	1	0	[3]
subatomic particles	mass	relative charge												
proton	1	+1												
electron	$\left(\frac{1}{1840}\right)$	-1												
neutron	1	0												
8(b)(i)	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>symbol of element</th> <th>nucleon number</th> <th>number of protons</th> <th>number of neutrons</th> <th>number of electrons</th> <th>electronic configuration</th> </tr> </thead> <tbody> <tr> <td>x</td> <td>23</td> <td>11</td> <td>12</td> <td>11</td> <td>2.8.1</td> </tr> </tbody> </table> <p>correct number of electrons ; correct neutron number and number of protons and neutrons;</p>	symbol of element	nucleon number	number of protons	number of neutrons	number of electrons	electronic configuration	x	23	11	12	11	2.8.1	[2]
symbol of element	nucleon number	number of protons	number of neutrons	number of electrons	electronic configuration									
x	23	11	12	11	2.8.1									
8(b)(ii)		[1]												
8(b)(iii)	'metallic' is circled ;	[1]												
8(c)(i)	<p>both models have protons and electrons ;</p> <p>both have electrons?</p> <p>Both have protons?</p> <p>Both have five electrons?</p> <p>Both have five protons (REJECT)</p>	[1]												
8(c)(ii)	<ul style="list-style-type: none"> • scattered particles vs localised particles; <p>(e.g. the protons and neutrons are found in the centre of the planetary model but the protons and electrons are scattered throughout the atom in the plum pudding model)</p> <ul style="list-style-type: none"> • different types of sub-atomic particles; <p>3 different sub-atomic particles in planetary model/ Fig. 8.2 vs 2 different sub-atomic particles in plum pudding model/ Fig. 8.1</p> <ul style="list-style-type: none"> • presence/absence of nucleus; • presence/absence of <u>electron shells</u>; • presence/absence of neutrons; 	[1]												
		[9]												