

[SBPTrial11-01] What is the first step in a scientific investigation?

- A Making a hypothesis
- B Making an observation
- C Identifying the problem
- D Planning an experiment

Matter

[SPM08-01] Which substance is an element?

- A Air
- B Stim
- C Carbon
- D Naphthalene

[SBPTrial08-15] Which of the following substances is made up of atoms?

- A Argon
- B Nitrogen
- C Chlorine
- D Ammonia

[SPM08-10] Which substance is an ionic compound?

- A Ethanol, C₂H₅OH
- B Sulphur dioxide, SO₂
- C Tetrachloromethane, CCl₄
- D Magnesium oxide, MgO

[SBPdiag08-01] Which of the following substances contain molecules?

- A Zinc
- B Ethanol
- C Sodium chloride
- D Magnesium oxide

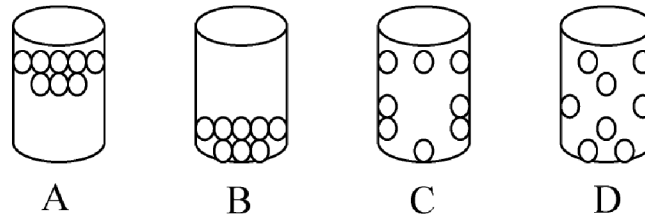
[SBPTrial11-14] Which of the following shows the correct type of particle for each substance?

	Atom	Molecule
A	Carbon	Carbon dioxide
B	Sulphur dioxide	Sulphuric acid
C	Sodium	Sodium chloride
D	Silicon dioxide	Silicon

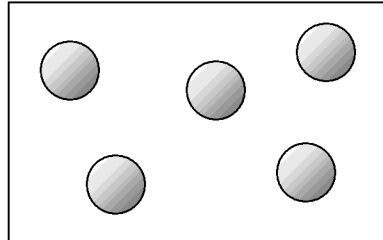
[SPM07-02] Which of the following shows the correct type of particle for each substance?

	Atom	Molecule	Ion
A	Water	Magnesium	Sodium chloride
B	Magnesium	Carbon dioxide	Sodium chloride
C	Sodium chloride	Carbon dioxide	Magnesium
D	magnesium	Sodium chloride	Carbon dioxide

[SBPdiag08-09] An enclosed cylinder is filled with helium atoms. Which diagram shows the arrangement of the helium atoms?



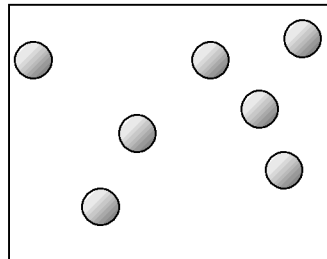
[SBPdiag06-09] The diagram shows the particles arrangement of a substance at room temperature.



What is the substance?

- A Water
- B Helium
- C Chlorine
- D Nitrogen

[SBPmidYear06-09] The diagram shows the arrangement of particles in a substance at room temperature.



This arrangement of particles can be found in

- A carbon
- B copper
- C oxygen
- D water

[MRSM04-32] Figure 11 shows the arrangement of particles found in four substances as named.

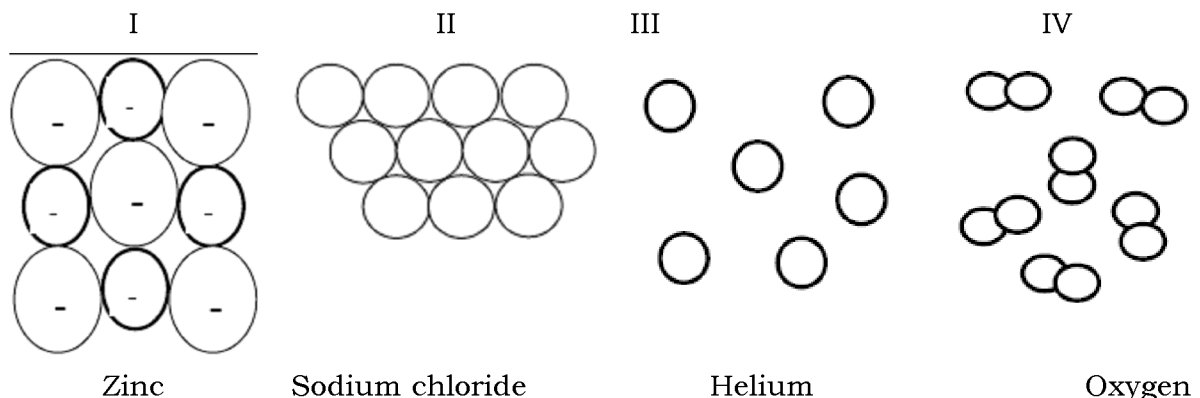
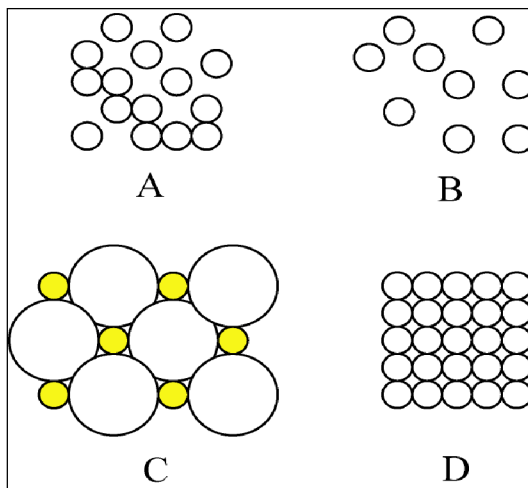


Figure 11

Which pairs of the arrangement of particles and the name of the substances are paired correctly?

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

[SBPmidYear06-09] Which of the following diagram represents magnesium oxide?



Kinetic theory of Matter

[SPM09-22] The following statements are about diffusion.

- **The tiny particles are discrete**
- **The tiny particles move randomly by themselves**

Which of the following situations are explained by the statements above?

- I bromine gas mixing with air
 II aqueous copper(II) sulphate moving through a gel
 III melting of lead(II) bromide
 IV combustion of magnesium in air

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

[SBPTrial07-01] Which of the following processes, proved the kinetic theory of matter?

- A Diffusion
 B Photosynthesis
 C Respiration
 D Neutralization

[SPM07-22] A sample of carbon dioxide gas is cooled.

Which of the following is true about the velocity and the size of its particles?

	Velocity of the particles	Size of the particles
A	Increases	Decreases
B	Increases	No change
C	Decreases	Decreases
D	Decreases	No change

[SBPTrial10-01] Diagram 1 shows an experiment to study the particles theory of matter.

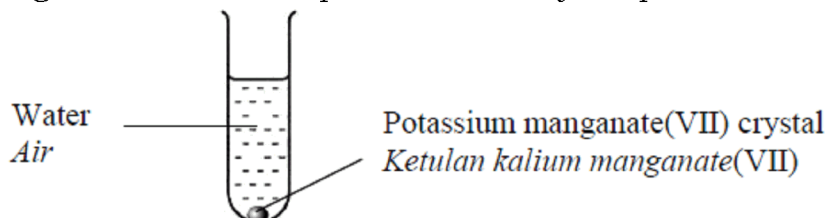
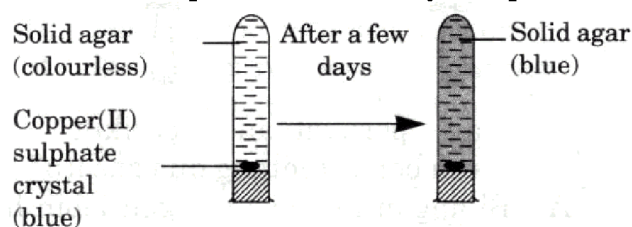


Diagram 1

After 30 minutes, the water turns purple. What is the process occur in the experiment shown in the diagram 1?

- A Melting process
- B Freezing process
- C Diffusion process
- D Evaporation process

[SPM05-21] The diagram shows an experiment to study the particle theory of matter.



Which of the following is the best explanation of the observation in the experiment?

- A agar dissolves copper (II) sulphate
- B copper (II) sulphate is an ionic compound
- C particles in copper (II) sulphate are minute and discrete
- D the attractive force between agar and copper (II) sulphate particles is strong

[SBPmidYear07F4-02] Diagram 2 shows the set up of apparatus to investigate the diffusion in a liquid. After a few hours, the whole test tube of water becomes purple in colour.

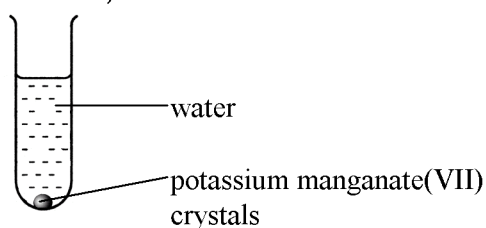
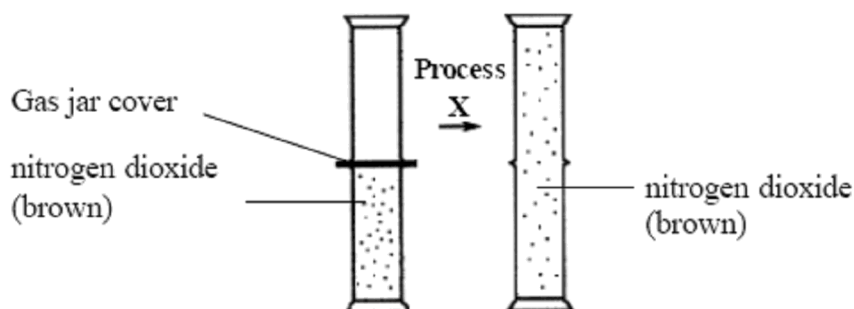


Diagram 2

Which of the following statements explain the observation?

- A Potassium manganate(VII) is denser than water.
- B Matter is made up of particles that expand uniformly.
- C Matter is made up of particles that are moving randomly.
- D Particles in potassium manganate(VII) move faster in water.

[MRSM06–01] The diagram shows the apparatus set – up to investigate Process X.



What is Process X?

- A Diffusion
- B Condensation
- C Evaporation
- D Sublimation

[MRSM04-21] Figure 6 shows an experiment to compare the rate of diffusion between ammonia and hydrogen chloride gases.

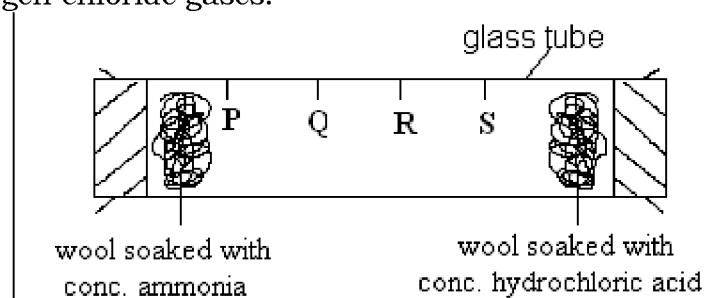


Figure 6

The bigger the mass of a particle, the slower the velocity of the particle.

Based on the above statement, where will the white fumes of ammonium chloride first formed?

[Molar mass: $\text{NH}_3 = 17 \text{ g mol}^{-1}$, $\text{HCl} = 36.5 \text{ g mol}^{-1}$]

- A P
- B Q
- C R
- D S

The change of Physical State

[SPM11-05] Which process occurs when iodine crystals are heated at room temperature and pressure?

- A Melting
- B Freezing
- C Evaporation
- D Sublimation

[SBPmidYear06-01] Which of these substances will sublime when heated?

- A Ice
- B Iodine
- C Chlorine
- D Sodium chloride

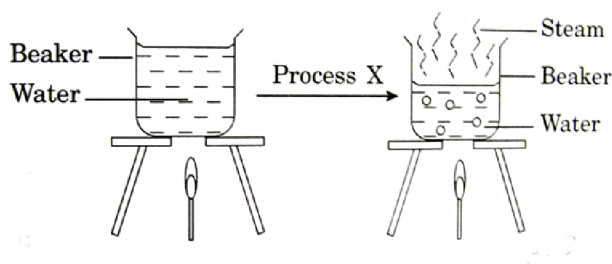
[SBPdiag06-17] Which of the following substances sublimes when heated?

- A Ammonium chloride
- B Potassium chloride
- C Lead (II) chloride
- D Zinc chloride

[SBPmidYear07F4-03] Which of the following solids changes to gaseous state when it is heated?

- A Lead(II) iodide
- B Silicon dioxide
- C Ammonium chloride
- D Copper(II) carbonate

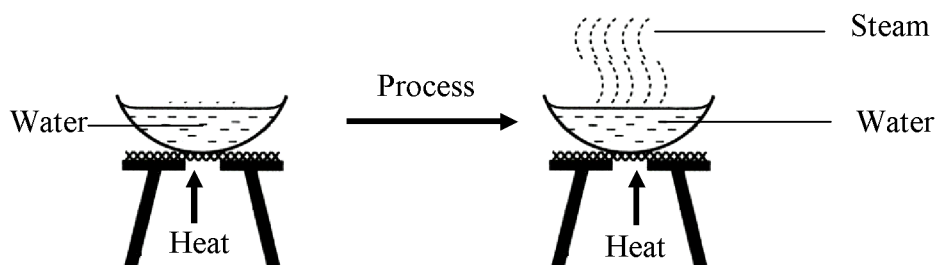
[SPM04-01] The diagram shows the change of state of matter



Which of the following is process X?

- A melting
- B boiling
- C freezing
- D condensation

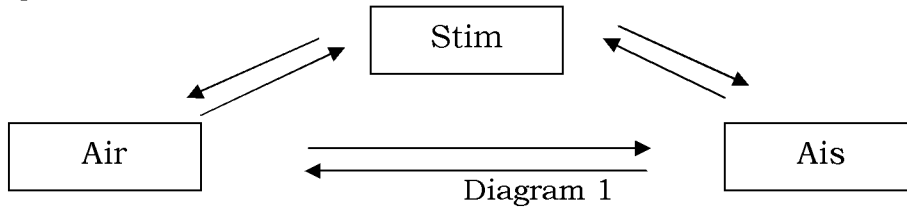
[SBPmidYear06-06] The diagram shows the change of state of matter.



The change of state is called

- A boiling
- B melting
- C sublimation
- D condensation

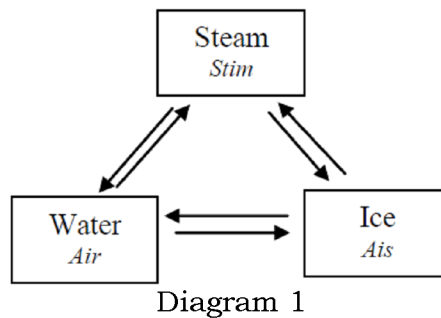
[SPM09-06] Diagram 1 shows the inter-conversion of the states of matter of a substance



Which inter-conversion involves the release of energy?

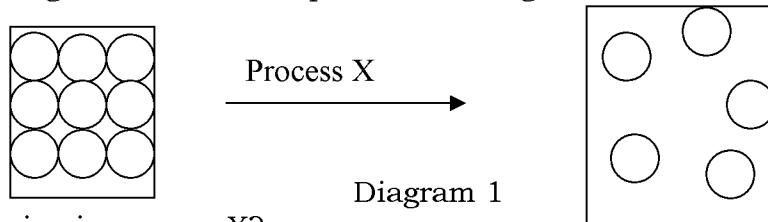
- A steam → ice
- B water → steam
- C ice → water
- D ice → Steam

[MRSM07-01] Diagram 1 shows the inter conversion of water, steam and ice. In which conversion do H₂O molecules lose speed?



- A Ice → water
- B Ice → steam
- C Water → steam
- D Steam → ice

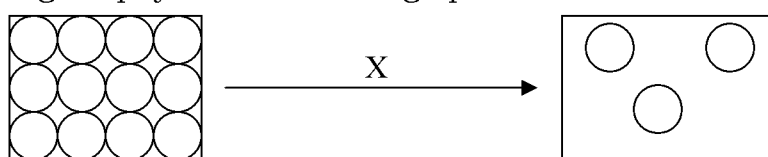
[SBPTrial09-01] Diagram 1 shows the particles arrangement for the change of state of matter.



Which of the following is process X?

- A Evaporation
- B Sublimation
- C Condensation
- D Boiling

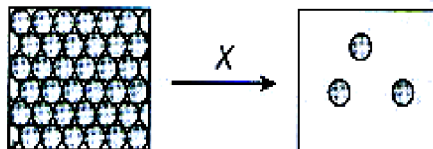
[SBPmidYearF5-22] The diagram shows the arrangement of particles for a type of matter that undergoes a change in physical state through process X.



What is process X?

- A Melting
- B Boiling
- C Freezing
- D Sublimation

[SBPTrial07-27] The figure shows the arrangement of particles of a substance that undergoes the change of state through process X



What is process X?

- A Melting
- B Boiling
- C Freezing
- D Sublimation

[SBPmidYear07F4-19] The melting point of substance Z is $-112\text{ }^{\circ}\text{C}$ and its boiling point is $78\text{ }^{\circ}\text{C}$. What is the physical state of substance Z at room temperature?

- A Gas
- B Solid
- C Liquid
- D Gas and liquid

[MRSM05-21] The melting point and boiling point of substance M is $-37\text{ }^{\circ}\text{C}$ and $5\text{ }^{\circ}\text{C}$ respectively. The physical state of substance M at room temperature is

- A gas
- B liquid
- C solid
- D gas and liquid

[SPM11-31] Substance R has a melting point of $-100\text{ }^{\circ}\text{C}$ and a boiling point of $-35\text{ }^{\circ}\text{C}$. What is substance R?

- A Sulphur
- B Alcohol
- C Carbon dioxide
- D Sodium hydroxide

[MRSM11-36] Table 4 shows the melting point and boiling point of substances W, X, Y and Z.

Substance	Melting point ($^{\circ}\text{C}$)	Boiling point ($^{\circ}\text{C}$)
W	-187	-126
X	-78	70
Y	75	130
Z	114	444

Table 4

Which substance is a liquid at room temperature?

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

[MRSM10-22] Table 2 shows the melting and boiling points of substances V, W, X and Y.

Substances	Melting point (°C)	Boiling point(°C)
V	- 23	7
W	64	298
X	- 256	- 192
Y	12	135

Table 2

Which of the following substances is in liquid form at room temperature?

- A V
- B W
- C X
- D Y

[SBPdiag06-25] The table shows the melting point and boiling point of four substances, W, X, Y and Z.

Substance	Melting point (°C)	Boiling point (°C)
W	-187	-126
X	75	130
Y	114	444
Z	-79	68

Which of the substances is a liquid at 60 °C?

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

[SBPmidYear06-21] The table shows the melting points of substances P, Q, R and S.

Substance	Melting point/°C
P	90
Q	25
R	-35
S	-273

Which of the following substance is a solid at 28 °C?

- A P
- B Q
- C R
- D S

[MRSM07-21] Table 2 shows the melting point and boiling points of five compounds J, K, L, M and N. Which substance exists as a liquid at room temperature?

Substance	Melting point(°C)	Boiling point(°C)
J	-160	-142
K	-32	55
L	-96	64
M	42	172
N	142	292

Table 2

- A J only
- B J and K only
- C K and L only
- D M and N only

[SBPmidYearF5-23] The table shows the melting points and boiling points of substances S, T, U, V and W.

Substance	Melting point/°C	Boiling point/°C
S	- 182	- 162
T	- 23	77
U	- 97	65
V	41	182
W	132	290

Which substance exists as a gas at room temperature?

- A S only
- B S and T only
- C T and U only
- D V and W only

[SBPmidYearF508-32] The table shows the melting point and boiling point for substances P, Q, R and S.

Substance	Melting point/°C	Boiling point/°C
P	79	108
Q	-180	-120
R	-95	69
S	-160	-90

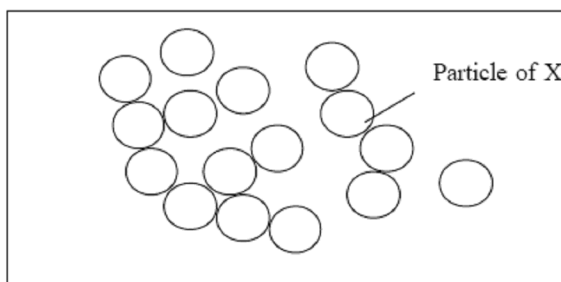
Which of the substances exists as a liquid at room temperature?

- A Q
- B R
- C S
- D P

[MRSM07-21] Substance T exists as a liquid at temperature of 120 °C. Which of the following is the probable melting point and boiling point of substance T?

	Melting point /°C	Boiling point /°C
A	2	62
B	-41	21
C	140	190
D	75	130

[MRS06-21] The diagram shows the particle arrangement of substance X at 100 °C.



Which is the most probable melting and boiling points for X?

	Melting point/°C	Boiling point/°C
A	-123	-78
B	-17	135
C	0	78
D	111	400

[SBPTrial08-44] Table 4 shows the melting and boiling points of substances P, Q, R and S.

Substance	Melting point/°C	Boiling point/°C
P	-59	60
Q	48	130
R	-110	-70
S	128	470

Table 4

Which of the following substances has the highest kinetic energy at room temperature?

- A P
- B Q
- C R
- D S

[MRS10-46] The following statements describe the particles of a substance at room temperature.

- The particles are far apart from each other.
- Forces of attraction between particles are weak.
- The particles have high kinetic energy and move randomly.

Which of the following substance match the criteria?

	Substance	Melting point (°C)	Boiling point (°C)
A	R	114	443
B	S	-11	44
C	T	-65	-8
D	U	20	98

[SPM09-27] Table 1 shows the melting point and boiling point of four substances.

substances	Melting point (°C)	Boiling point (°C)
W	- 157	- 9
X	- 13	55
Y	80	196
Z	256	300

Which substance is a liquid at room temperature?

- A W
B X
C Y
D Z

[MRSM09-36] Table 3 shows the melting point and boiling point of substances P, Q, R and S.

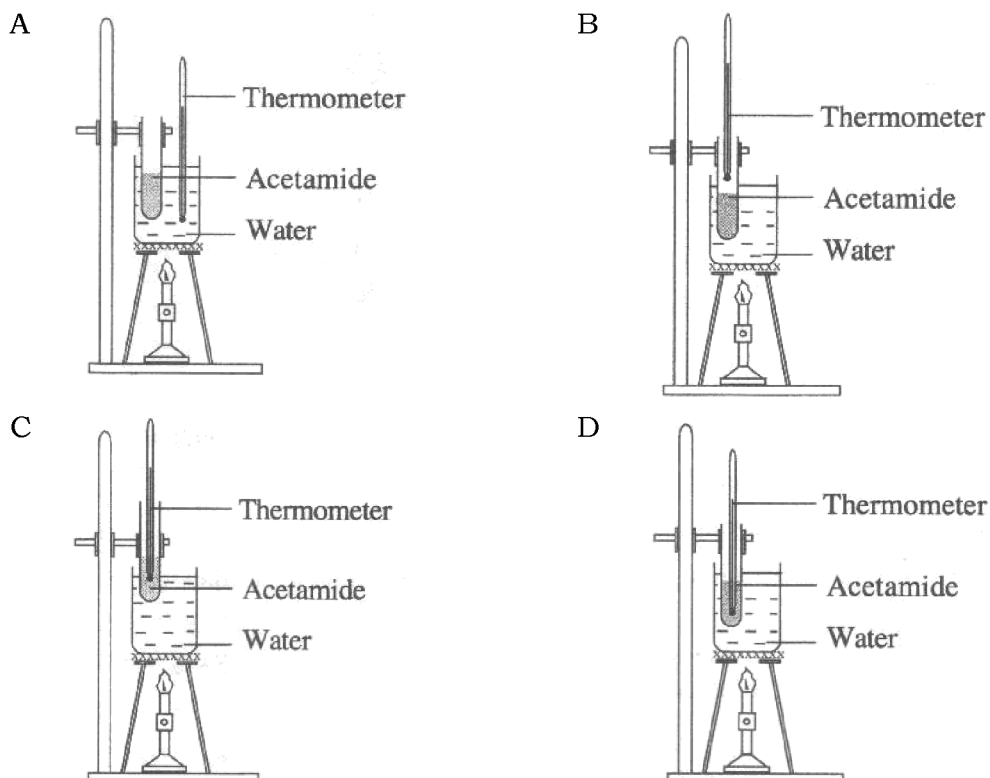
Substance	Melting point (°C)	Boiling point(°C)
P	-187	-126
Q	-78	70
R	75	130
S	114	444

Table 3

Which of the following substance is in liquid state at room temperature?

- A P
B Q
C R
D S

[SPM06-01] Which of the following set ups of apparatus is correct to determine the melting point of acetamide?



[SPM03-24] Table 1 shows the melting points and types of particles of four substances.

Solid substance	Melting point/ °C	Type of particle
G	80	Molecules
J	320	Ions
L	780	Ions
M	3 000	Atoms

Based on Table 1, which solid substance becomes an electrolyte (melting) when it is heated to a temperature of 350 °C?

- A G
- B J
- C L
- D M

[SPM11-20] Diagram 3 is a graph of temperature-time for the heating of substance Q.

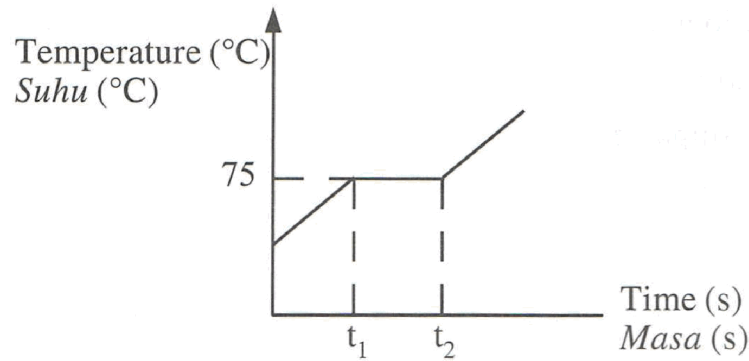
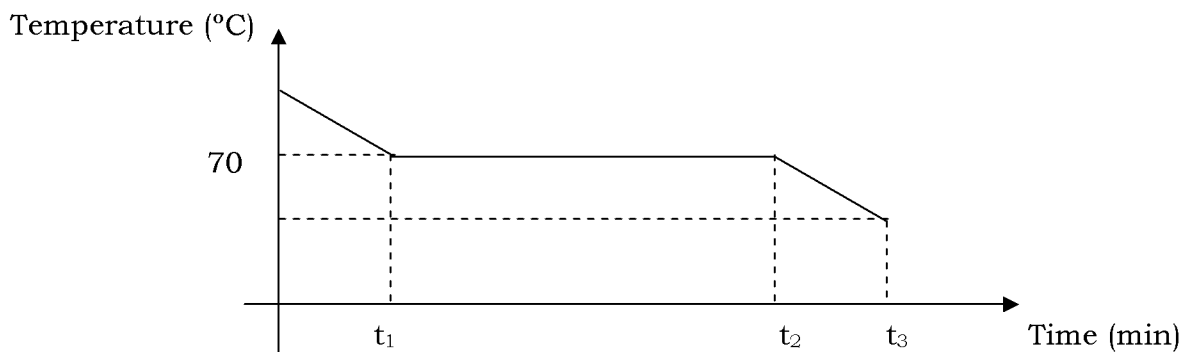


Diagram 3

Which statement is correct about the property of substance Q based on the graph?

- A Is a gas at room temperature
- B Experiences physical changes at temperature 75°C
- C Releases heat at time interval t_1 and t_2
- D Only in liquid condition at time interval t_1 and t_2

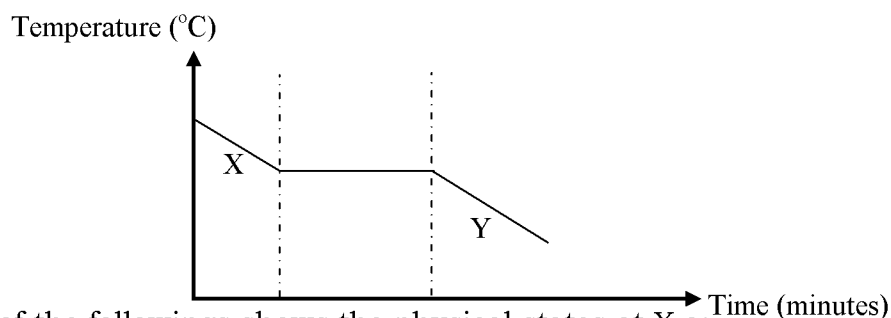
[SPM07-32] Diagram 6 shows the cooling curve of liquid Y.



Which statement can be deduced from Diagram 6?

- A At t_1 , Y exist as solid
- B The freezing point of Y is 70 °C
- C From t_1 to t_2 , Y does not release heat energy
- D From t_2 to t_3 , the particles are less closely packed

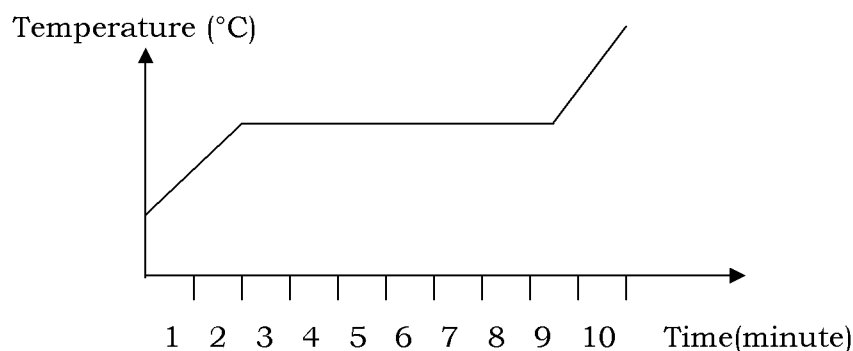
[SBPmidYear06-25] The diagram shows the cooling of liquid naphthalene.



Which of the followings shows the physical states at X and Y.

	<u>X</u>	<u>Y</u>
A	Solid	Liquid
B	Gas	Solid
C	Liquid	Gas
D	Liquid	Solid

[SBPmidYearF5-04] The diagram shows a graph of temperature against time for the heating of substance X



Which of the following is true about substance X at the sixth minute?

- A All the molecules move freely
- B Molecules are closely packed and atoms move freely
- C Molecules and atoms move freely
- D Some molecules are closely packed while some molecules move freely

[MRSM04-41] Figure 14 shows the cooling curve for gas J.

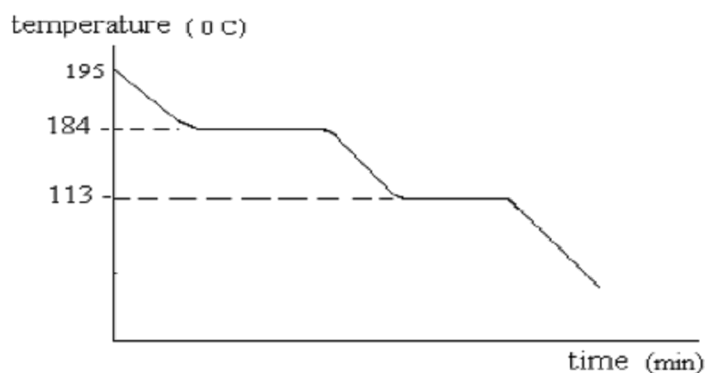
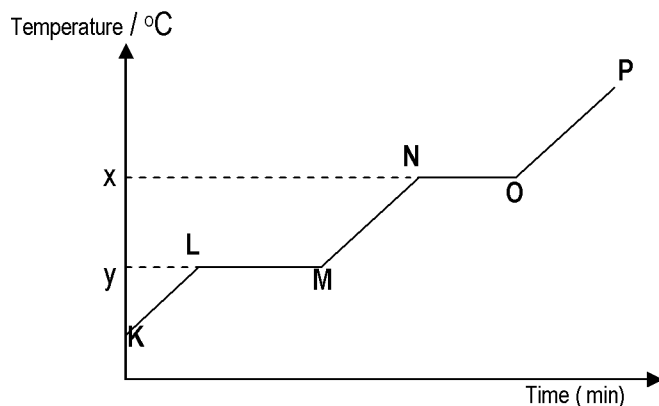


Figure 14

Which of the following is true for substance J?

	Physical state at room temperature	Types of particles
A	Solid	Molecule
B	Liquid	Molecule
C	Solid	Ion
D	Gas	Atom

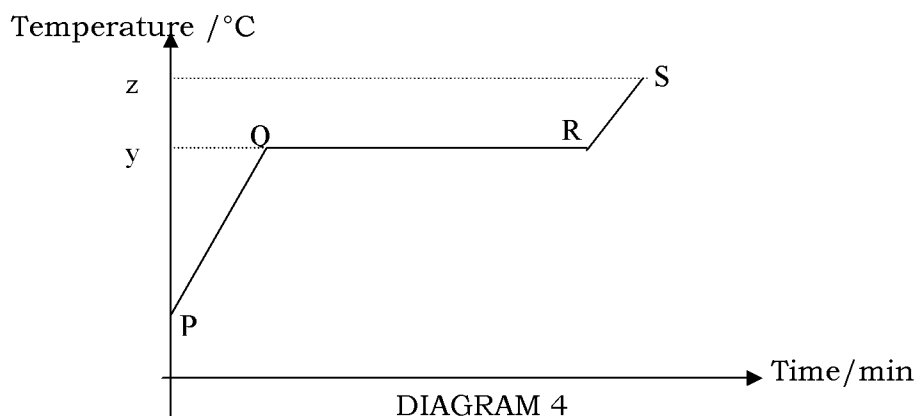
[SBPdiag06-33] The graph shows the heating curve of solid R.



Which of the following statements is true?

- A The melting point of R is x.
- B At L, substance R exists as liquid only
- C The process that occurs at O is freezing
- D At N, energy is used to break up the bonds between particles

[SBPmidYear07F4-20] Diagram 4 shows the curve obtained when a solid X is heated.

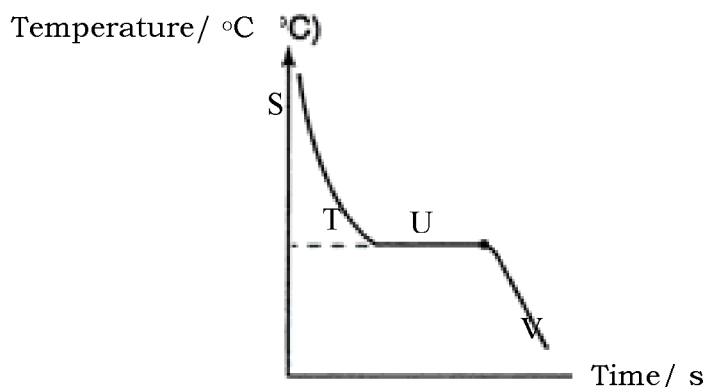


Which of the following statements are true about the curve?

- I At Q, solid X begins to melt.
- II At PQ, particles in X released heat to the surroundings.
- III Solid X melted completely at S.
- IV The melting point of X is y °C.

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

[SBPmidYearF508-22] The graph shows the cooling curve of acetamide.



Which of the following statements are true about the particles in acetamide from S to V?

- I Heat energy is released by particles
- II The kinetic energy of the particles increase
- III The particle are closer to one another
- IV The movement of the particles becomes slower

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

[MRSM03-14]

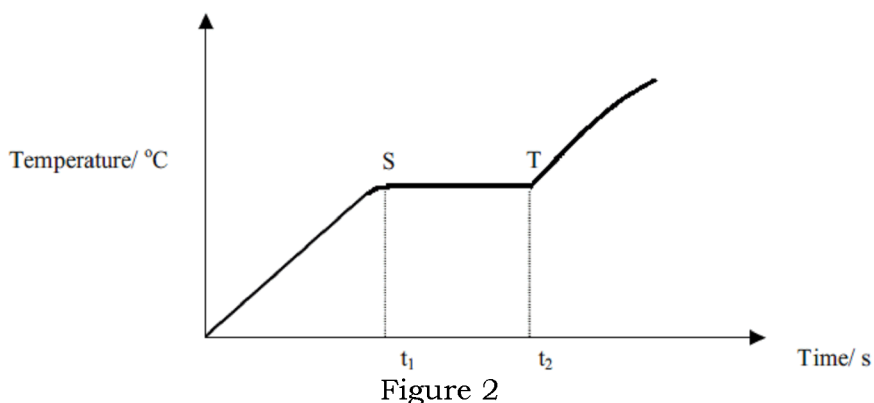


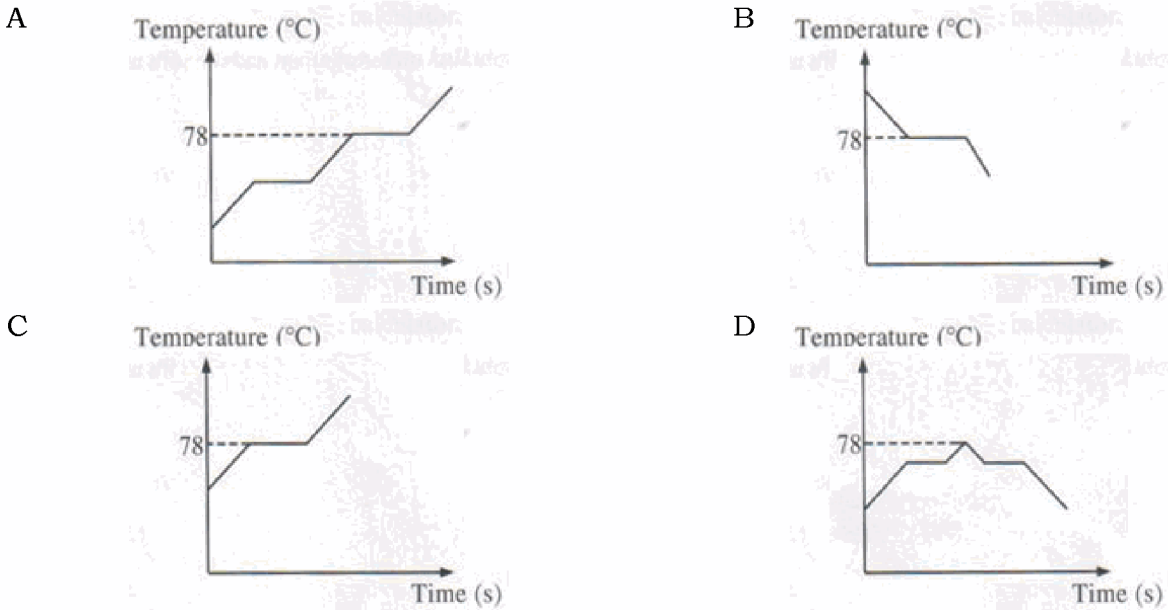
Figure 2

Figure 2 shows the melting curve of substance M. Which of the following describe what happen between points S and T?

- I Substance M is both in solid and liquid form
- II The force of attraction between particles are getting weaker
- III The particles rotate and vibrate at their fixed position
- IV Heat energy, which is absorbed at this stage, is used to overcome the forces of attraction between particles

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

[SPM10-02] Solid x is heated in a boiling tube and the temperature is recorded at regular time intervals. If the melting point of X is 78 °C, which graph represents the heating curve of X?



[MRSM09-21] A solid substance is heated until it turns to vapour. Diagram 8 shows the graph of temperature against time taken in the experiment.

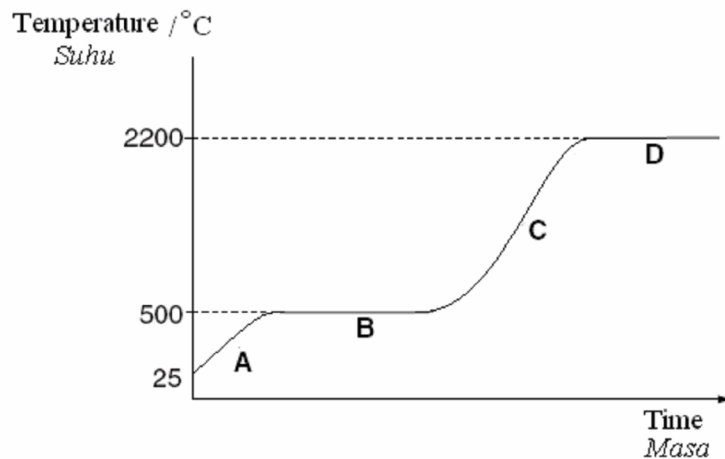
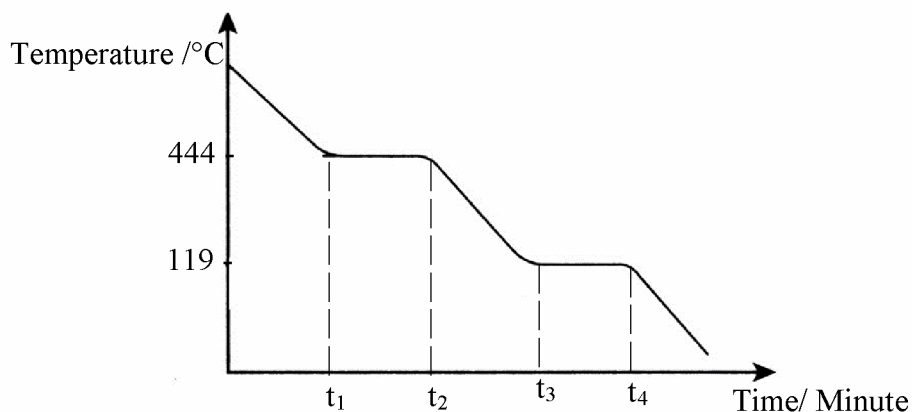


Diagram 8

Which part of the graph does melting process occurs?

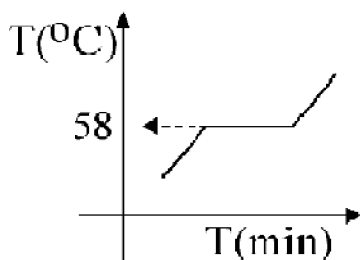
[SPM03-21] Diagram 6 shows the cooling curve for gas X.



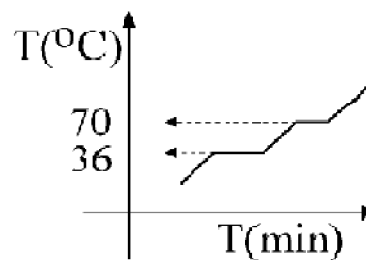
Which of the following statement is true?

- A From 0 to t_1 heat energy is absorbed
 B From t_1 to t_2 forces between particles are overcome
 C From t_2 to t_3 the kinetic energy of particles increased
 D From t_3 to t_4 the heat energy released is equal to the heat energy lost to the surroundings.

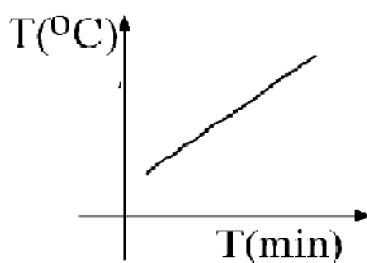
[SBPdiag08-41] Which of the following graphs shows the temperature (T) against time (t) when a mixture of pentane (boiling point 36°C) and hexane (boiling point 70°C) is distilled?



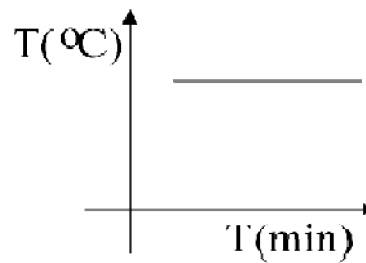
A



B



C



D

History of Development Atomic Model

[MRSM10-01] Which of the following scientists discovered proton?

- A Neils Bohr
 B J. J Thomson
 C James Chadwick
 D Ernest Rutherford

[SBPTrial10-15] Which of the following statements is true about atomic model proposed by Ernest Rutherford?

- A The electrons in an atom move in shells around the nucleus which contains proton.
 B The atom was described as a sphere of positive charge embedded with electron.
 C The nucleus of the atom contains proton and neutrons.
 D The nucleus of the atom contains proton.

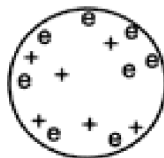
[SPM08-23] The following statements refer to the contributions of a scientist in the development of ideas about atomic structure.

- Discovered proton
- Most of the mass of the atom is in the nucleus
- The electrons move in empty space

Who was the scientist?

- A Neil's Bohr
- B John Dalton
- C J.J Thomson
- D Ernest Rutherford

[SBPdiag06-01] The diagram shows a model of an atom.



Who introduced this model?

- A Neils Bohr
- B John Dalton
- C J.J. Thomson
- D Ernest Rutherford

[SBPmidYear07F4-01] Diagram 1 shows the atomic model of an atom.

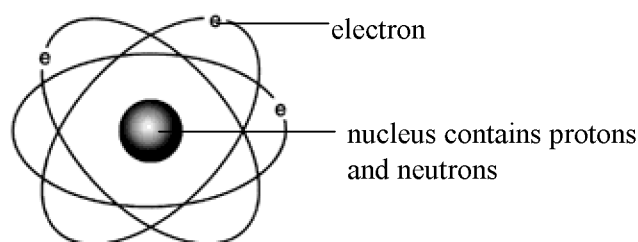
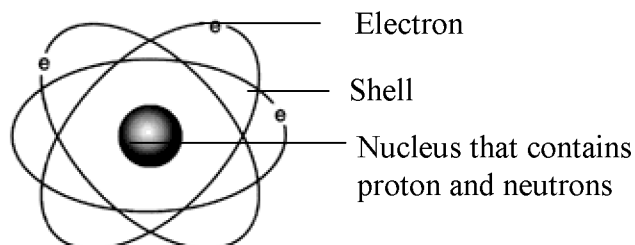


DIAGRAM 1

Which of the following scientists suggested the model?

- A Ernest Rutherford
- B James Chadwick
- C J.J. Thomson
- D Neils Bohr

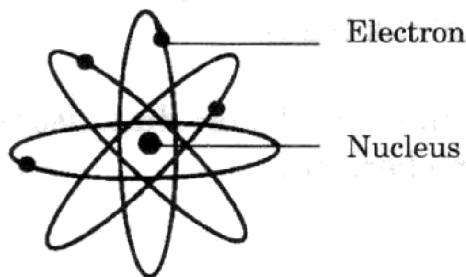
[SBPmidYearF508-02] The diagram shows a model of an atom.



Who introduced this model?

- A Neils Bohr
- B J.J Thomson
- C James Chadwick
- D Ernest Rutherford

[SPM05-01] The diagram shows a model of an atom.



Who introduced this model?

- A Neils Bohr
- B John Dalton
- C James Chadwick
- D Ernest Rutherford

[SPM03-14] Diagram 3 shows a model of an atom.

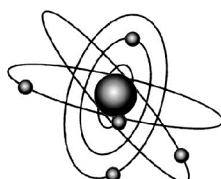


Diagram 3

Which of the following is true of the atomic model?

- I Proposed by Neil Bohr
 - II Was built based on the existence of the neutron
 - III Shows that electrons move in shells around the nucleus
 - IV Discovered through the bombardment experiment of alpha particles on gold foil
- A I and III only
 - B II and IV only
 - C I, II, and III only
 - D I, II, III and IV

[SBPmidYearF5-02] Which of the following atomic models was proposed by Ernest Rutherford?

- A The atom is the smallest particle
- B The atom is a positively charged sphere
- C The atom contains a nucleus that is surrounded by electrons moving at random
- D The atom contains a nucleus that is surrounded by electrons that move in certain shells.

Subatomic Particles of an Atom

[MRSM07-01] The nucleus of an atom contains

- A electrons only
- B neutrons only
- C both protons and neutrons
- D both protons and electrons

[MRS11-01] Diagram 1 shows the structure of an atom.

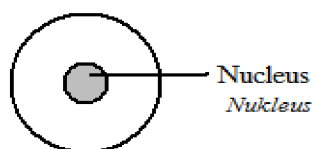


Diagram 1
Rajah 1

What are the subatomic particles in the nucleus?

- A Neutron only
- B Proton and neutron
- C Electron and proton
- D Electron and neutron

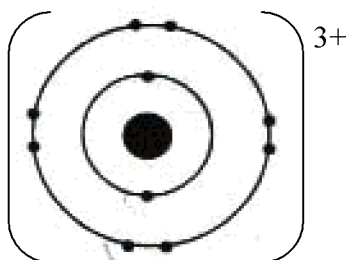
[SBPTrial08-02] What are the symbols of the elements of chromium, copper, manganese and potassium?

	Chromium	Copper	Manganese	Potassium
A	C	Co	Mg	K
B	C	Cu	Mn	P
C	Cr	Co	Mg	P
D	Cr	Cu	Mn	K

[SBPTrial08-27] Atom of oxygen-18 has 8 electrons. How many neutrons does an atom of oxygen-18 contains?

- A 6
- B 8
- C 10
- D 18

[SPM07-21] Diagram 6 shows the electron arrangement for the J^{3+} ion. An atom of element J contains 12 neutrons.



What is the nucleon number of element J?

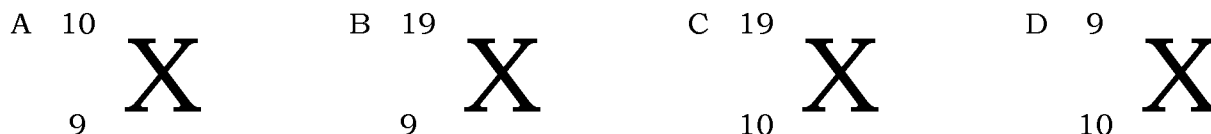
- A 10
- B 12
- C 22
- D 25

[MRS104-10] Which of the following statements is true about subatomic particles?

- A The number of protons changes in a chemical reaction.
- B Protons and neutrons are found in the nucleus of an atom.
- C In an atom, the number of protons equals the number of neutrons.
- D Subatomic particles have the same mass but differ in charges

Symbol of Element

[MRSM05-01] Atom X has a proton number 9 and the nucleon number is 19. Which of the following symbols is for atom X?



[MRSM09-01] Diagram 1 shows the atomic representation of an atom.

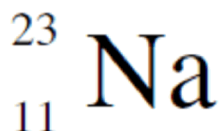


Diagram 1

Number 23 refers to

- A nucleon number
- B number of proton
- C atomic number
- D number of neutron

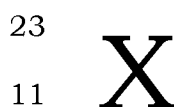
[SPM03-01] Diagram 1 shows the symbols for chlorine atom.



Which of the following is true based on the symbol in Diagram 1?

	Proton number	Nucleon number	Number of electrons
A	17	37	17
B	17	20	17
C	20	37	20
D	37	17	37

[SPM04-21] The diagram shows the atomic symbol of element X.



Which of the following is true about the subatomic particles of element X?

	Proton number	Nucleon number	Electron configuration
A	11	23	2.8.1
B	11	23	2.8.8.5
C	23	11	2.8.1
D	23	11	2.8.8.1

[SPM08-24] Diagram 2 shows the symbol for element X. X is not the actual symbol of the element.

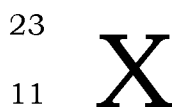


Diagram 2

Which of the following shows the electron arrangement and the number of neutrons in an atom of X?

	Electron arrangement	Number of neutrons
A	2.8.1	11
B	2.8.2	11
C	2.8.1	12
D	2.8.2	12

[MRSM07-22] Table 3 shows the number of protons for elements V, W, X, Y and Z.

Element	V	W	X	Y	Z
Number of protons	3	8	10	11	20

TABLE 3

Which of the following elements have the same number of valence electrons?

- A V and Z
- B W and X
- C V and Y
- D W and Z

[SPM11-34] Table 3 shows the proton numbers of elements, U, V, W and Z.

Element	U	V	W	Z
Proton number	8	9	10	11

Table 3

Which pair of particles has the same number of electrons?

- A U and V
- B W and Z
- C W and V⁻
- D Z and U²⁻

[SBPmidYear07F4-21] Diagram 5 shows the standard representation of beryllium atom.



DIAGRAM 5

What is the number of valence electrons of beryllium atom?

- A 2
B 3
C 4
D 7

[SBPTrial10-27] The information below shows the electron arrangement and the number of neutrons in an atom Y. Y is not the actual symbols of elements.

- Electron arrangement 2.8.3
- Number of neutrons 14

Which of the following symbol represents the atom Y?

- A 14 $\overset{13}{\text{Y}}$ B 27 $\overset{13}{\text{Y}}$
C 13 $\overset{14}{\text{Y}}$ D 13 $\overset{27}{\text{Y}}$

[SBPmidYearF508-12] The diagram shows the atomic symbol of element X.



Which of the following is true about the sub-atomic particles of element X?

	Proton Number	Number of neutron	Number of electron
A	7	7	10
B	7	7	7
C	3	4	3
D	3	4	2

[MRSM04-01] Figure 1 shows the electron arrangement for atom Y.

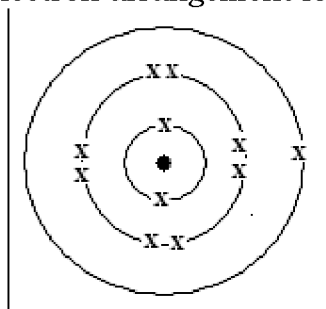


FIGURE 1

What is the nucleon number for atom Y?

- A 11
B 12
C 23
D 34

[MRSM05-02] Which of the following electron arrangement of an atom has eight electrons valence?

- A 2.6
- B 2.8.2
- C 2.8.8
- D 2.8.8.2

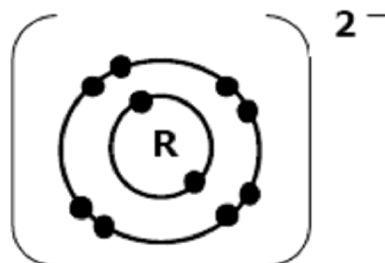
[MRSM05-36] Ion M^{3-} has 16 neutrons and the electron arrangement is 2.8.8. What is the nucleon number of element M?

- A 5
- B 6
- C 31
- D 34

[SBPdiag06-40] Atom Y consists of 17 protons and 20 neutrons. Which of the following symbols represent the ion of Y?

- A ${}_{17}^{20}Y^{-}$
- B ${}_{17}^{37}Y^{-}$
- C ${}_{20}^{37}Y^{+}$
- D ${}_{17}^{20}Y^{+}$

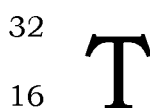
[MRSM06-41] The diagram shows an electron arrangement of R^{2-} ion.



How many protons and electrons does an atom of R contain?

	Protons	Electrons
A	8	6
B	8	10
C	10	10
D	8	8

[MRSM05-23] The diagram shows the atomic symbol of element T.



Which of the following combination represents the ionic formula and electron arrangement of ion T?

	Ionic Formula	Electron arrangement
A	T ²⁻	2.8.8
B	T ²⁺	2.8.8
C	T ²⁻	2.8.6
D	T ²⁺	2.8.4

[MRSM07-36] Table 6 shows the number of neutrons, protons and electrons of particles R and S.

Particle	Number of neutrons	Number of proton	Number of electrons
R	12	11	11
S	12	12	10

TABLE 6

Which of the following is **true** about R and S?

- A R and S are ions
- B R and S are isotopes
- C R has one valence electron
- D S has gained two electrons

[MRSM07-37] Table 3 describes the structures of four particles.

Particle	Number of protons	Number of neutrons	Number of electrons
O	8	8	8
O ²⁻	8	8	P
Na	11	Q	11
Na ⁺	11	12	R

What are the correct values of P, Q and R?

	P	Q	R
A	9	11	10
B	9	11	11
C	10	12	10
D	10	12	11

[MRSM09-23] Element S has 11 protons. It can be deduced that element S has the same chemical properties with the element which have

- A 9 protons
- B 10 protons
- C 18 protons
- D 19 protons

[SPM03-22] Sulphide and chloride ions have the same number of
[Proton numbers: S=16, Cl=17]

- A charge
- B electrons
- C neutrons
- D protons

[SPM04-24] The information shows the sub-atomic particles of atom W.

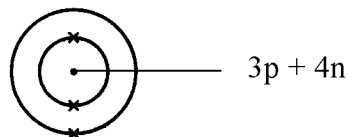
Electron configuration 2.1

Number of protons 3

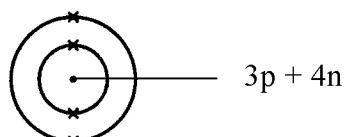
Number of neutrons 4

Which of the following diagrams shows an atom W?

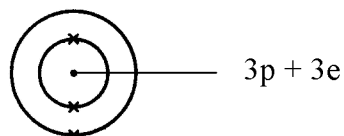
A



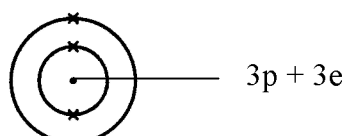
B



C



D



[SPM05-41] The table shows the number of electrons and neutrons for ions G^{2-} , H^+ , L^- and M^{2+} . These letters are not the actual symbols for the elements.

Ion	Number of electron	Number of neutron
G^{2-}	10	11
H^+	10	12
L^-	18	18
M^{2+}	18	20

Which of the following shows the correct nucleon number of the ion?

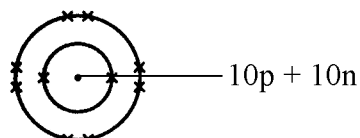
	ion	Number of electron
A	G^{2-}	21
B	H^+	21
C	L^-	35
D	M^{2+}	36

[SPM07-24] The following information is about an atom

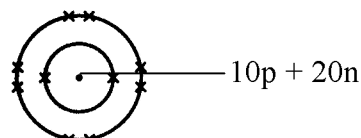
- The number of neutrons is 10
- The nucleon number is 20

Which following diagram shows the atom?

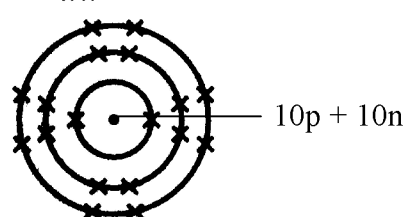
A



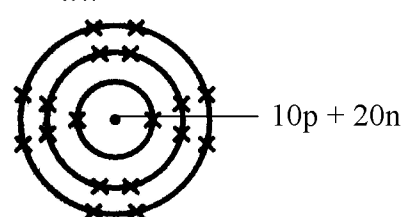
B



C



D



[MRSM07-01] Diagram 1 shows the electron arrangement of an atom.

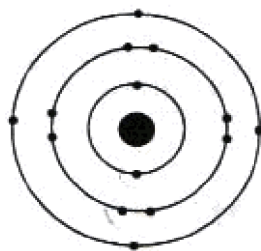
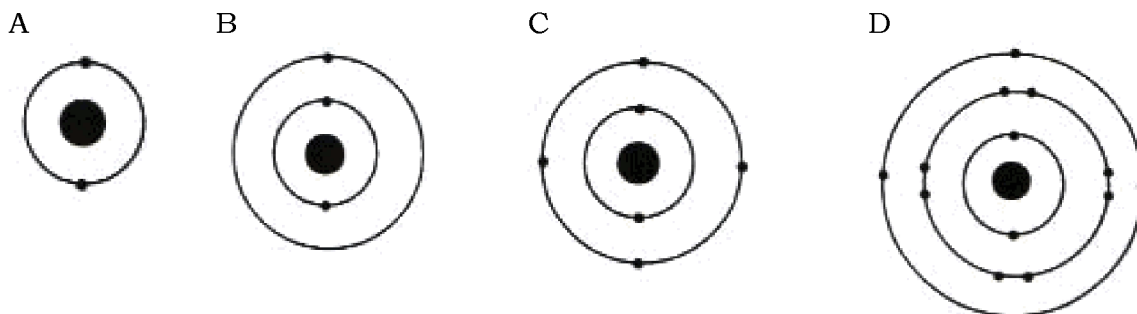


Diagram 1

Which of the following electron arrangement has the same number of valence electrons as the atom in diagram 1?



[SPM06-36] Element T has the same chemical property as the element with the proton number of 20.

The letter T is not the actual symbol of the element.

Which of the following is the electron arrangement for an atom of element T?

- A 2
- B 2.8.2
- C 2.8.4
- D 2.8.8

[MRSM10-21] The following shows a standard representation of potassium atom, K.



Which is the correct electron arrangement for potassium?

- A 2.8.8.1
- B 2.8.8.2
- C 2.8.1
- D 2.8.2

[SPM08-26] Which of the following particles contain 10 electrons?

[Proton number: Ne=10, Na=11, Mg=12]

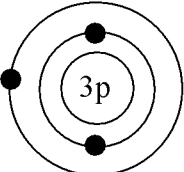
- I Na
- II Ne
- III Na⁺
- IV Mg²⁺

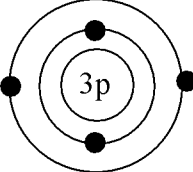
- A I, II and II
 B I, II and IV
 C I, III and IV
 D II, III and IV

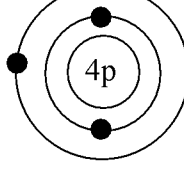
[SPM03-39] In the periodic table, Y is below Z in the same group. If the proton number of atom Z is 12, what is the electron configuration for atom Y?

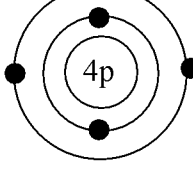
- A 2.8.2
 B 2.8.6
 C 2.8.8.2
 D 2.8.8.6

[SBPTrial07-15] Which of the following is the atomic structure of lithium atom?

A 

B 

C 

D 

[SBPTrial08-01] Diagram 1 shows the electron arrangement of an atom of element P.

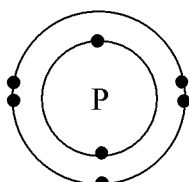


Diagram 1

What is the number of valence electrons in atom P?

- A 7
 B 6
 C 5
 D 4

[SBPTrial08-29] The following statement is about X^{3+} ion.

X^{3+} ion has 14 neutrons and 10 electrons.

Which of the following proton numbers and nucleon numbers shows for atom X?

	Proton number	Nucleon number
A	10	14
B	10	27
C	13	14
D	13	27

[SBPTrial09-05] Diagram 3 shows the atomic symbol of element X.

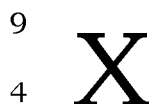


Diagram 3

Which of the following is true about the sub-atomic particles of element X?

	Proton number	Nucleon number	Electron arrangement
A	4	9	2.2
B	4	9	2.7
C	9	4	2.2
D	9	4	2.7

[SBPTrial09-41] The nucleon number of X is 40 and X^{2+} ion has 18 electrons. What is the number of neutrons of X^{2+} ion?

- A 18
- B 20
- C 22
- D 40

[SBPTrial09-27] The electron arrangement of atom Z is 2.8.1.

Which of the following is the number of protons and electrons of Z^+ ion?

	Number of proton	Number of electron
A	10	11
B	11	11
C	11	10
D	10	12

[SPM09-20] Diagram 3 shows the electrons arrangement of an atom of Y. Y is not the actual symbol of the element.

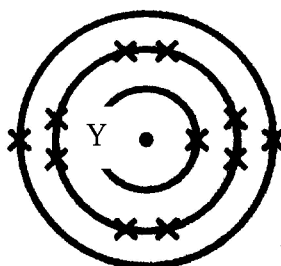


Diagram 3

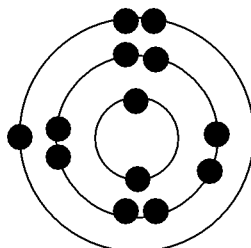
Which of the following is the position of element Y in the Periodic Table?

	Group	Period
A	2	2
B	2	3
C	12	2
D	12	3

[SBPmidYear06-08] Atom X will lose two electrons to form an ion. Which of the following symbol represents ion of X.

- A X^{2+}
- B X_2^+
- C X^{2-}
- D X_2^-

[SBPmidYear06-14] The diagram shows the atomic structure of aluminium



What is the electron arrangement of aluminium?

- A 13
- B 2.3
- C 2.8.3
- D 3.8.2

[SBPmidYear06-15] The table shows information about two types of particle

Particle	Proton number	Electron arrangement
P	11	2.8
Q	19	2.8.8

Based on the information in the table, both particles P and Q are

- A atom of inert gases
- B atom of metals
- C positive ions
- D isotopes

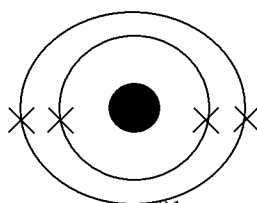
[SBPmidYear06-33] The table shows the information of atom V.

Element	Electron arrangement	Number of neutrons
V	2.8.7	20

What is the nucleon number of atom V?

- A 2
- B 7
- C 17
- D 37

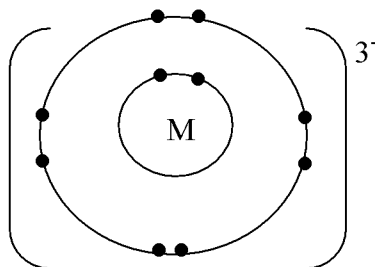
[SPM08-25] Diagram 3 shows the electron arrangement of a beryllium atom.



Which of the following is true about this atom?

- A The proton number is 2
- B The nucleon number is 2
- C The total number of electrons is 4
- D The number of valence electrons is 4

[SBPmidYear06-23] The diagram below shows the electron arrangement for ion M^{3-} .



What is the Group of element W in the Periodic Table?

- A Group 13
- B Group 15
- C Group 16
- D Group 18

[MRS11-21] Diagram 7 shows the symbol of X atom.

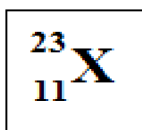
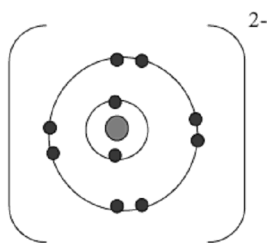


Diagram 7

What is the electron arrangement for ion of X?

- A 2.8
- B 2.8.1
- C 2.8.2
- D 2.8.8.5

[MRS03-36]

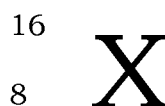


Ion R^{2-}
Figure 10

Figure 10 shows electron arrangement for ion R^{2-} . Which of the following is true for atom R?

- A Atom R is in group 18
- B Atom R is in period 2
- C Electron arrangement R is 2.8
- D Number of proton in atom R is 10

[SBPdiag07-01] The following figure shows the symbol of atom X



Which of the following is the electron arrangement for an ion for X?

- A 2.6
- B 2.8
- C 2.8.6
- D 2.8.8

[SBPdiag07-34] The table shows the electron arrangement for elements X, Y and Z.

Element	Electron arrangement
X	2.8.2
Y	2.8.18.6
Z	2.8.8.3

What is the charge for ion of element X, Y and Z?

	X	Y	Z
A	+2	-2	+6
B	-2	+2	-3
C	+2	-2	+3
D	+2	-2	-3

[SBPmidYear07F4-16] Oxygen atom is different from oxide ion because oxide ion has

- A more protons than oxygen atom
- B more neutrons than oxygen atom
- C more electrons than oxygen atom
- D more shells occupied with electron than oxygen atom

[SBPmidYear07F4-05] The following information is about atom A.

- Number of electrons = _____
- Nucleon number = 7
- Number of neutrons = 4

What is the electron arrangement of atom A?

- A 2.1
- B 2.2
- C 2.5
- D 2.8.1

[SBPmidYear07F4-27] Table 3 shows the proton numbers of elements P, Q, R and S.

Element	Proton number
P	5
Q	10
R	11
S	12

Which of the following is the **correct** ion formula for the elements?

	Element	Ion formula
A	P	P ²⁺
B	Q	Q ²⁺
C	R	R ⁺
D	S	S ⁺

[SBPmidYear07F4-40] An ion X²⁺ contains 20 neutrons and has a nucleon number of 40. Which of the following is true about ion X²⁺?

	Electron arrangement	Proton number
A	2.8.8	20
B	2.8.8.2	20
C	2.8.8	40
D	2.8.8.2	40

[SPM05-22] The table shows information about two types of particle.

Particle	Proton number	Electron configuration
X	9	2.8
Y	17	2.8.8

Based on the information in the table, both particles X and Y are

- A inert gas
- B negative ions
- C atom of metals
- D isotopes of the same element

[SBPmidYear07F4-31] Diagram 8 shows the electron arrangement for an ion of element J.

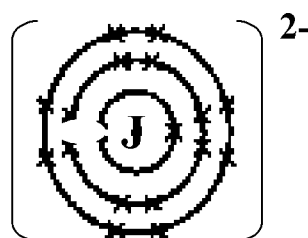
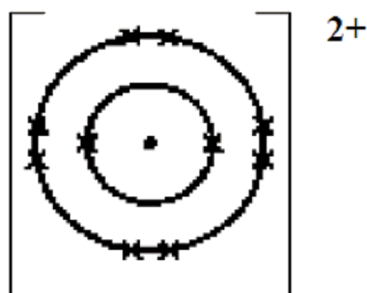


DIAGRAM 8

What are the number of protons and electrons in an atom of element J?

	Number of protons	Number of electrons
A	20	20
B	20	18
C	16	18
D	16	16

[SBPtrial11-40] Diagram 12 shows the electron arrangement of a G^{2+} ion.



G^{2+} ion contains 12 neutrons. What is the nucleon number of atom G?

- A 10
- B 12
- C 20
- D 24

[SBPmidYear07F4-32] Ion W^{3+} has 14 neutrons and its electron arrangement is 2.8. What is the nucleon number of an atom of element W?

- A 13
- B 14
- C 24
- D 27

[MRSM10-36] Table 5 shows four elements and their proton numbers.

Element	Proton number
P	8
Q	11
R	17
S	16

Table 5

Given the proton number of flourine is 9, which of the following elements has similar chemical properties to it?

- A P
- B Q
- C R
- D S

Isotopes

[SPM10-01] What is the meaning of isotopes?

- A Atoms of the same element with the same nucleon number
- B Atoms of the same element with different of neutrons
- C Atoms of different elements with different proton numbers
- D Atoms of different elements with the same nucleon number

[MRSM06-02] Which of the following is the common characteristic for isotopes of an element?

- A Physical properties
- B Chemical properties
- C Nucleon number
- D Number of neutrons

[SBPdiag08-17] The atoms $^{31}_{15}\text{P}$ and $^{32}_{16}\text{S}$ have the same

- A number of protons
- B number of neutrons
- C number of electrons
- D nucleon number

[SBPtrial11-27] Table 1 shows the number of neutrons for bromine isotopes.

Isotope	Number of neutrons
Bromine-79	44
Bromine-81	X

What is the value of x?

- A 35
- B 37
- C 44
- D 46

[SBPmidYear07F4-22] Bromine-80 and bromine-81 are isotopes. Both isotopes have 35 protons. Which of the following statements is true about the bromine isotopes?

- A Bromine-80 has less electrons than bromine-81.
- B Both isotopes have the same number of neutrons.
- C Both isotopes have the same chemical properties.
- D Bromine-81 has more shells filled with electrons than bromine-80.

[SPM09-13] What is the number of neutrons in the isotope of uranium $^{235}_{92}\text{U}$?

- A 92
- B 143
- C 235
- D 327

[MRSM10-12] Diagram 1 shows standard representation of chlorine isotopes.



Both isotopes have

- A different number of valence electrons
- B different chemical properties
- C same number of neutrons
- D same number of protons

[SBPmidYear06-29] Which of the following statements is true about the isotopes $^{37}_{17}\text{Cl}$ and $^{35}_{17}\text{Cl}$?

- I They have the same chemical properties.
 - II They have different physical properties.
 - III They have the same number of valence electrons.
 - IV They have different numbers of neutrons.
- A I , II and III only
 - B I, III and IV only
 - C II, III and IV only
 - D I, II ,III and IV

[MRSM03-22]

Particle	Number of electrons	Nucleon number
E	8	16
Q	9	18
R ²⁻	10	18
T ⁺	10	22

Table 1 shows the number of electrons and nucleon number for particles E,Q, R²⁺, T⁺. Which of the following is a pair of isotope of an element?

- A E and R
- B Q and R
- C E and T
- D Q and T

Use of Isotope

[MRSM11-02] Carbon-14 is an isotope of carbon. What is the use of carbon-14?

- A Estimate the age of fossils and artefacts
- B Radiotherapy for the treatment of cancer
- C Regulate the heartbeats of patients with heart problems
- D Destroy bacteria in food without changing the quality of food

[SBPTrial10-42] Diagram 10 shows one fossil.



Diagram 10

Which of the following isotopes is used to estimate the age fossil?

- A Sodium-24
- B Iodine-131
- C Cobalt-60
- D Carbon-14

[SPM06-02] Which of the following is a use of carbon-14 isotope?

- A Determine the age of a fossil
- B Generate electrical energy
- C Diagnose thyroid problems
- D Kill cancer cells

[SPM08-13] Which of the following is a use of carbon-14?

- A To treat cancer patients
- B To estimate the age of fossils and artifacts
- C To study the metabolism of phosphorus in plants
- D To destroy bacteria in food without changing the quality of the food

[SBPTrial07-40] Which of the following isotopes is used to detect leakage in a gas pipe.

- A Carbon-14
- B Cobalt-60
- C Sodium-24
- D Iodine-131

[SPM09-05] Which of the following is a use of cobalt-60 isotope?

- A treatment of cancer
- B sterilization on insects
- C X-ray for body examination
- D Dating for the age of fossils and artifact

[SBPmidYear07F4-04] Which of the following isotopes is used in archaeology?

- A Cobalt-60
- B Carbon-14
- C Iodine-131
- D Phosphorus-32

[SBPmidYearF508-43] Which of the following pairs show the correct uses of the isotopes?

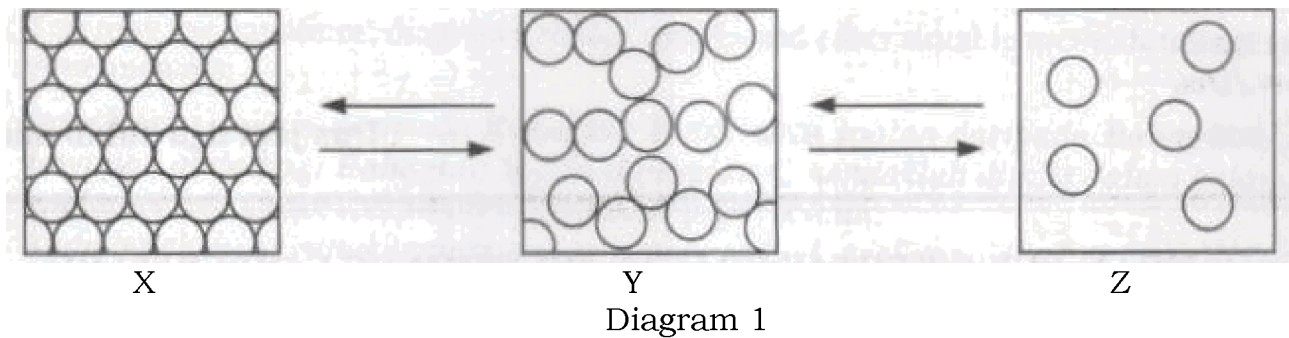
	Isotope	Uses
I	Cobalt-60	To destroy bacteria in food
II	Carbon-14	To estimate the age of artifacts
III	Iodine-131	To detect the location of tumour
IV	Sodium-24	To detect leaks in underground petroleum piping

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

Structure {Paper02}

[SPM10-01]

Diagram 1 shows the inter-conversion of the three states of matter, X, Y and Z of water



(a) What type of particle is found in water? [1M]

.....

(b) Under the room temperature, at what temperature does ice change to water?

.....

(c) What is the physical state labelled Z? [1M]

.....

(d) Name the process when water changes from state X to state Y. [1M]

.....

(e) When water changes from state Y to state Z, state the changes in:

(i) the energy of the particles. [1M]

.....

(ii) The forces of attraction between the particles. [1M]

.....

(f) The smell of curry cooking in the kitchen spreads to the living room. Based on the kinetic theory of matter, state the process involved. Explain your answer. [3M]

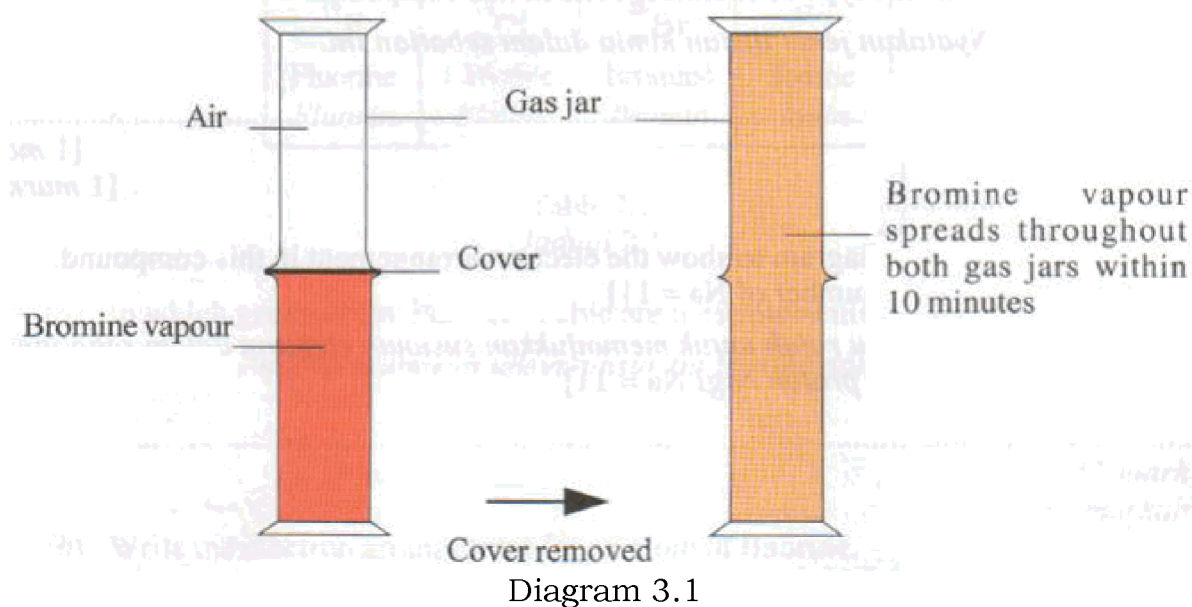
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[SPM08-03a]

(a) Diagram 3.1 shows the results of an experiment to investigate the movements of bromine particles in air.



(i) State the name of the process involved in this experiment. [1M]

.....

(ii) State the type of particles present in bromine gas, Br_2 . [1M]

.....

(iii) Explain the observation in this experiment based on the kinetic theory of matter. [3M]

.....

.....

(iv) This experiment is repeated at a higher temperature. Predict the time taken for the bromine vapour to spread throughout the space in both gas jars. [1M]

.....

[SPM04-01] Table 1 shows four substances and their respective formulae.

Substance	Chemical Formula
Iodine	I ₂
Copper	Cu
Naphthalene	C ₁₀ H ₈
Copper (II) sulphate	CuSO ₄

Table 1

Use information from table 1 to answers the following questions.

(i) State one substance from table 1 which exists as a molecule. [1M]

.....

(ii) Which substance has the highest melting, iodine, copper or naphthalene? [1M]

.....

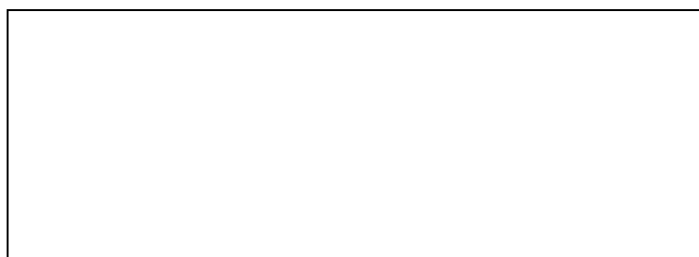
(iii) What is the state of matter of copper (II) sulphate at room temperature? [1M]

.....

(iv) State the substance in Table 1 which can conduct electricity in the solid state. [1M]

.....

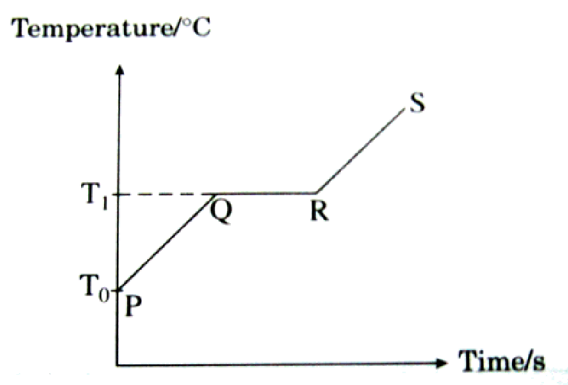
(v) Draw the arrangement of particles in the substance in (a) (iv) [1M]



(vi) Write the ionic formula the substance in (a) (iv) [1M]

.....

(b) Graph 1.1 shows the temperature against time when solid naphthalene is heated.



(i) State the melting point of naphthalene. [1M]

.....

(ii) Explain why there is no change in temperature from Q to R. [2M]

.....

.....

.....

(iii) State how the movement of naphthalene particles changes between R and S during the heating. [1M]

.....

[SBPTrial10-01] Table 1 shows the melting point and boiling point of substance X, Y and Z

Substance	Melting point/ °C	Boiling point/°C
X	-110	5
Y	-18	66
Z	98	413

Table 1

(a) (i) What is the state of matter of substance X at room temperature? [1 mark]

.....

(ii) Give reason to your answer in (a)(i). [1M]

.....

.....

(b) (i) Substance Y is heated from room temperature to 100 °C. Sketch a graph of temperature against time for the heating of substance Y. [2M]

(ii) What is the state of matter of substance Y at 66 °C? [1M]

.....

(c) Explain why the melting point of substance Z is higher than substance Y. [2M]

.....

.....

(d) What is meant by melting point? [1M]

.....

.....

(e) Draw the particle arrangement of substance Z at room condition. [1M]



[SBPtrial07-01] Table 1 shows the melting point and boiling point of four substances.

Substances	Melting point/ °C	Boiling point/ °C
P	-5	67
Q	-105	-38
R	80	140
S	801	1413

TABLE 1

(a) What is the physical state of P and S at room temperature? [2M]

P :

S :

(b) Draw the arrangement of particles of P at room temperature. [1M]



(c) Explain why substance Q has a low melting point and boiling point. [2M]

.....
.....

(d) Draw the setup of apparatus to determine the melting point of substance R. [2M]

(e) Sketch the graph of temperature against time for substance R when it is heated from room temperature until it reaches a temperature of 100 °C. [2M]

[SBPmidyearF406-01] Figure 1 shows the setup of the apparatus used in an experiment to determine the melting point and freezing point of substance X.

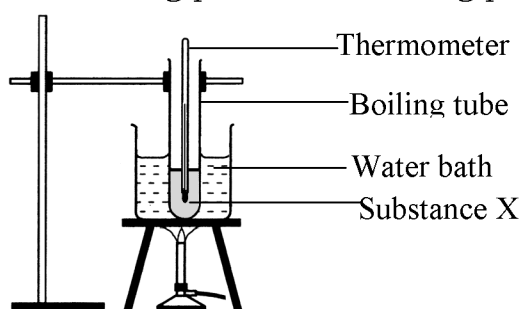


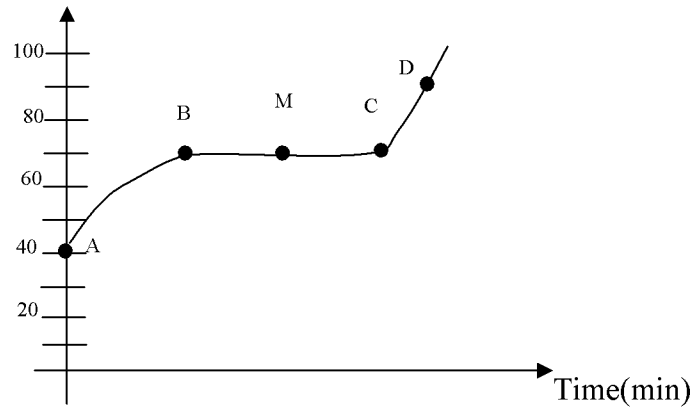
FIGURE 1

(a) Why is a water bath used to heat the substance X? [1M]

.....

(b) Graph 1 show the temperature against time when solid of substance X is heated.

Temperature (°C)



(i) What is the melting point of substance X? [1M]

.....

(ii) State the physical state of substance X at point M. [1M]

.....

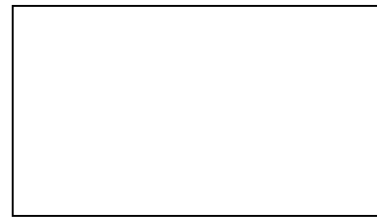
(iii) State the change of kinetic energy along the region AB. [1M]

.....

(iv) Draw the arrangement of particles of substance X at 60 °C and 90 °C. [2M]



60 °C



90 °C

(v) Explain why the temperature remains constant from point B to point C. [2M]

.....

.....

.....

.....

A substance Y has a melting point of 150 °C. Predict whether the melting point of Y can be determined using the water bath. Explain why. [2M]

.....

.....

.....

[MRSM08-01] Diagram 1.1 shows the setup of the apparatus used in an experiment to determine the melting point of a substance M.

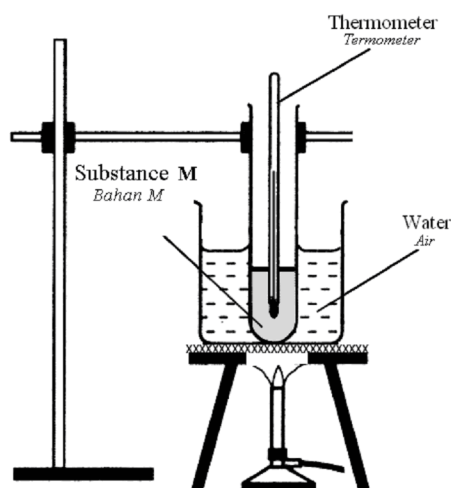


Diagram 1.1

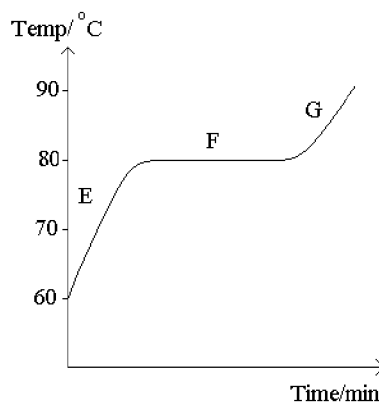
(a) (i) State one error in Diagram 1.1. [1M]

.....

(ii) Why water bath is used to heat the substance M? [1M]

.....

(b) Diagram 1.2 shows a graph of temperature against time when solid of substance M is heated.



(i) What is the melting point of substance M? [1M]

.....

(ii) State the physical state of substance M at point F. [1M]

.....

(iii) Compare kinetic energy of particles at points E and F. [1M]

.....

(iv) Draw the arrangement of particles of substance M at 60°C and 90°C. [2M]

60°C	90 °C

(c) Diagram 1.3 shows the structural formula of substance M.

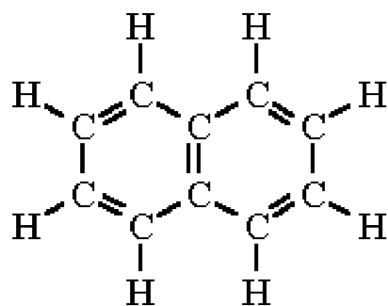


Diagram 1.3

(i) What is meant by molecular formula? [1M]

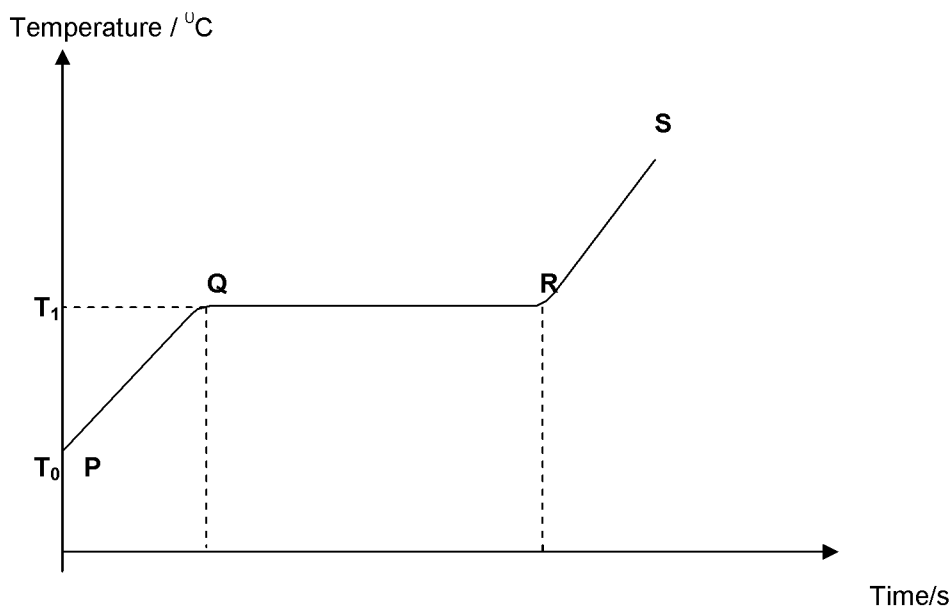
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.....

(ii) State the molecular formula of substance M. [1M]

.....

[SBPmidyearF508-02] Graph 2.1 shows the temperature against time when solid naphthalene is heated.



(a) State the melting point of naphthalene. [1M]

.....

(b) What is the physical state of naphthalene at: [2M]

(i) PQ :

(ii) RS :

(c) Explain why there is no change in temperature from Q to R. [2M]

.....

.....

(d) State how the movement of naphthalene particles changes between R and S during heating. [1M]

.....

(e) Table 2.2 shows four substances and their respective formulae.

Substances	Chemical formula
Iodine	I ₂
Copper	Cu
Naphthalene	C ₁₀ H ₈
Copper(II) sulphate	CuSO ₄

Table 2.2

Use information from table 2.2 to answer the following questions.

(i) State one substance which exists as a molecule. [1M]

.....

(ii) Which substance can conduct electricity in the solid state? [1M]

.....

(iii) What type of particle presents in copper(II) sulphate? [1M]

.....

(f) A few drops of liquid bromine are dropped into a gas jar. The brown bromine vapour spreads to the upper part of the gas jar. The time taken is very short. Name the process occurs. [1M]

.....

[SBPdiag08-01] Diagram 1.1 shows the symbols for atoms of elements X, Y and Z.



DIAGRAM 1.1

(a) (i) Write the electron arrangement of atom Z. [1M]

.....

(ii) What is the number of neutrons for atom Y? [1M]

.....

(iii) What is the atomic mass of atom X? [1M]

.....

(b) Diagram 1.2 shows the set up of the apparatus of an experiment where a drop of bromine liquid is dropped into a gas jar and is left for a few minutes.

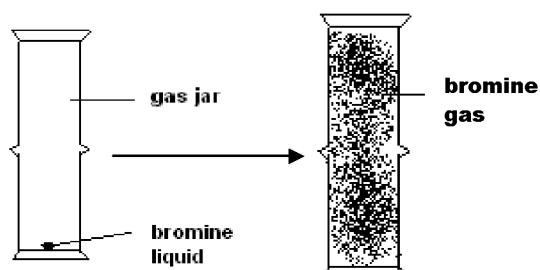


DIAGRAM 1.2

(i) State **one** observation in the gas jar after a few minutes. [1M]

.....

(ii) Name the process that occurred in the gas jar. [1M]

.....

(iii) Name the type of particles that exist in bromine. [1M]

.....

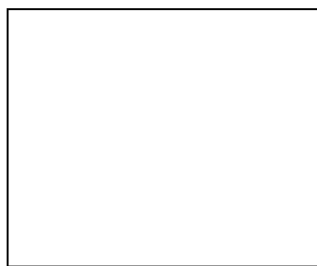
(iv) State the change of state of bromine that occurred in the gas jar. [1M]

.....

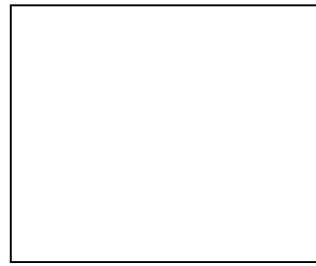
(v) The change of state in (b) (iv) can occur at room temperature. Explain why. [1M]

.....

(c) Substance X has a melting point of 79 °C. Draw the particles arrangement of substance X at 60 °C and at 80 °C. [2M]



At 60°C



At 80°C

[SPM11-01] Table 1 shows the number of protons, neutrons and electrons present in atom Q and atom X. The letters used are not the actual symbols of the atoms.

Atom	Number of protons	Number of neutrons	Number of electrons
Q	11	12	11
X	17	18	17

Table 1

1. (a)(i). State the term for 'the total number of protons and neutrons' in an atom.[1M]

.....

(ii) Name the two subatomic particles present in the nucleus of an atom. [2M]

1.

2.

(iii) Draw the electron arrangement of Q ion. [1M]

(b) (i) Atom Y is an isotope of atom X. State the number of protons in atom Y. [1M]

.....

(ii) Atom X and atom Y show the same chemical properties. State **one** reason. [1M]

.....

(c) (i). Element X has a boiling point of $-34.0\text{ }^{\circ}\text{C}$. Predict the physical state of element X at room temperature. [1M]

.....

(ii). Based on the kinetic theory of matter, describe the arrangement and movement of particles of element X at room temperature. [2M]

Arrangement of particles :

Movement of particles :

[SBPmidyearF407-01] Diagram 1 shows the atomic structure for two isotopes of carbon atoms.

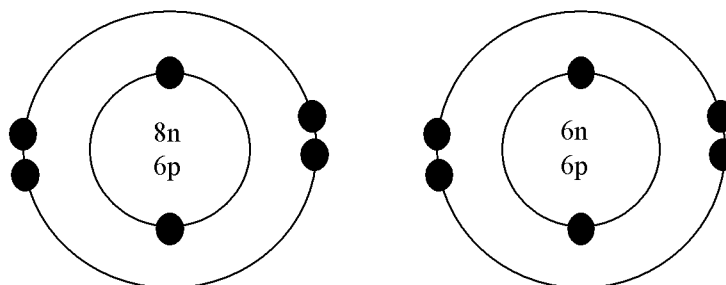


DIAGRAM 1

(a) What is meant by **isotopes**? [1M]

.....

.....

(b) (i) Name the positively charged subatomic particles found in the nucleus of an atom. [1M]

.....

(ii) What is the relative mass of the particles in b(i)? [1M]

.....

(c) Name the subatomic particle which is neutral. [1M]

.....

(d) Write the symbol of **one** of carbon isotopes above in the form of A_ZX . [2M]

.....

(f) In which period and group is carbon element located in the Periodic Table of Elements? Explain your answer. [4M]

Group :

Reason :

Period :

Reason :

[SBPtrial08-01] Table 1 shows the number of proton, electrons and neutrons for atom W, X, Y and Z.

Atom	Number of protons	Number of neutrons
W	8	9
X	8	10
Y	12	12
Z	11	12

(a) (i) What is meant by nucleon number? [1M]

.....

(ii) What is the nucleon number of atom W? [1M]

.....

(b) Write the symbol of atom Y in the form of A_ZY . [1M]

.....

(c) (i) Write the electron arrangement of atom Z. [1M]

.....

(ii) What is the number of valence electrons in atom Z. [1M]

.....

(d) Which atoms are isotopes? Explain why. [2M]

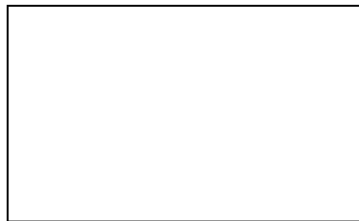
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.....

(e) Solid Q is a compound of element W. Solid Q has melting point of 85 °C and boiling point of 150 °C. A boiling tube containing solid Q is heated at room temperature until 180 °C.

(i) Sketch a graph of temperature against time during the heating. [2M]

(ii) Draw the arrangement of particles of substance Q at 50 °C. [1M]



[SBPtrial09-02]

(a) Diagram 2.1 shows the symbol for elements V, W, X and Y.



Diagram 2.1

(i) State the name of the three subatomic particles in an atom. [1M]

.....

(ii) Draw the electron arrangement of an ion of element X. [1M]

(iii) Which of the atoms above are isotopes of an element? Explain your answer. [2M]

.....

(iv) State the position of element Y in the Periodic Table of Elements. [1M]

.....

(v) What is the number of neutrons in atom V? [1M]

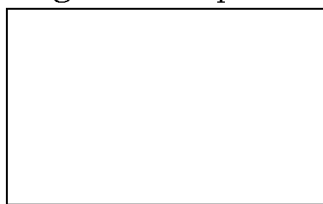
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(b) Table 2 shows the melting point and boiling point of substances P, Q, R and S.

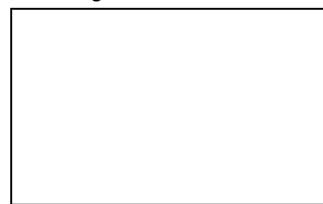
Substance	Melting point (°C)	Boiling point (°C)
P	- 42	-10
Q	65	110
R	- 8	54
S	200	450

Table 2

(i) Draw the arrangement of particles of substances Q and R at room temperature. [2M]

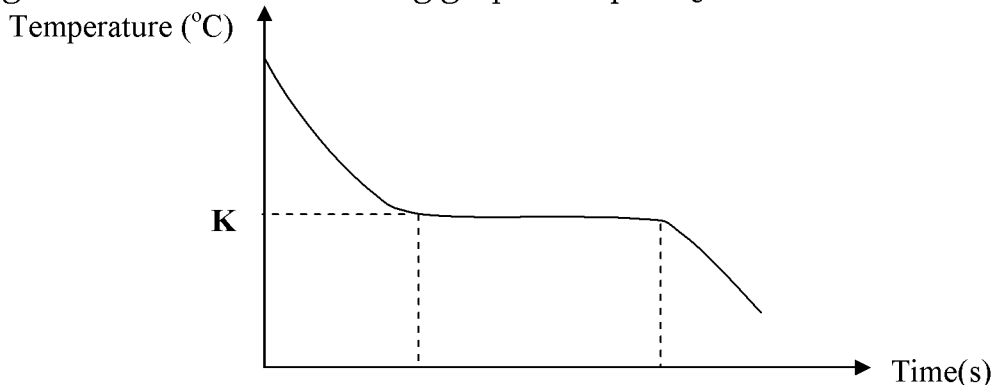


Substance Q



Substance R

(ii) Diagram 2.2 shows the cooling graph of liquid Q.



State the value of K.

Give reason why the temperature remains constant at K °C from t_1 to t_2 . [2M]

.....

.....

[MRSM09-02] (a) Atoms of all elements consist of three main sub-particles; proton, electron and neutron. Diagram 2.1 shows an atomic structure of helium.

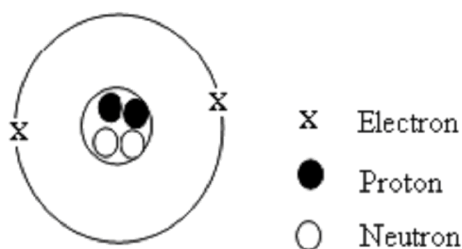


Diagram 2.1

Based on Diagram 2.1, answer the following questions.

(i) State the nucleon number of helium. [1M]

.....

(ii) Write a chemical symbol for helium atom in the form of [1M]

.....

(iii) An atom of helium is electrically neutral. Explain. [1M]

.....

(b) Diagram 2.2 shows an experiment to compare the rate of diffusion between ammonia and hydrogen chloride gas.

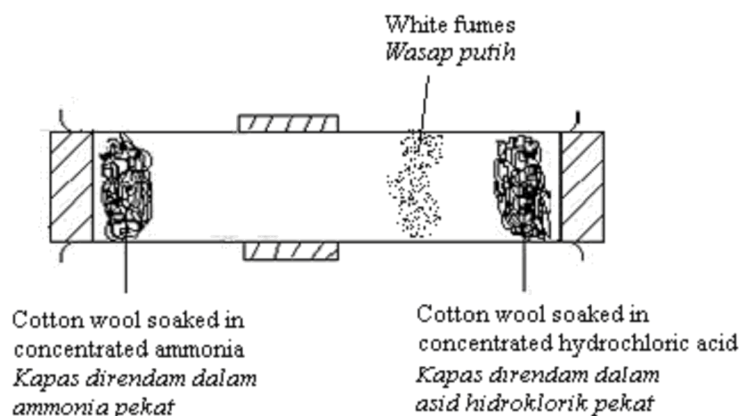


Diagram 2.2

(i) Name the white fume formed. [1M]

.....

(ii) Write the chemical equation for the reaction. [2M]

.....

(c) Diagram 2.3 shows the heating curve for solid naphthalene.

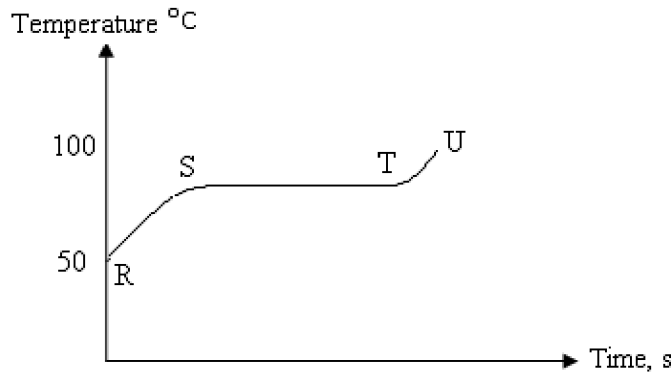


Diagram 2.3

(i) On the graph, indicate and label the melting point of naphthalene. [1M]

(ii) What is the physical state of naphthalene from S to T? [1M]

.....

(iii) Explain why there is no change in temperature from S to T. [2M]

.....

.....

[MRSM11-01] Table 1 shows the proton number and nucleon number for atoms P, Q, R and S. The letters used do not represent the actual symbols of the atoms.

Atom	Proton number	Nucleon number
P	6	12
Q	6	14
R	11	24
S	12	24

Table 1

(a) What is meant by proton number? [1M]

.....

(b) Determine the number of neutrons in these atoms. [2M]

(i) P :

(ii) R :

(c) Write the symbol for atom Q in the form of A_ZX [1M]

.....

(d) For the atom S,

(i) Write the electron arrangement. [1M]

.....

(ii) State the number of valence electron. [1M]

.....

(e) (i) Which atoms are isotopes? [1M]

.....

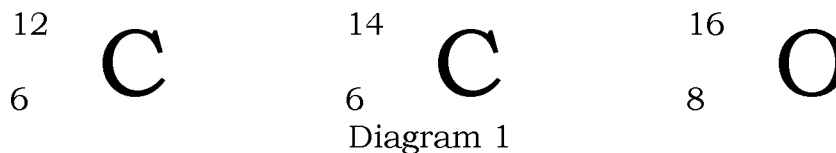
(ii) Explain your answer in (e)(i). [1M]

.....

(iii) State **one** use of the isotope in (e)(i) which is radioactive. [1M]

.....

[MRSM06-01] Diagram 1 shows the atomic symbol of carbon and oxygen elements.



Based on Diagram 1, answer the following questions.

(a) What is represented by:

(i) The number 12 of the atom of element C? [1M]

.....

(ii) The number 8 of the atom of element O? [1M]

.....

(b) (i) what is meant by isotopes? [1M]

.....

.....

(ii) State which atoms are isotopes of the same element? [1M]

.....

(iii) Write the symbol of an atom which is also an isotope for the element stated in (b)(ii). [1M]

.....

(c)(i) How many electrons are present in atom ^{16}O ? [[1M]]

.....

(ii) Write the electron arrangement for the atom in (C)(i) [[1M]]

.....

(d) Carbon and oxygen are located in the same period in the Periodic Table. State the period and explain your answer. [2M]

.....

.....

[MRSM04-01] Table 1 shows the proton number and part of the nucleon number for the elements C, O, Na and Cl.

Elements	C	O	Na	Cl
Proton number	6	8	11	17
Nucleon number	_____	16	23	_____

Table 1

(a) What is meant by proton number? [1M]

.....

(b) Write the atomic symbol for sodium including the proton number and nucleon number in the box provided.[1M]

(c) State the number of neutron for Cl atom. [1M]

.....

(d) Element C has a few isotopes.

(i) Suggest a possible nucleon number for the element C. [1M]

.....

(ii) Name an isotope that is radioactive. [1M]

.....

(e) Write the electron arrangement for the ion of element O. [1M]

.....

(f) The element Na is very reactive chemically. Explain this statement based on electron arrangement. [2M]

.....

.....

[MRSM10-02a] (a) Table 2 shows the proton number and nucleon number of atoms P, Q and R.

Atom of element	Proton number	Nucleon number
P	8	16
Q	9	19
R	8	17

Table 2

Answer the following question based on Table 2,

(i) Which pair of atoms are isotopes? [1M]

.....

(ii) Give the reason for your answer in (a)(i). [1M]

.....

(iii) Draw the electron arrangement for atom Q. [1M]

Essay {Paper02}

[SBPdiag06-07 a, b]

(a) What is meant by “melting point”?

During the melting of naphthalene, the temperature remains constant even though heat is applied. Explain why. [4M]

(b)

Condensation is the process where a gas changes to its liquid state at a certain temperature and pressure when it is cooled.

Describe the change of the kinetic energy, arrangement and the forces of attraction between the particles at the following states: [10M]

- before condensation
- during condensation
- after condensation

-----oooOO aĐaŽ OOooo-----

[SBPmidyearF407-08]

A compound changed from state P to state Q under process I.

Diagram 8 shows the arrangement of particles of the compound in state P and state Q.

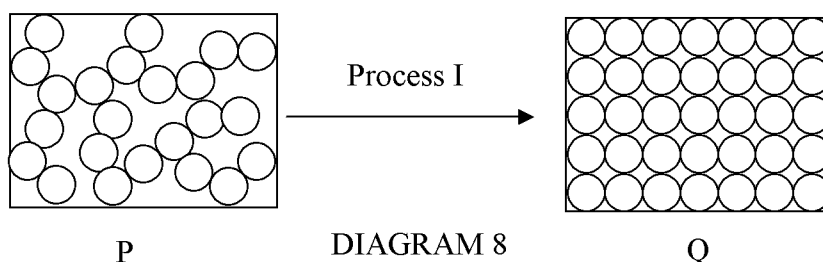


Table 8.1 shows the temperature of the compound during process I.

Time (min)	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5
Temperature (°C)	82	80	78	75	75	75	75	75	73	71

TABLE 8.1

(a) Name process I.

Explain why the temperature remains constant from 1.5 minutes to 3.5 minutes. [4M]

(b) Table 8.2 shows the melting point and boiling point of a compound M.

Melting point (°C)	105
Boiling point (°C)	210

TABLE 8.2

(i) State the physical state of compound M at 80 °C and 280 °C. [2M]

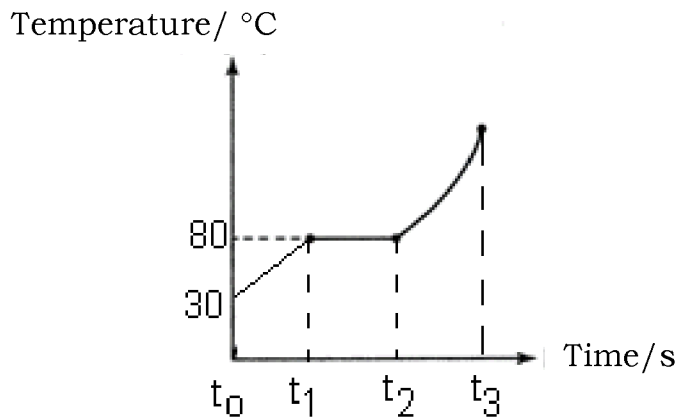
Compare the particles of compound M at 80 °C to those at 280 °C in terms of the arrangement of particles, the movement of particles, the forces of attraction between particles and kinetic energy of particles. [4M]

(ii) Describe an experiment to determine the melting point of compound M. Include a sketch of the heating curve and explain how you obtain the melting point of the substance. [10M]

-----oooOO aĐaŽ OOooo-----

[SBPtrial04-07]{Translate}

(a) A student was done experiment to determine melting point for substance X. A graph for temperature versus time was plotted below:



(i) What mean by melting points? [1M]

(ii) State the changing state for particle substance X at the time between t_0 to t_1 . Name all the process involve in changing of state of substance X. [4M]

(iii) Describe why the temperature constant at the time t_1 to t_2 while the heating still continue. [2M]

(b) **The value of melting point and freezing point for a pure substance is equal.** With use naphthalene as example, describe an experiment to prove the statement above. [13M]

-----oooOO aĐaŽ OOooo-----

[SPM07-08]

Diagram 8 shows an atom of element X. The letter used is not the actual symbol of the element.

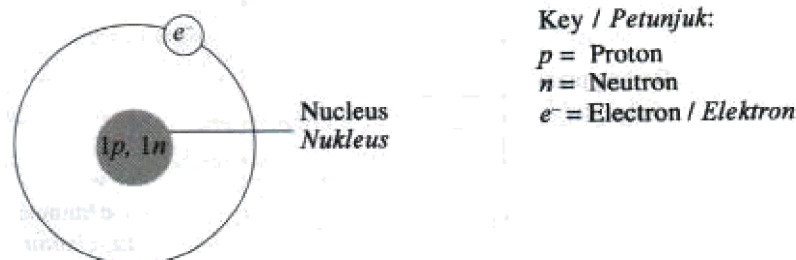
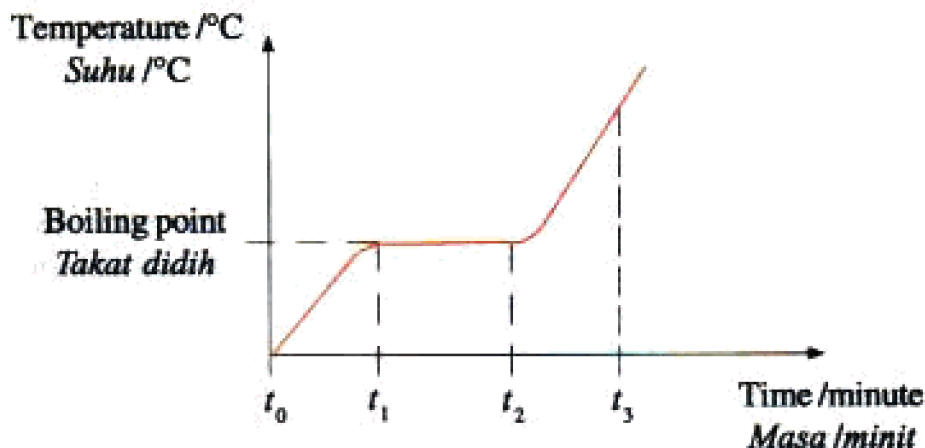


Diagram 8

(a) Describe the atom shown in diagram 8. [4M]

- (b) Another atom of element X has 2 neutrons.
 (i) Compare this atom with the atom in diagram 8. [4M]
 (ii) Write the symbol for this atom in the form ${}^A_Z X$. [2M]
- (c) Graph 8 shows the heating curve of element X.



Graph 8

Describe graph 8 in terms of states of matter, particle arrangements and changes in energy. [10M]

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[SBPtrial11-07] (a) Carbon-14 is one isotope of carbon. It has 8 neutrons.

(i) Draw and describe the atomic structure of carbon-14. [4M]

(ii) Give one example of another isotope of carbon. State the number of neutron in the isotope. Write the symbol of the isotope in the form ${}^A_Z X$. [3M]

(b) Diagram 7 shows the set-up of apparatus to determine the melting point of naphthalene.

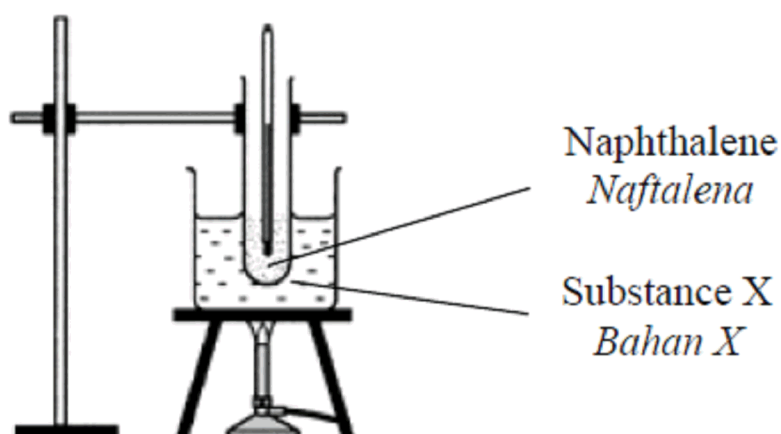


Diagram 7

Table 7 shows the melting point and boiling point of naphthalene, substance P and substance Q.

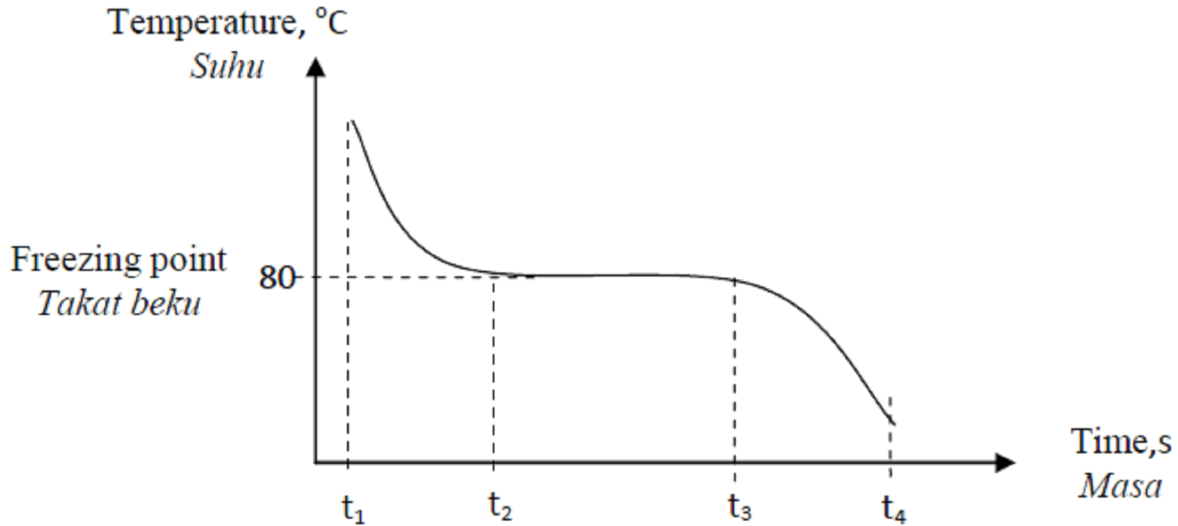
Substance	Melting point (°C)	Boiling point (°C)
Naphthalene	80	218
P	0	100
Q	-97	65

Table 7

(i) Which substance P or Q is suitable to be used as substance X in Diagram 7? Explain your answer. [2M]

(ii) Explain why naphthalene is not heated directly with a bunsen burner. [1M]

(c) Graph 7 shows the cooling curve of naphthalene.



Graph 7

Describe Graph 7 in terms of states of matter, particle arrangements and changes in energy. [10M]

-----oooOO aĐaŽ OOooo-----

[SPM06-09] Diagram 9.1 shows an atom of an element based on the model by James Chadwick.

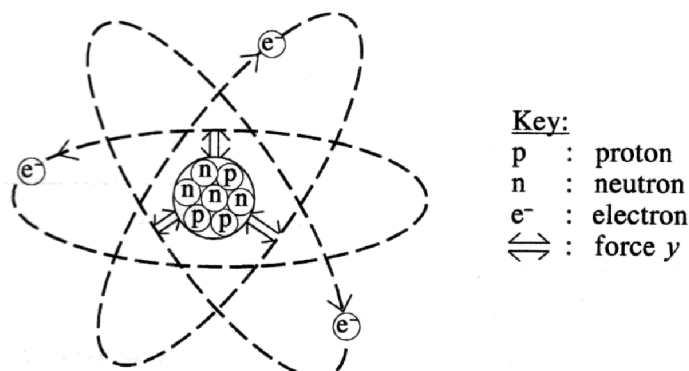


Diagram 9.1

(a) Compare the relative mass and the charge of **two** of the subatomic particles in diagram 9.1. [4M]

(b) Using the Periodic Table of Elements provided on page 47, identify an element that is placed in the same group as the element in Diagram 9.1.

Write the symbol for the element in the form A_ZX , where:

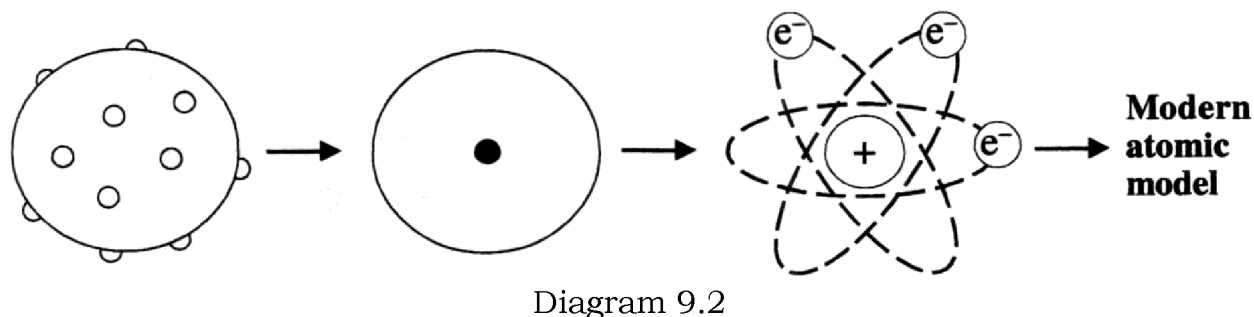
X = symbol of the element

A = nucleon number

Z = proton number

(c) Describe fully the atomic structure for the element that you have stated in Use the information in Diagram 9.1 to help your description. [6M]

(d) Diagram 9.2 shows how the model of an atom was develop by several scientists.



The following is information about an element:

- A good conductor of heat and electricity.
- Has a shiny surface
- Needs to be kept in paraffin oil
- Has more than two shells filled with electrons
- Reacts with water to form a metal hydroxide and hydrogen

Draw the structure of an atom of the element using the **modern atomic model** that you have identified in diagram 9.2.

Name the element. [7M]

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[MRS03-07a]



Figure 6

Figure 6 shows the symbols for isotopes of oxygen.

(a) Based on figure 6, state the proton number and the nucleon number for both isotopes. Determine the position of oxygen in the Periodic Table. [4M]

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[SPM05-10a]

(a) Isotopes are used for example in medicine, industry, science and archaeology. Choose **two** of the above example.

State an isotope and its purpose in each example that you have chosen. [4M]

[MRSM11-07] (a) Diagram 7.1 shows the atomic structure of element X.

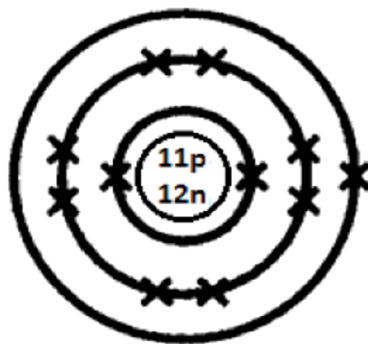


Diagram 7.1

- (i) Describe the atomic structure shown in Diagram 7.1. [6M]
- (ii) State the position of element X in the Periodic Table. Explain your answer. [4M]

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Structure {Paper03}

[SBPdiag05-01-P3]

Figure 1.1 shows the set-up of apparatus to determine freezing point of substance X.

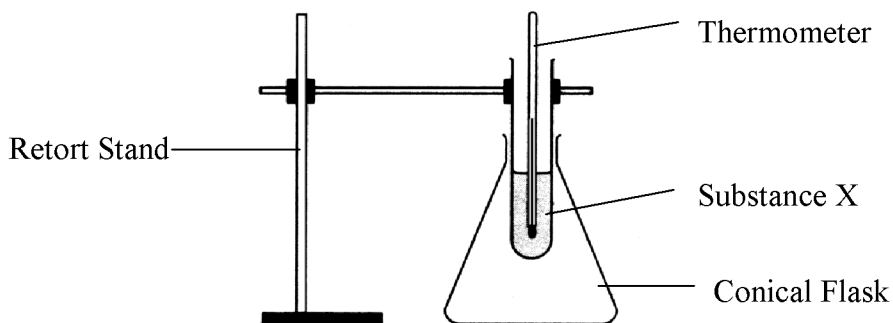


Diagram 1.1

Figure 1.2 shows the reading of thermometer for the freezing point of Substance X at a certain time.

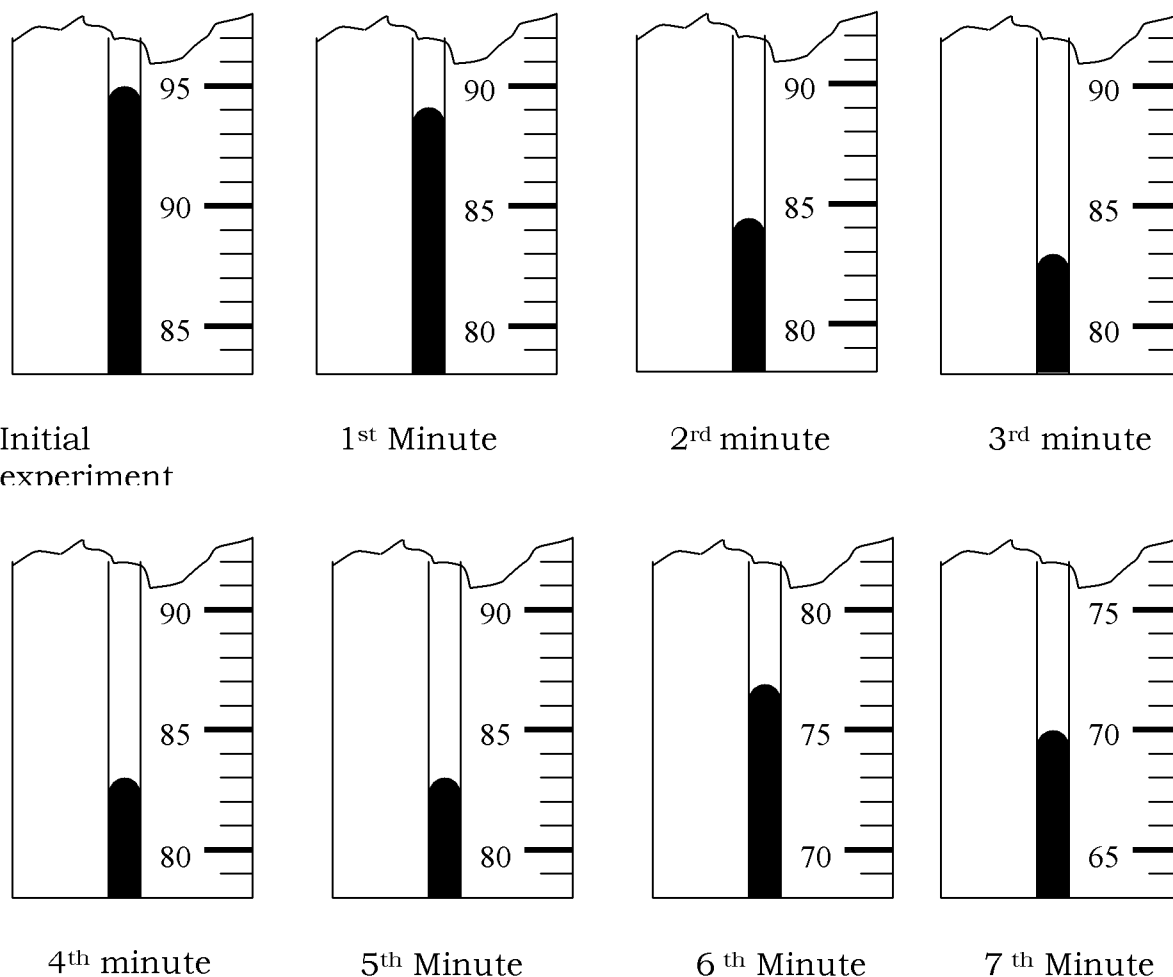
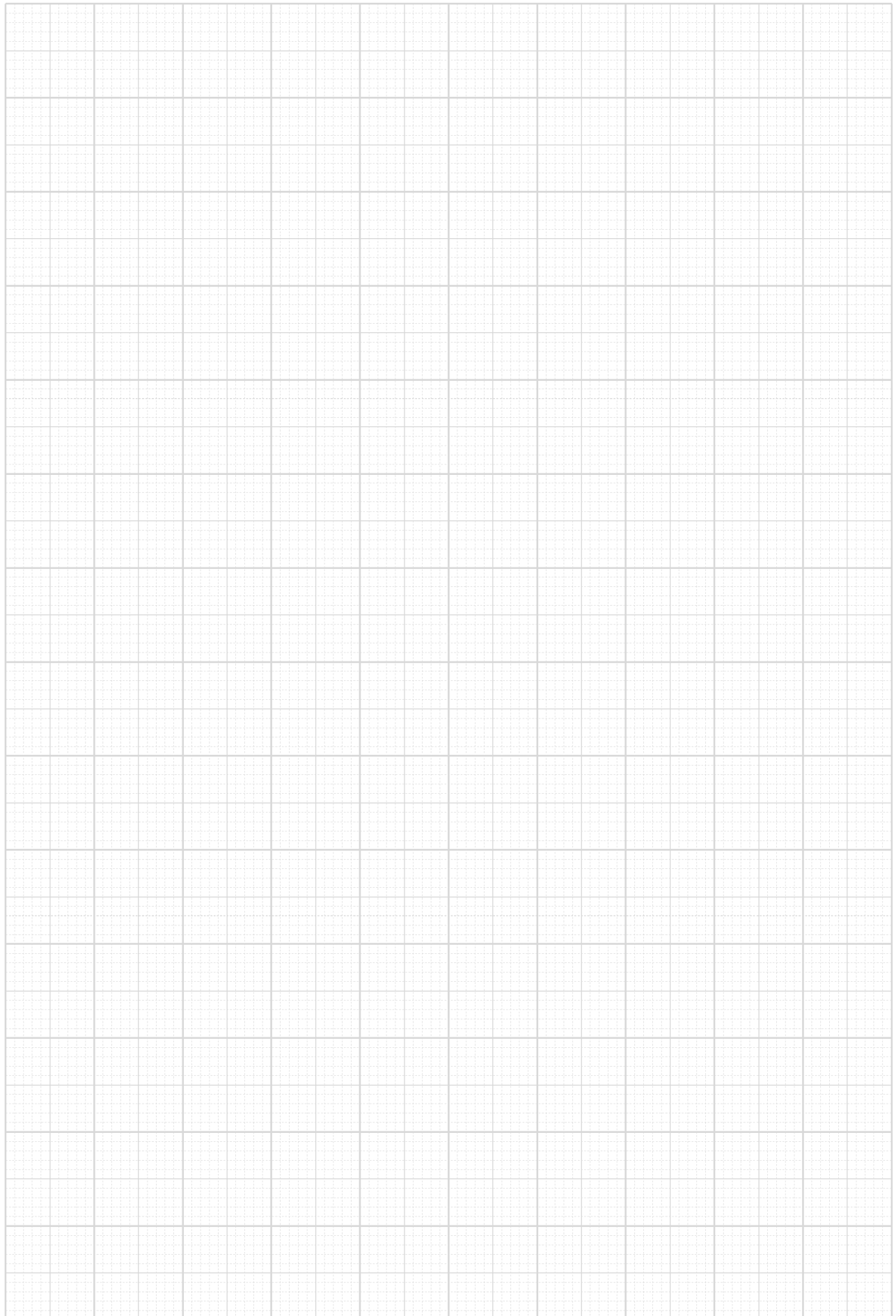


Figure 1.2

(a) Record the thermometer readings that showed in Figure 1.2 in this table below. [3M]

Time / minute	0	1	2	3	4	5	6	7
Thermometer / °C								

(b) Draw the graph of temperature against time on the graph sheet that has been given.



(c) Based on the graph at (b), [3M]

(i) State the changes of temperature of X during this experiment.

.....
.....
.....

(ii) State the inference for your answer in (c)(i) .

.....
.....
.....

(d) What is the boiling point of substance X?
Label on the graph to show how you get the answer. [3M]

.....

(e) Based on the experiment, what is the meaning of freezing point? [3M]

.....
.....
.....

(f) If X is boiled at room temperature until 100 °C, what is the temperature for X to start to melt? Explain your answer.

.....
.....
.....

[SPM05-01-P3]

An experiment is carried out to determine the freezing point of naphthalene. Solid naphthalene is heated in a water bath until it melts completely. The initial temperature is recorded. Then molten naphthalene is left to cool. The reading of the temperature is recorded every 30 seconds.

Figure 1 shows the recorded thermometer readings at 30 seconds intervals.

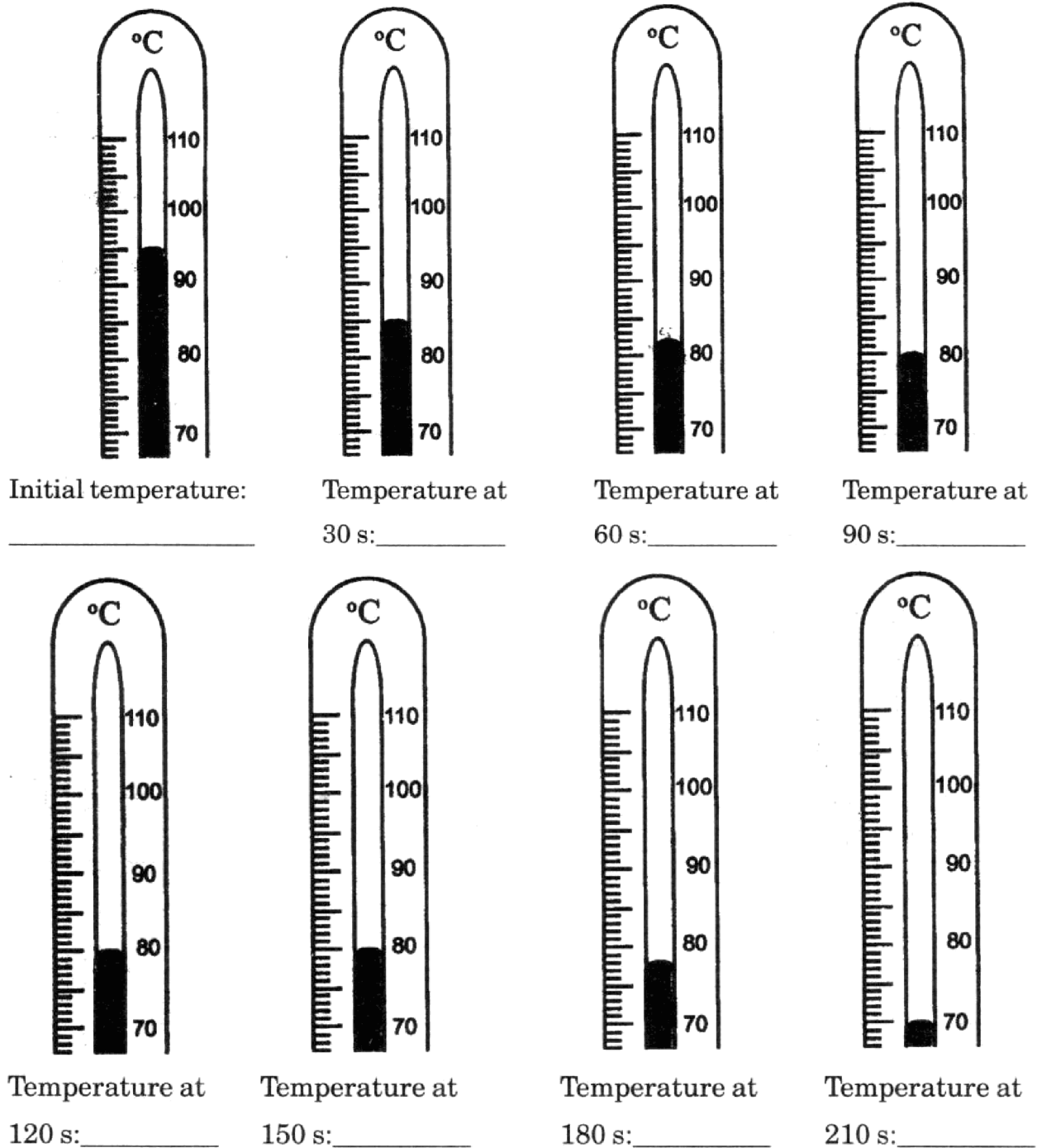
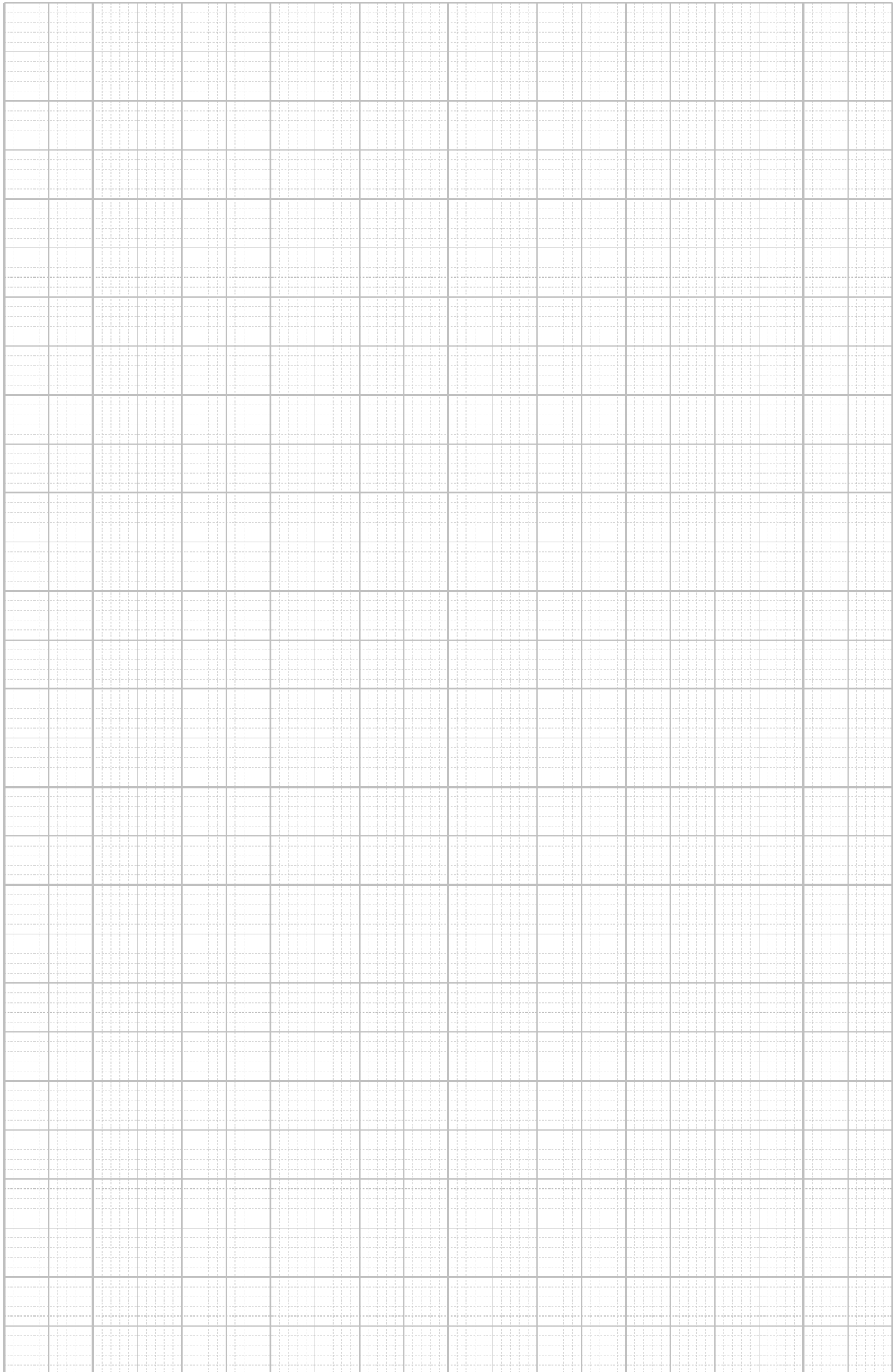


Figure 1

(a) Record the temperatures in the spaces provided in figure 1. [3M]

(b) On the graph paper below, draw the graph of temperature against time for the cooling of naphthalene. [3M]



(c) (i) use the graph in (b), to determine the freezing point of naphthalene. Show on the graph how you determine this freezing point. [3M]

(ii) How does the graph in (b) show freezing point of naphthalene? [3M]

.....
.....
.....

(d) Temperature of naphthalene did not change from the 90th second until the 50th second during the cooling process. Explain why. [3M]

.....
.....
.....

(e) On the graph paper below sketch the curve you would expect if the molten naphthalene is cooled quickly. [3M]

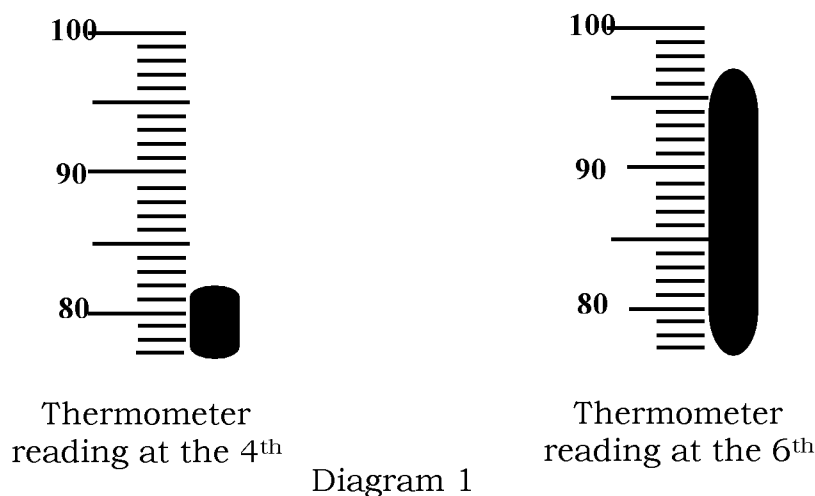
(f) Naphthalene is an example of a covalent compound and sodium chloride is an example of an ionic compound.

Classify the following into covalent or ionic compounds. [3M]

**Glucose, potassium iodide, copper (II) sulphate,
Aluminium oxide, tetrachloromethane, ethanol**

[SBPdiag08-01-P3]

An experiment was carried out by a group of students to determine the melting point of acetamide. Diagram 1 shows the thermometer reading at the 4th and the 6th minute of the experiment when acetamide was heated in a boiling tube until above its melting point.



Time /min	0	½	1	1 ½	2	2 ½	3	3 ½	4	4 ½	5	5 ½	6
Temperature/°C	27.0	36.0	50.0	66.0	82.0	82.0	82.0	82.0	84.0	_____	88.0	92.0	_____

TABLE 1

(a) Table 1 shows the results of the experiment. Based on Diagram 1, complete the table to show the temperature at the 4th and the 6th minute. [3M]

(b) On the graph paper provided, draw the graph of temperature against time based on the collected data. [3M]

(c) Use the graph in (b), to determine the melting point of acetamide. Show on the graph how you determine this melting point. [3M]

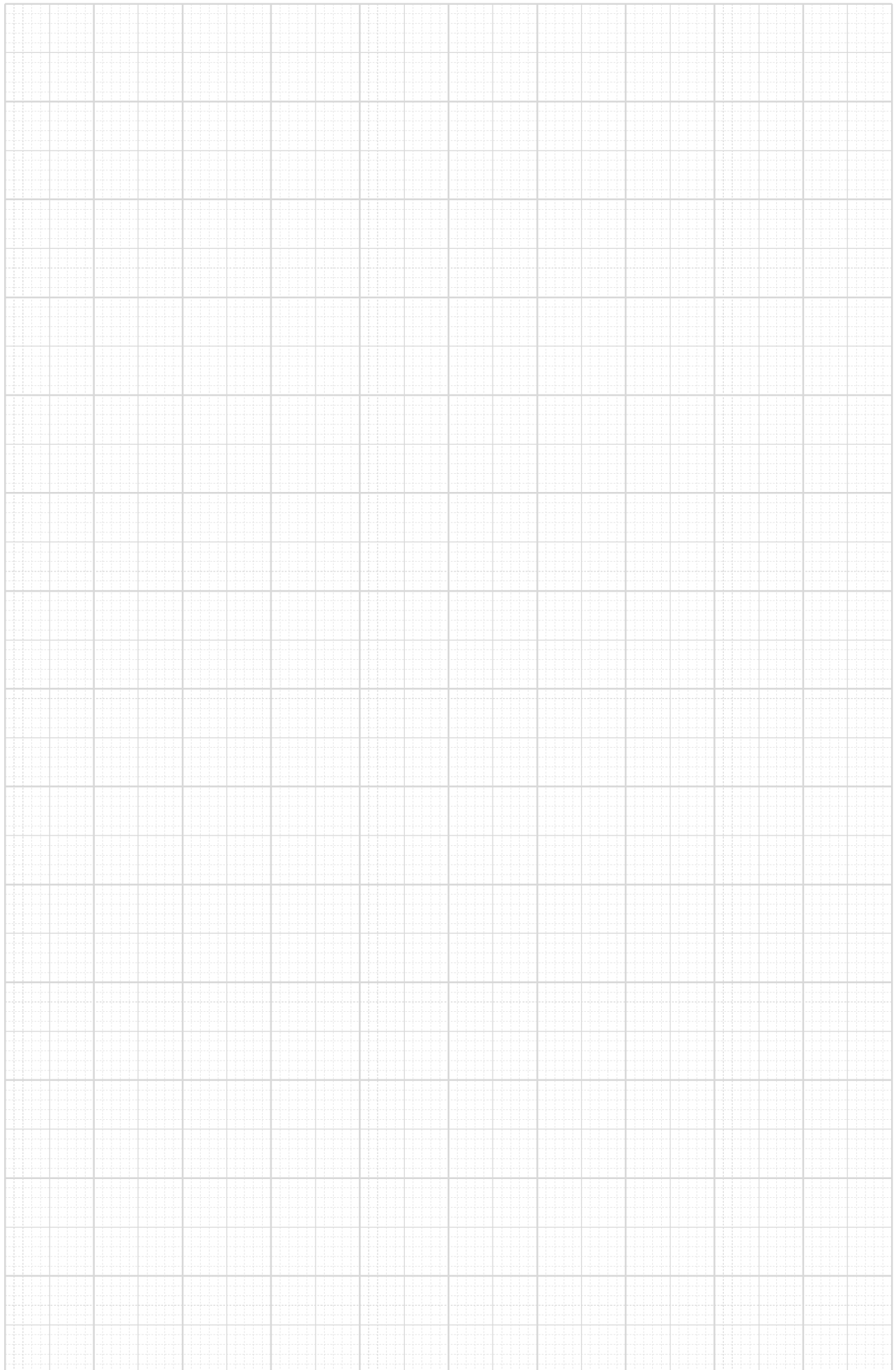
.....

(d) The temperature did not change from the 2nd minute until the 4th minute. Explain why. [3M]

.....

.....

.....



(e) Acetamide is an example of a covalent compound and sodium chloride is an example of an ionic compound. Classify the following compounds into covalent compounds and ionic compounds. [3M]

Magnesium chloride
Methylbenzene

Carbon dioxide
Zinc sulphate

Tetrachloromethane
Copper(II) nitrate

Essay {Paper03}

[SBPdiag07-03-P3]

Any pure substance has its own fixed melting point. For example, the melting point of pure acetamide is 83 °C.

You are given two beakers, each containing acetamide A and acetamide B. One of them is impure acetamide.

Plan an experiment to determine which of the acetamide is pure.
Your planning must include the following items:

- (a) Problem statement
- (b) All variables involved
- (c) Statement of the hypothesis
- (d) List of materials and apparatus
- (e) Experimental procedure
- (f) Tabulation of data