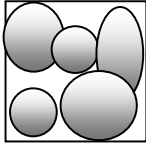
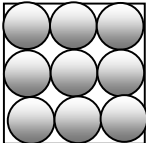
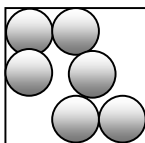
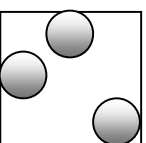
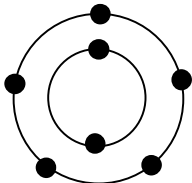
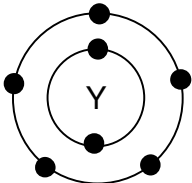
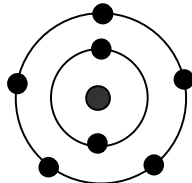


CHAPTER 2: THE STRUCTURE OF THE ATOM

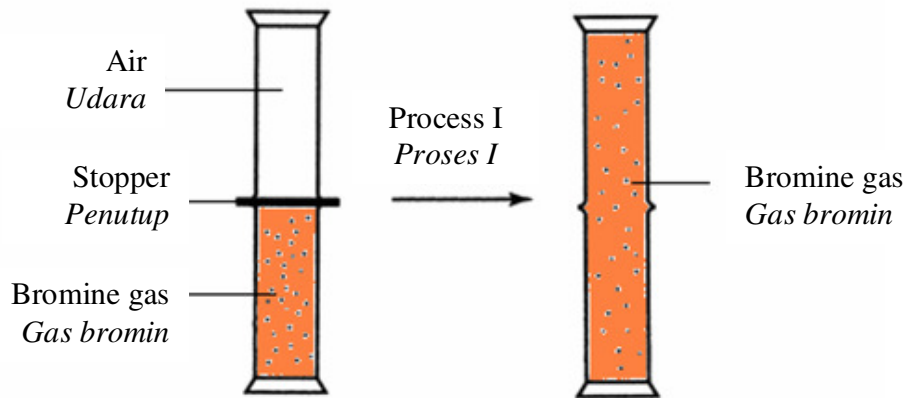
SECTION A: Common Mistake Made By The Candidates

INCORRECT TERMS	CORRECT TERMS
<p>The electron arrangement of sodium atom is 2 : 8 : 1.</p>	<p>The electron arrangement of sodium atom is 2.8.1 / 2,8,1</p>
<div style="text-align: center;">  </div> <p>Size of particles in solid/liquid/gas not equal.</p>	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Solid</p> </div> <div style="text-align: center;">  <p>Liquid</p> </div> <div style="text-align: center;">  <p>Gas</p> </div> </div>
<p>Melting point is the point where solid starts changes to liquid.</p>	<p>Melting point is the temperature where solid starts to change to liquid</p>
<p>Nucleus contains 1 proton number and 1 neutron number</p>	<p>Nucleus contains 1 proton and 1 neutron</p>
<p>Do not put the nucleus in the drawing electron arrangement</p> <div style="text-align: center;">  </div>	<div style="display: flex; justify-content: center; align-items: center;"> <div style="text-align: center;">  </div> <div style="margin: 0 10px;">or</div> <div style="text-align: center;">  </div> </div>

SECTION B: DIAGNOSTIC QUESTION

a) Objective question

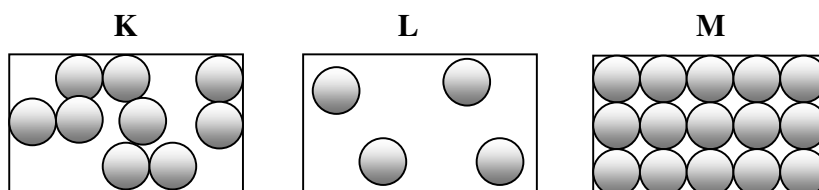
- 1 The figure below shows the set-up of the apparatus to study Process I
Rajah di bawah menunjukkan susunan rajah bagi mengkaji Proses I



What is Process I?
Apakah Proses I

- A Condensation
Kondensasi
- B Evaporation
Sejatan
- C Diffusion
Resapan
- D Sublimation
Pemejalwapan

- 2 The diagram shows the arrangement of molecules in the three states of matter.
Rajah menunjukkan susunan molekul dalam tiga keadaan jirim.



Which the **correct** states of matter for K, L and M?

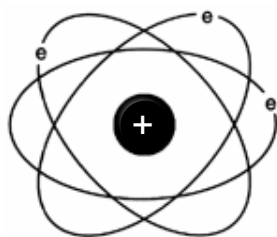
Yang manakah menunjukkan keadaan jirim yang betul bagi K, L dan M?

- | | K | L | M |
|----------|-------------------------|-------------------------|-------------------------|
| A | Gas
<i>Gas</i> | Liquid
<i>Cecair</i> | Solid
<i>Pepejal</i> |
| B | Gas
<i>Gas</i> | Solid
<i>Pepejal</i> | Liquid
<i>Cecair</i> |
| C | Solid
<i>Pepejal</i> | Liquid
<i>Cecair</i> | Gas
<i>Gas</i> |
| D | Liquid
<i>Cecair</i> | Gas
<i>Gas</i> | Solid
<i>Pepejal</i> |

- 3 The boiling point of a substance X is 78°C and its melting point is -5°C . What is the physical state of substance X at -8°C and 80°C ?
Takat didih bahan X ialah 78°C dan takat leburnya ialah -5°C . Apakah keadaan fizikal bahan X pada suhu -8°C dan 80°C ?

	At -8°C	At 80°C
A	Solid <i>Pepejal</i>	Gas <i>Gas</i>
B	Solid <i>Pepejal</i>	Liquid <i>Cecair</i>
C	Liquid <i>Cecair</i>	Gas <i>Gas</i>
D	Liquid <i>Cecair</i>	Liquid <i>Cecair</i>

4. The diagram shows a model of an atom.
Rajah menunjukkan satu model bagi satu atom.



Which of the following is true about the atomic model?
Antara berikut yang manakah benar mengenai model atom itu?

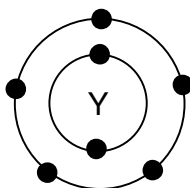
- I Proposed by Neil Bohr
Dikemukakan oleh Neil Bohr
 - II Electrons move in shells around the nucleus
Elektron bergerak mengelilingi nukleus pada petala
 - III Atom contains neutral particles is called neutron
Atom mengandungi zarah neutral dipanggil neutron
 - IV Discovered through the bombardment experiment of alpha particles on gold foil
Ditemui melalui eksperimen bedilan zarah alfa ke atas kerajang emas
- A I and II only
I dan II sahaja
 - B I and III only
I dan III sahaja
 - C I,II and III only
I,II dan III sahaja
 - D I,II,III and IV.
I,II,III and IV
5. The number of electrons and the number of neutrons of atom X are 4 and 5 respectively.
 What is the proton number and nucleon number of atom X?
*Bilangan elektron dan bilangan neutron bagi atom X masing-masing ialah 4 dan 5.
 Apakah nombor proton dan nombor nukleon bagi atom X?*

	Proton number <i>Nombor proton</i>	Nucleon number <i>Nombor nukleon</i>
A	4	9
B	4	5
C	9	4
D	1	9

6. The symbol of boron atom can be written as ${}^{11}_5\text{B}$.
The nucleus of this boron atom contains

*Simbol bagi atom boron boleh ditulis sebagai ${}^{11}_5\text{B}$.
Nukleus bagi atom boron mengandungi*

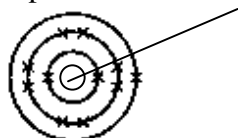
- A** 5 protons and 6 neutrons
5 proton dan 6 neutron
- B** 5 neutrons and 6 protons
5 neutron dan 6 proton
- C** 5 protons and 6 electrons
5 proton dan 6 elektron
- D** 6 neutrons and 5 electrons
6 neutron dan 5 elektron
7. The diagram shows the electron arrangement of atom Y.
Rajah menunjukkan susunan elektron bagi atom Y.



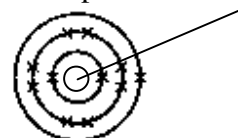
- How many valence electrons are there in the atom Y?
Berapakah bilangan elektron valens yang terdapat dalam atom Y?
- A** 2
B 3
C 5
D 7
8. This isotopes produces gamma radiation to kill cancer cells. What is the isotope?
Isotop ini menghasilkan sinar gamma untuk membunuh sel kanser. Apakah isotop ini?
- A** *Iodine-131*
Iodin-131
- B** *Cobalt-60*
Kobalt-60
- C** *Sodium-24*
Natrium-24
- D** *Carbon-12*
Karbon-12

9. Sodium has a proton number of 11 and a nucleon number of 23.
Which of the following figures shows an atom of sodium?
Natrium mempunyai nombor proton 11 dan nombor nucleon 23.
Antara gambarajah berikut, yang manakah menggambarkan atom natrium?

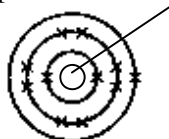
A 11proton + 23 neutron



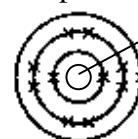
C 11proton + 11neutron



B 11proton + 34 neutron



D 11proton + 12neutron



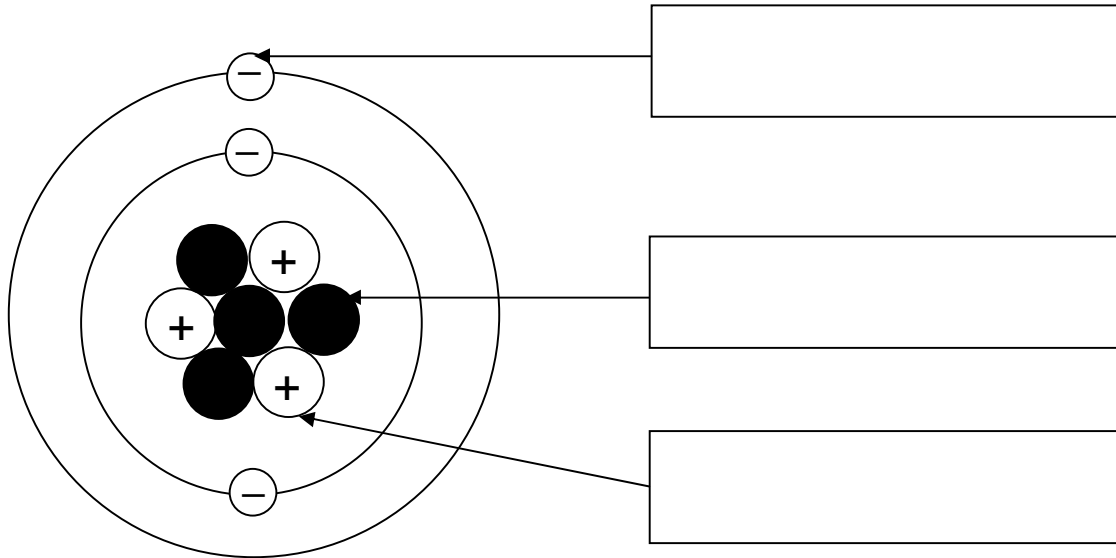
10. What can be deduced from the symbol ${}_{13}^{27}\text{Al}$?
Apakah yang dapat disimpulkan dari symbol ${}_{13}^{27}\text{Al}$?

- I** The electron arrangement of aluminium atom is 2.8.3
Susunan elektron bagi atom aluminium ialah 2.8.3.
- II** Aluminium atom has 13 protons and 27 neutrons.
Atom aluminium mempunyai 13 proton dan 27 neutron.
- III** Aluminium atom has a proton number of 27 and 14 neutrons.
Atom aluminium mempunyai nombor proton 27 dan 14 neutron.
- IV** The total number of proton and neutron of aluminium atom is 27.
Jumlah bilangan proton dan neutron atom aluminium ialah 27.

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

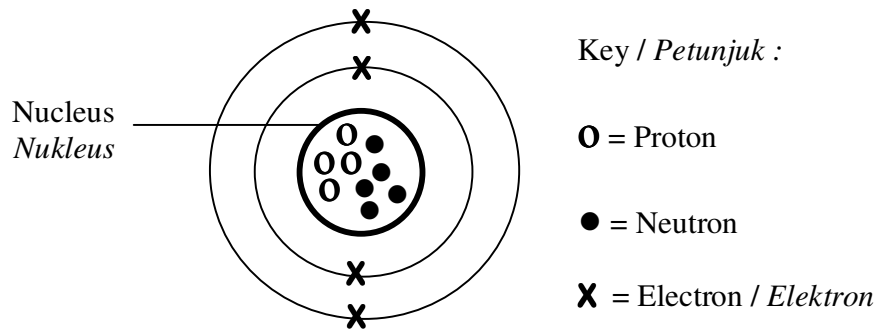
b) Structure Questions

1. Diagram 1 shows the atomic structure of an atom of lithium.
Rajah 1 menunjukkan struktur atom bagi satu atom litium.



Label the diagram to show an electron, a neutron and a proton.
Labelkan rajah untuk menunjukkan satu elektron, satu neutron dan satu proton.

2. Diagram shows the electron arrangement of an atom of beryllium.
Rajah 1 menunjukkan susunan elektron bagi satu atom berilium.



Proton number for beryllium is 4.
 What is meant by Proton number?
Nombor proton bagi berilium ialah 4.
Apakah yang dimaksudkan dengan nombor proton.

.....

.....

3. Diagram shows the symbols for the atoms of element carbon.
Rajah menunjukkan simbol bagi atom unsur karbon.

Atom	Proton number <i>Nombor proton</i>	Nucleon number <i>Nombor nukleon</i>
$^{12}_6\text{C}$	6	12
$^{13}_6\text{C}$	6	13

$^{12}_6\text{C}$ and $^{13}_6\text{C}$ are isotopes.

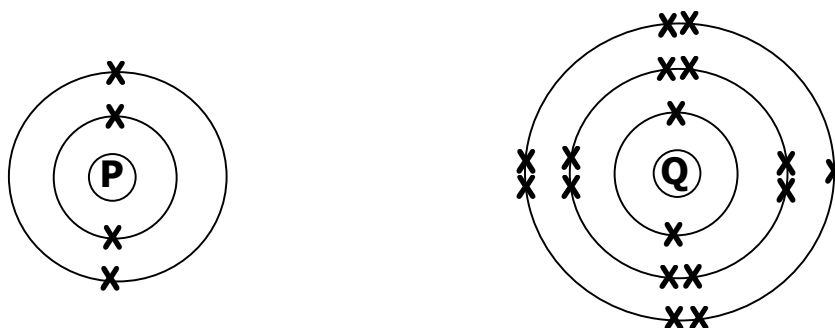
What is meant by isotope?

$^{12}_6\text{C}$ dan $^{13}_6\text{C}$ ialah isotop.

Apakah yang dimaksudkan dengan isotop?

.....

4. Diagram shows the electron arrangement for atoms P and Q.
Rajah menunjukkan susunan electron bagi atom P dan Q.

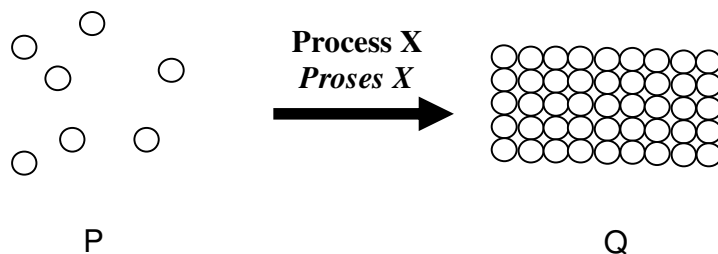


What is the number of valence electrons for atom P and Q?

Apakah bilangan elektron valens bagi atom P dan Q?

.....

5. The diagram shows the changes in the state of a substance from P to Q under process X.
Rajah menunjukkan perubahan keadaan bagi sebatian daripada P kepada Q melalui proses X.



What is process X?
Apakah proses X?

.....

6. Solid Z has a melting point of 50°C . If a test tube of molten Z at 110°C is allowed to cool at room temperature,
- sketch a graph of temperature against time for the cooling of molten Z.
 - mark the freezing point on your graph.

Pepejal Z mempunyai takat lebur pada 50°C . Jika tabung uji bagi leburan Z pada 110°C dibiarkan menyejuk sehingga suhu bilik,

- lakarkan graf suhu melawan masa bagi penyejukan leburan Z.*
- tandakan takat beku pada graf anda.*



SECTION C: PAPER 2

a) Structure Question

1. Table 1 shows five different substances.
Jadual 1 menunjukkan lima bahan yang berlainan.

Substance <i>Bahan</i>	Chemical formula <i>Formula kimia</i>
Chlorine <i>Klorin</i>	Cl ₂
Sodium <i>Natrium</i>	Na
Magnesium sulphate <i>Magnesium sulfat</i>	MgSO ₄
Naphthalene <i>Naftalena</i>	C ₁₀ H ₈

Table 1
Jadual 1

- (a) State **one** substance from the Table 1 which exists as molecule.
*Nyatakan **satu** bahan dari Jadual 1 yang wujud sebagai molekul.*

[1 mark]

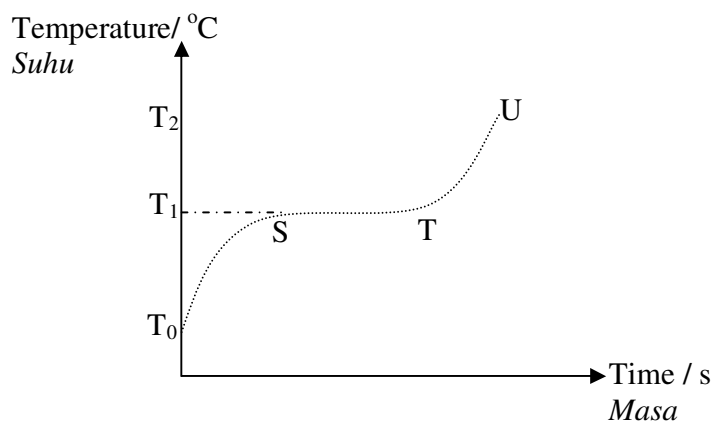
- (b) What is the state of matter of magnesium sulphate at room temperature?
Apakah keadaan jirim magnesium sulfat pada suhu bilik?

[1 mark]

- (c) Draw the arrangement of particles in chlorine at room temperature.
Lukiskan susunan zarah-zarah dalam klorin pada suhu bilik.

[1 mark]

- (d) The graph shows the temperature against time when solid naphthalene is heated.
Graf menunjukkan suhu lawan masa apabila naftalena dipanaskan.



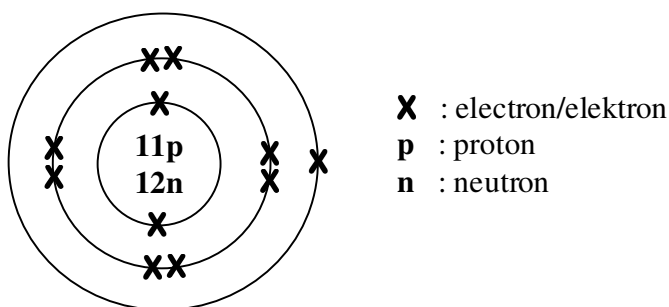
- (i) State the melting point of naphthalene.
Nyatakan takat lebur bagi naftalena.

[1 mark]

- (ii) Explain why there is no change in temperature from S to T.
Terangkan mengapa tiada perubahan suhu dari S ke T

[1 mark]

- (e) Diagram shows the atomic structure of an atom of sodium.
Rajah menunjukkan struktur atom bagi satu atom natrium.



- (i) What is the proton number for sodium?
Apakah nombor proton bagi natrium?

[1 mark]

- (ii) What is the nucleon number for sodium?
Apakah nombor nukleon bagi natrium?

[1 mark]

- (iii) Write the electron arrangement for an atom of sodium.
Tuliskan susunan susunan elektron bagi satu atom natrium.

[1 mark]

- (iv) What is the number of valence electrons for an atom of sodium.
Berapakah elektron valens bagi satu atom natrium?

[1 mark]

- (v) Write the symbol for the element sodium in the form A_ZX .
Tuliskan simbol unsur bagi unsur natrium dalam bentuk A_ZX .

[1 mark]

b) Essay Questions

2. (a) (i) What is the meaning of melting point?
Apakah yang dimaksudkan dengan takat lebur. [1 mark]

- (ii) Substance X, Y and Z have different melting point and boiling point.
Substance X, Y and Z have a different physical state at the room temperature and pressure.
How can you predict the physical state of X, Y and Z.
*Bahan X, Y dan Z mempunyai takat lebur dan takat didih yang berbeza.
Pada suhu dan tekanan bilik bahan X, Y dan Z mempunyai keadaan fizik yang berbeza.
Bagaimanakah anda meramalkan keadaan fizik bagi bahan X, Y dan Z.*

[3 marks]

- (b) Diagram 2.1 shows the chemical symbol which represent three elements, X, Y and Z.
Rajah 2.1 menunjukkan simbol kimia bagi 3 unsur X, Y dan Z

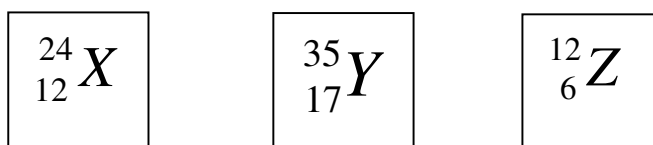


Diagram 2.1
Rajah 2.1

- (i) Write the electron arrangement of atoms X and Y.
Tuliskan susunan elektron bagi atom X dan atom Y [2 marks]
- (ii) State the number of neutrons in an atom of element Z and write the symbol for another isotope of element Z.
Nyatakan bilangan neutron dalam atom bagi unsur Z dan tuliskan simbol bagi satu isotop lain unsur Z. [2 marks]
- (c) Isotope are used in medicine, industry, science and archeology.
Choose two of the above examples.
State an isotope and its purpose in each example that you have chosen.
*Isotop digunakan dalam bidang perubatan, industri, sains dan arkeologi.
Pilih dua dari contoh di atas.
Nyatakan jenis isotop dan kegunaan untuk setiap contoh yang diberi.* [4 marks]

- (d) Diagram 2.2 shows how the model of an atom was developed by several scientist
Rajah 2.2 menunjukkan bagaimana model atom diperkembangkan oleh beberapa orang ahli sains

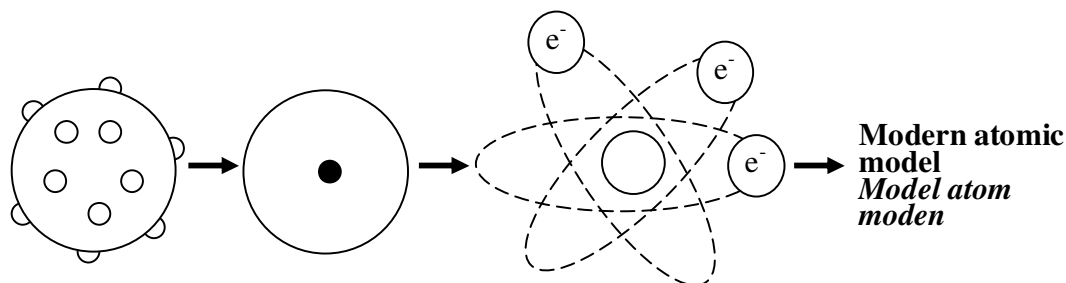


Diagram 2.2
Rajah 2.2

Diagram 2.3 shows the symbol for an atom of the element.
Rajah 2.3 menunjukkan simbol bagi satu atom unsur.

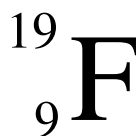


Diagram 2.3
Rajah 2.3

Based on Diagram 2.3, **draw** the structure of an atom of the element using the modern atomic model that you identified in Diagram 2.2 .

Name the element.

Berdasarkan Rajah 2.3, lukis struktur atom bagi unsur itu menggunakan model atom moden yang telah anda kenal pasti dalam Rajah 2.2.

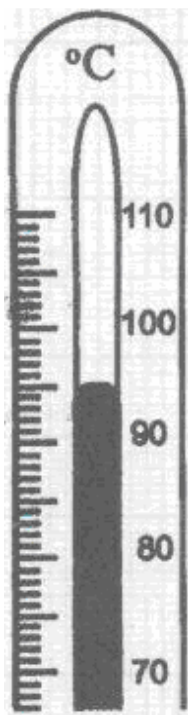
Namakan unsur itu.

[8 marks]

SECTION D: PAPER 3
Structure Questions

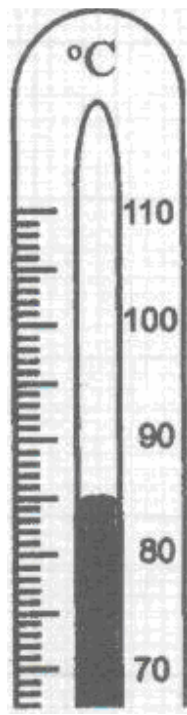
1. An experiment was conducted to find out the freezing point of liquid naphthalene. A boiling tube containing molten naphthalene at 95°C was allowed to cool in a conical flask to room temperature. The temperature of naphthalene was recorded at half-minute intervals. Diagram 1 shows the reading of the thermometer for this experiment.

Satu eksperimen telah dijalankan untuk menentukan takat beku bagi cecair naftalena. Satu tabung didih mengandungi leburan naftalena pada 95°C dibiarkan menyejuk di dalam kelalang kon sehingga suhu bilik. Suhu bagi naftalena direkodkan setiap setengah minit. Rajah 1 menunjukkan bacaan termometer bagi eksperimen ini.



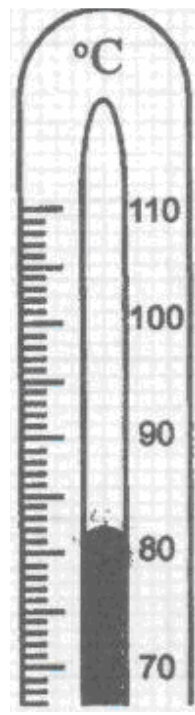
Initial temperature
Suhu awal

0 s :



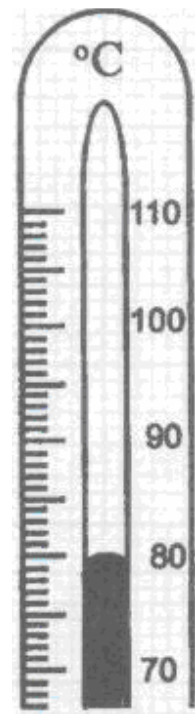
Temperature at
Suhu pada

30 s :



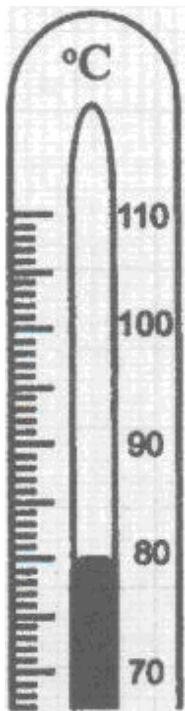
Temperature at
Suhu pada

60 s :



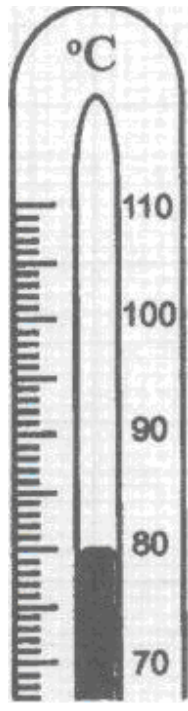
Temperature at
Suhu pada

90 s :



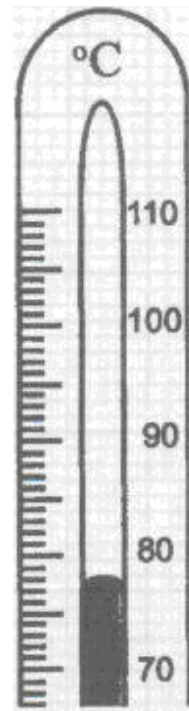
Temperature at
Suhu pada

120 s :



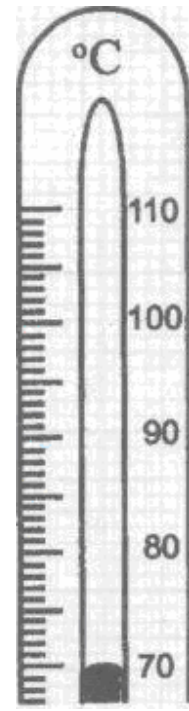
Temperature at
Suhu pada

150 s :



Temperature at
Suhu pada

180 s :



Temperature at
Suhu pada

210 s :

Diagram 1
Rajah 1

- (a) Record the temperature in the spaces provided in Diagram 1.
Catat suhu pada ruang yang disediakan dalam Rajah 1.

[3 marks]

- (b) Construct a table to record the data shown in Diagram 1.
Bina jadual untuk mencatat data dalam Rajah 1.

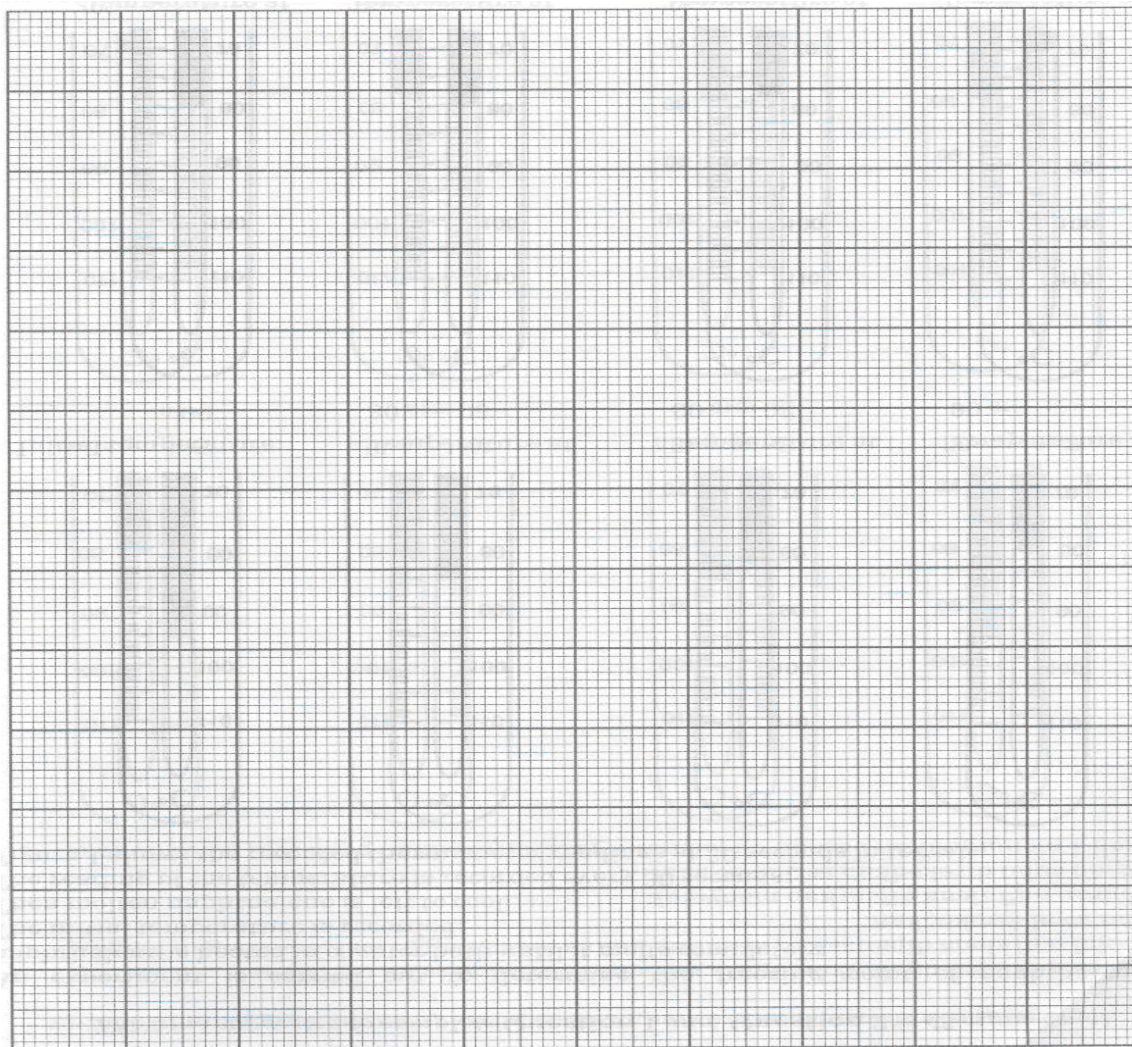
[3 marks]

- (c) (i) Draw a graph of temperature against time.
Lukiskan graf suhu melawan masa.

[3 marks]

- (ii) On your graph, mark the freezing point of naphthalene.
Pada graf anda, tandakan takat beku bagi naftalena.

[3 marks]



- (d) (i) What is meant by the term freezing point ?
Apakah yang dimaksudkan dengan istilah takat beku?

[3 marks]

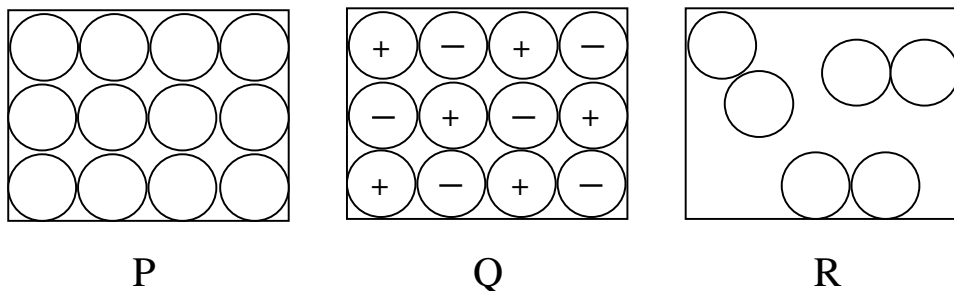
- (ii) Explain why the temperature of naphthalene did not change from the 90th second until the 150th second during the cooling process.
Terangkan mengapa suhu naftalena tidak berubah dari saat ke 90 sehingga ke 150 semasa penyejukan itu.

[3 marks]

- (e) Why was the boiling tube placed in the conical flask during the cooling ?
Mengapa tabung didih diletakkan dalam kelalang kon semasa penyejukan?

[3 marks]

- (f) Diagram shows the arrangement of particles of three substances.
Rajah menunjukkan susunan zarah-zarah dalam tiga bahan.



Classify P, Q and R into atom, molecule or ion substances.
Kelaskan P, Q dan R ke dalam bahan atom, molekul dan ion.

Atom <i>Atom</i>	Molecule <i>Molekul</i>	Ion <i>Ion</i>

[3 marks]