

**SULIT**



**KEMENTERIAN PENDIDIKAN TINGGI  
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI**

**BAHAGIAN PEPERIKSAAN DAN PENILAIAN  
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI  
KEMENTERIAN PENDIDIKAN TINGGI**

**JABATAN MATEMATIK, SAINS DAN KOMPUTER**

**PEPERIKSAAN AKHIR  
SEMESTER I : 2025/2026**

**FB10083: CHEMISTRY I**

**TARIKH : 01 DISEMBER 2025  
MASA : 8.30 PAGI – 10.30 PAGI (2 JAM)**

Kertas ini mengandungi **DUA BELAS (12)** halaman bercetak.

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Tiada

**JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN**

(CLO yang tertera hanya sebagai rujukan)

**SULIT**

**INSTRUCTION:**

This section consists of **FOUR (4)** questions. Answers **ALL** questions.

**ARAHAN:**

*Bahagian ini mengandungi EMPAT (4) soalan. Jawab SEMUA soalan.*

**QUESTION 1****SOALAN 1**

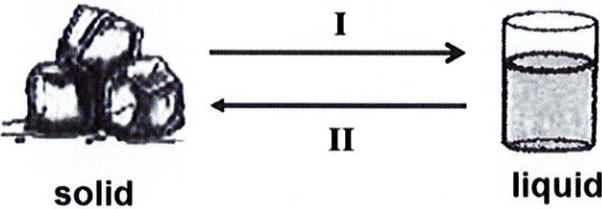
- CLO1 (a) (i) Define atom and isotope.  
*Definisikan atom dan isotop.*
- [2 marks]  
[2 markah]
- (ii) Express the number of protons and electrons for each polyatomic ion of  $\text{OH}^-$  and  $\text{NH}_4^+$ . (Proton number: O = 8, H = 1, N = 7)  
*Nyatakan bilangan proton dan elektron untuk setiap ion poliatom  $\text{OH}^-$  dan  $\text{NH}_4^+$ : (Nombor proton: O = 8, H = 1, N = 7)*
- [4 marks]  
[4 markah]
- CLO1 (b) (i) Figure 1(b) shows the changes in the phases of matter. Identify the process involved in I and II based on Figure 1(b).  
*Rajah 1(b) menunjukkan perubahan fasa jirim. Kenal pasti proses yang terlibat dalam I dan II berdasarkan Rajah 1(b).*
- 

Figure 1(b)  
*Rajah 1(b)*
- [2 marks]  
[2 markah]

- (ii) Compare **THREE (3)** properties of gas and liquid in term of shape and arrangement of particles by providing a diagram to illustrate the differences.

*Bandungkan TIGA (3) sifat gas dan cecair dari segi bentuk dan susunan zarah dengan menyediakan gambar rajah untuk menggambarkan perbezaan.*

[4 marks]

[4 markah]

CLO1

- (c) (i) Define triple point and critical point.

*Definisikan takat triple dan takat kritikal.*

[2 marks]

[2 markah]

- (ii) Explain the condition at point A, O, B and C based on the phase diagram of water ( $H_2O$ ) in Figure 1(c).

*Jelaskan keadaan di titik A, O, B dan C berdasarkan gambar rajah fasa air ( $H_2O$ ) dalam Rajah 1(c).*

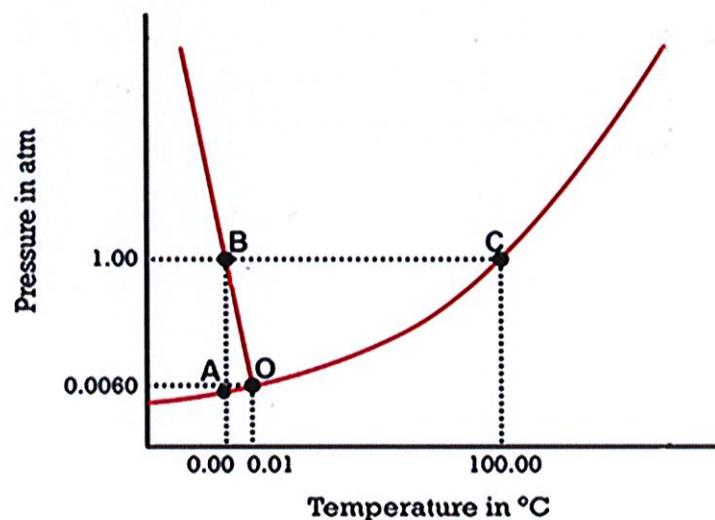


Figure 1(c)

*Rajah 1(c)*

[4 marks]

[4 markah]

CLO1

- (d) (i) Figure 1(d) illustrates the phases diagram of water ( $H_2O$ ). List the state of matter for region/area under the curve QTR, RTS and QTS based on Figure 1(d).

*Rajah 1(d) menggambarkan gambar rajah fasa air ( $H_2O$ ). Senaraikan keadaan jirim bagi kawasan/ruang di bawah lengkung QTR, RTS dan QTS berdasarkan Rajah 1(d).*

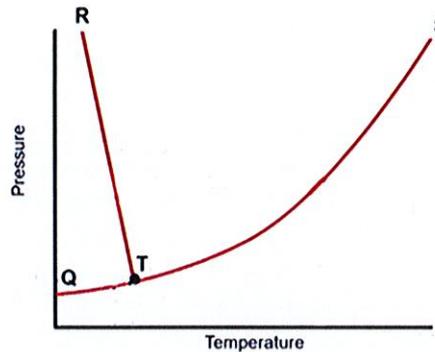


Figure 1(d)

*Rajah 1(d)*

[3 marks]

[3 markah]

- (ii) Explain **TWO (2)** differences between phase diagrams of water ( $H_2O$ ) and carbon dioxide ( $CO_2$ ) in term of melting curve and triple point.

*Terangkan **DUA (2)** perbezaan antara gambar rajah fasa air ( $H_2O$ ) dan karbon dioksida ( $CO_2$ ) dari segi lengkung lebur dan takat triple.*

[4 marks]

[4 markah]

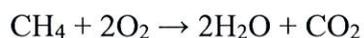
## QUESTION 2

## SOALAN 2

- CLO2 (a) (i) Express the number of moles of 12 g potassium chloride (KCl).  
(Relative atomic mass K = 39, Cl = 35.5)  
*Nyatakan bilangan mol 12 g kalium klorida (KCl).*  
*(Jisim atom relatif K = 39, Cl = 35.5)*
- [2 marks]  
[2 markah]
- (ii) Calculate the mass of copper oxide (CuO) produced when 30 g of copper carbonate (CuCO<sub>3</sub>) is thermally decomposed and carbon dioxide (CO<sub>2</sub>) gas is released. (Relative atomic mass Cu = 63.5, C = 12, O = 16).  
*Kirakan jisim kuprum oksida (CuO) yang dihasilkan apabila 30 g kuprum karbonat (CuCO<sub>3</sub>) terurai secara haba dan gas karbon dioksida (CO<sub>2</sub>) dibebaskan. (Jisim atom relatif Cu = 63.5, C = 12, O = 16).*
- $\text{CuCO}_3 \rightarrow \text{CuO} + \text{CO}_2$
- [4 marks]  
[4 markah]
- CLO2 (b) (i) Express the number of molecules in 0.21 moles of magnesium chloride (MgO). (Avogadro's constant =  $6.02 \times 10^{23}$ )  
*Nyatakan bilangan molekul dalam 0.21 mol magnesium klorida (MgO).*  
*(Pemalar Avogadro =  $6.02 \times 10^{23}$ )*
- [2 marks]  
[2 markah]
- (ii) The complete combustion of 245 g methane (CH<sub>4</sub>) produces carbon dioxide (CO<sub>2</sub>) and water vapor. Calculate the volume of carbon dioxide (CO<sub>2</sub>) at room temperature.  
(Relative atomic mass C = 12, H = 1, O = 16; molar volume at RTP = 24).

Pembakaran lengkap 245 g metana ( $\text{CH}_4$ ) menghasilkan karbon dioksida ( $\text{CO}_2$ ) dan wap air. Kirakan isipadu karbon dioksida ( $\text{CO}_2$ ) pada suhu bilik.

(Jisim atom relatif  $\text{C} = 12$ ,  $\text{H} = 1$ ,  $\text{O} = 16$ ; isipadu molar pada RTP = 24).



[4 marks]

[4 markah]

CLO2

- (c) (i) Express the volume of 0.025 moles of ethane ( $\text{C}_2\text{H}_6$ ) gas at standard temperature and pressure.

(Molar volume at STP = 22.4)

Nyatakan isipadu 0.025 mol gas etana ( $\text{C}_2\text{H}_6$ ) pada suhu dan tekanan standard.

(Isipadu molar pada STP = 22.4)

[2 marks]

[2 markah]

- (ii) The polymer has the following mass composition of 60 % carbon (C), 8 % hydrogen (H) and 32 % oxygen (O). Derive the empirical formula of the polymer.

(Relative atomic mass:  $\text{C} = 12$ ,  $\text{H} = 1$ ,  $\text{O} = 16$ )

Polimer mempunyai komposisi jisim berikut iaitu 60% karbon (C), 8% hidrogen (H) dan 32% oksigen (O). Terbitkan formula empirikal bagi polimer tersebut.

(Jisim atom relatif:  $\text{C} = 12$ ,  $\text{H} = 1$ ,  $\text{O} = 16$ )

[4 marks]

[4 markah]

CLO2

- (d) (i) Express the number of hydrogen (H) atoms present in 0.077 moles of  $C_6H_{12}O_6$ .  
(Relative atomic mass: C = 12, H = 1, O = 16; Avogadro's constant =  $6.02 \times 10^{23}$ )  
Nyatakan bilangan atom hidrogen (H) yang terdapat dalam 0.077 mol  $C_6H_{12}O_6$ .  
(Jisim atom relatif: C = 12, H = 1, O = 16; pemalar Avogadro =  $6.02 \times 10^{23}$ )

[3 marks]

[3 markah]

- (ii) A textile dye manufacturer developed a new red dye with relative molecular mass of 240. The dye has a percent composition of 76.0% carbon (C), 6.3% hydrogen (H) and 17.7% nitrogen (N). Derive the molecular formula of the red dye.

(Relative atomic mass: C = 12, H = 1, N = 14)

*Pengeluar pewarna tekstil membangunkan pewarna merah baharu dengan jisim molekul relatif 240. Pewarna tersebut mempunyai komposisi peratus 76.0% karbon (C), 6.3% hidrogen (H) dan 17.7% nitrogen (N). Terbitkan formula molekul bagi pewarna merah tersebut.*  
(Jisim atom relatif: C = 12, H = 1, N = 14)

[4 marks]

[4 markah]

**QUESTION 3****SOALAN 3**

- CLO1 (a) (i) State the group, period, block and electronic configuration of magnesium atom.  
(Proton number Mg = 12)  
*Nyatakan kumpulan, tempoh, blok dan konfigurasi elektronik atom magnesium.*  
*(Nombor proton Mg = 12)*
- [4 marks]  
[4 markah]
- (ii) Explain the trend of increasing atomic radius when down a group in the periodic table for lithium (Li), rubidium (Rb), sodium (Na), and potassium (K) atom.  
(Proton number lithium = 3, rubidium = 37, potassium = 19, sodium = 11)  
  
*Terangkan trend peningkatan jejari atom apabila menurunkan kumpulan dalam jadual berkala untuk atom litium (Li), rubidium (Rb), natrium (Na), dan kalium (K).*  
*(Nombor proton litium = 3, rubidium = 37, kalium = 19, natrium = 11)*
- [4 marks]  
[4 markah]
- CLO1 (b) (i) Identify the block of carbon, sulphur and copper atom in periodic table.  
(Proton number carbon (C) = 6, sulphur (S) = 16, copper (Cu) = 29)  
*Kenal pasti blok atom karbon (C), sulphur (S) dan kuprum (Cu) dalam jadual berkala.*  
*(Nombor proton karbon = 6, sulphur = 16, kuprum = 29)*
- [3 marks]  
[3 markah]

- (ii) Explain the trend of decreasing ionisation energy for a group of fluorine (F), bromine (Br), iodine (I) and chlorine (Cl) atom.

(Proton number fluorine = 9, bromine = 35, iodine = 53, chlorine = 17)

*Terangkan trend penurunan tenaga pengionan bagi sekumpulan atom fluorin (F), bromin (Br), iodin (I) dan klorin (Cl).*

(Nombor proton fluorin = 9, bromin = 35, iodin = 53, klorin = 17)

[4 marks]

[4 markah]

- CLO2 (c) (i) Choose the smallest atomic or ionic radius between Fe,  $\text{Fe}^{2+}$  and  $\text{Fe}^{3+}$ .

(Proton number Fe = 26)

Pilih jejari atom atau ionik terkecil antara Fe,  $\text{Fe}^{2+}$  dan  $\text{Fe}^{3+}$ .

(Nombor Proton Fe = 26)

[2 marks]

[2 markah]

- (ii) The ions  $\text{Mg}^{3+}$ ,  $\text{Al}^{3+}$  and  $\text{Na}^+$  are isoelectronic species across Period 3 which have the same number of electrons. Demonstrate the trend of ionic radius decrease between  $\text{Mg}^{3+}$ ,  $\text{Al}^{3+}$  and  $\text{Na}^+$  with appropriate explanations.

(Proton number Na = 11, Al = 13, Mg = 12)

*Ion  $\text{Mg}^{3+}$ ,  $\text{Al}^{3+}$  and  $\text{Na}^+$  ialah spesies isoelektronik merentas Tempoh 3 yang mempunyai bilangan elektron yang sama. Tunjukkan trend penurunan jejari ionik antara  $\text{Mg}^{3+}$ ,  $\text{Al}^{3+}$  and  $\text{Na}^+$  dengan penjelasan yang sesuai.*

(Nombor Proton Na = 11, Al = 13, Mg = 12)

[3 marks]

[3 markah]

- CLO2 (d) (i) Explain **TWO (2)** factors that influence the variation size of atomic radius.  
Terangkan **DUA (2)** faktor yang mempengaruhi saiz variasi atom radius.  
[2 marks]  
[2 markah]
- (ii) Given bromine (Br) and potassium (K) atoms. Demonstrate which atom has the greater electronegativity with the factors affecting them.  
(Proton number Br = 35, K = 19)  
Diberi atom bromin (Br) dan kalium (K). Tunjukkan atom mana yang mempunyai keelektronegatifan yang lebih besar dengan faktor-faktor yang mempengaruhinya.  
(Number proton Br = 35, K = 19)  
[3 marks]  
[3 markah]

**QUESTION 4****SOALAN 4**

- CLO2 (a) (i) Express the electronic configuration of  $\text{Cl}^-$  using spdf notation.  
(Proton number Cl = 17)  
*Nyatakan konfigurasi elektronik  $\text{Cl}^-$  menggunakan notasi spdf.*  
(Nombor Proton Cl = 17)  
[2 marks]  
[2 markah]

- (ii) Show the hybridization of Boron (B) atom in boron trifluoride ( $\text{BF}_3$ ) molecule.  
(Proton number B = 5, F = 9)  
*Tunjukkan hibridisasi boron, atom Boron (B) dalam molekul boron trifluorida ( $\text{BF}_3$ ).*  
(Nombor proton B = 5, F = 9)  
[4 marks]  
[4 markah]
- CLO2 (b) (i) Express the electronic configuration of  $\text{Na}^+$  using spdf notation.  
(Proton number Na = 11)  
*Nyatakan konfigurasi elektronik  $\text{Na}^+$  menggunakan notasi spdf.*  
(Nombor proton Na = 11)  
[2 marks]  
[2 markah]
- (ii) Write the quantum number of n, l, m and s for an electron in orbital 2p subshell based on the Pauli Exclusion Principle.  
*Tuliskan nombor kuantum n, l, m dan s untuk elektron dalam subkulit 2p orbital berdasarkan Prinsip Pengecualian Pauli.*  
[4 marks]  
[4 markah]
- CLO2 (c) (i) Explain the formation of oxygen ( $\text{O}_2$ ) gas based on covalent bond.  
(Proton number O = 8)  
*Terangkan pembentukan gas oksigen ( $\text{O}_2$ ) berdasarkan ikatan kovalen.*  
(Nombor proton O = 8)  
[2 marks]  
[2 markah]

- (ii) Draw the Lewis structure of ammonia ( $\text{NH}_3$ ).  
(Proton number  $\text{N} = 7$ ,  $\text{H} = 1$ )  
*Lukiskan struktur Lewis ammonia ( $\text{NH}_3$ ).*  
*(Nombor proton  $\text{N} = 7$ ,  $\text{H} = 1$ )*
- [4 marks]  
[4 markah]
- CLO2 (d) (i) Explain the molecular shape of carbon dioxide ( $\text{CO}_2$ ) according to Valence Shell Electron Pair Repulsion (VSEPR) theory.  
*Terangkan bentuk molekul karbon dioksida ( $\text{CO}_2$ ) mengikut teori Valence Shell Electron Pair Repulsion (VSEPR).*
- [3 marks]  
[3 markah]
- (ii) Draw the molecular shape of methane ( $\text{CH}_4$ ) according to Valence Shell Electron Pair Repulsion (VSEPR) theory.  
*Lukiskan bentuk molekul metana ( $\text{CH}_4$ ) mengikut teori Valence Shell Electron Pair Repulsion (VSEPR).*
- [4 marks]  
[4 markah]

**SOALAN TAMAT**