

INSTRUCTION:

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

ARAHAN:

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

QUESTION 1**SOALAN 1**

CLO1

- (a) (i) Define the proton number and nucleon number.

Definisikan nombor proton dan nombor nukleon.

[2 marks]

[2 markah]

CLO1

- (ii) State the protons and electrons for element Y^{3+} with atomic number of 15.

Nyatakan proton dan elektron bagi elemen P^{3+} dengan nombor atomik 15.

[2 marks]

[2 markah]

CLO1

- (b) (i) Table 1(b)(i) shows the group and period of the elements P, Q and R. Express the electronic configuration for each of the elements.

Jadual di bawah menunjukkan kumpulan dan kala bagi unsur P, Q dan R.

Tentukan konfigurasi elektron bagi setiap unsur tersebut.

Table 1(b)(i) Group and Period of Elements/ **Jadual 1(b)(i)** Kumpulan dan Kala Unsur

Element/Unsur	Period/Kala	Group/Kumpulan
P	2	15
Q	2	18
R	3	1

[3 marks]

[3 markah]

CLO1

- (ii) Based on the information in **Table 1(b)(ii)**, explain the differences in radius between the ions and their respective neutral atoms.

Berdasarkan informasi pada Jadual 1(b)(ii), terangkan perbezaan jejari antara ion dan atom neutral masing-masing.

Table 1(b)(ii) Radius of Species/ **Jadual 1(b)(ii)** Jejari Spesis

Species/Spesis	Na	Na ⁺	Cl	Cl ⁻
Radius/Jejari	0.156	0.095	0.099	0.181

[6 marks]

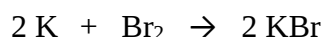
[6 markah]

- (c) 2.00 g of potassium is reacted with 2.45 g bromine to produce potassium bromide according to the following reaction:

2.00 g kalium bertindak balas dengan 2.45 g bromin untuk menghasilkan kalium bromida berdasarkan tindak balas berikut:

[Relative atomic mass: K = 39, Br = 80]

[Jisim atom relatif; K=39, Br=80]



CLO1

- (i) calculate the limiting reactant and mass of potassium bromide produced in this reaction.

kirakan bahan tindak balas terhad dan jisim kalium bromida yang dihasilkan dalam tindakbalas ini.

[8 marks]

[8 markah]

CLO1

- (ii) calculate the amount of the other reactant remaining after the reaction is completed.

kirakan jumlah bahan tindak balas lain yang tinggal selepas tindak balas tersebut selesai.

[4 marks]

[4 markah]

QUESTION 2

SOALAN 2

CLO 1

- (a) (i) Indicate Lewis dot symbols to represent the formation of Magnesium chloride (MgCl_2) and Methane (CH_4).

Tunjukkan simbol titik Lewis untuk mewakili pembentukan Magnesium klorida (MgCl_2) dan Metana (CH_4).

[Proton Number; *Nombor Proton*; Mg = 12, Cl = 17, C = 6, H = 1]

[4 marks]

[4 markah]

CLO 1

- (ii) Fill the table below:

Lengkapkan jadual berikut:

Group/Kumpulan	1	13	17
Valence Electron/ <i>Elektron Valens</i>			
Lewis dot symbol/ <i>Simbol Titik Lewis</i>	Na	Al	Cl

[3 marks]

[3 markah]

CLO 1

- (b) (i) Express the type of bond for the following compound.

Zahirkan jenis ikatan kepada sebatian dibawah.

Compound/ <i>Sebatian</i>
SiF_4
CO_2
BCl_3
GeCl_4

[4 marks]

[4 markah]

- CLO 1 (ii) A covalent bond is a chemical bond that involves the sharing of electrons to form electron pairs between atoms. Write **TWO (2)** properties of covalent compound.
- Ikatan kovalen ialah ikatan kimia yang melibatkan perkongsian elektron untuk membentuk pasangan elektron antara atom. Tuliskan **DUA(2)** sifat sebatian kovalen.*
- [2 marks]
[2 markah]
- CLO 1 (c) (i) Categorize each of the species in the following reactions as Bronsted Acid, Bronsted Base, Conjugate Acid or Conjugate Base.
- Kategorikan setiap spesies dalam tindak balas berikut sebagai Asid Bronsted, Bes Bronsted, Asid Konjugat atau Bes Konjugat.*
- $\text{HNO}_3 + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{NO}_3^-$
- $\text{CN}^- + \text{H}_2\text{O} \rightarrow \text{HCN} + \text{OH}^-$
- [4 marks]
[4 markah]
- CLO 1 (ii) Calculate the mass of NaOH needed to prepare 500 ml of solution with a pH of 10.00.
- Kirakan jisim NaOH yang diperlukan untuk menyediakan 500 ml larutan dengan pH 10.00.*
- Given: Relative atomic mass, Na = 23, H=1, O = 16
- Diberi: Jisim atom relatif, Na = 23, H=1, O = 16*
- [4 marks]
[4 markah]

CLO 1

- (iii) In an experiment, potassium hydroxide, KOH with a pOH of 0.25 was used for titration with hydrochloric acid, HCl. Calculate the concentration of 55.0mL HCl solution when the volume of KOH solution used is 25.5mL.
- Dalam satu eksperimen, kalium hidroksida, KOH dengan pOH 0.25 digunakan dalam pentitratan bersama asid klorida, HCl. Kirakan kepekatan larutan 55.0 mL HCl apabila isipadu KOH yang digunakan adalah 22.5mL.*

[4 marks]

[4 markah]

QUESTION 3**SOALAN 3**

CLO2

- (a) (i) Define the redox reaction.
- Definisikan tindak balas redoks.*

[2 marks]

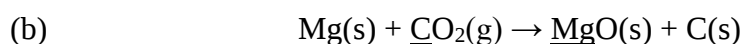
[2 markah]

CLO2

- (ii) Compare the differences between oxidation and reduction.
- Bandingkan perbezaan antara pengoksidaan dan penurunan.*

[2 marks]

[2 markah]



Based on equation above:

Berdasarkan pada persamaan di atas:

CLO2

- (i) Choose the element that undergoes oxidation and reduction.
- Pilih elemen yang mengalami pengoksidaan dan penurunan.*

[3 marks]

[3 markah]

CLO2

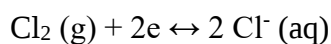
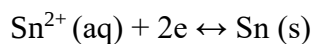
- (ii) Detail the calculation of oxidation number for the underlined elements.

Perincikan pengiraan nombor pengoksidaan bagi unsur yang bergaris.

[4 marks]

[4 markah]

(c)



By referring to the half-cell equation above:

Berpandukan persamaan setengah di atas:

CLO2

- (i) Draw a labelled galvanic cell diagram including the direction of its ions and electron flow.

Lukis rajah sel galvanik berlabel termasuk arah ion-ionnya dan pergerakan elektron.

[8 marks]

[8 markah]

CLO2

- (ii) Write the equations for the reaction at the anode, cathode and overall reaction.

Tuliskan persamaan kimia yang berlaku di anod, katod dan keseluruhan tindak balas.

[3 marks]

[3 markah]

CLO2

- (iii) Calculate the value of E°_{cell} for the galvanic cell.

Kirakan nilai E°_{cell} bagi sel galvanik ini.

Given, $E^\circ \text{Sn}^{2+}|\text{Sn} = -0.14\text{V}$, $E^\circ \text{Cl}_2|\text{Cl}^- = +1.36\text{V}$

Diberi, $E^\circ \text{Sn}^{2+}|\text{Sn} = -0.14\text{V}$, $E^\circ \text{Cl}_2|\text{Cl}^- = +1.36\text{V}$

[3 marks]

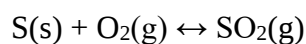
[3 markah]

QUESTION 4

SOALAN 4

CLO2

- (a) State the equilibrium constant expression, K_c for the reaction below:
Nyatakan ungkapan pemalar keseimbangan, K_c bagi tindak balas di bawah:



[2 marks]

[2 markah]

CLO2

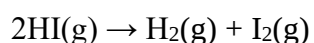
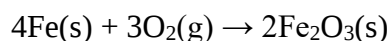
- (b) (i) Outline **THREE (3)** factors that affect the rate of reaction.
*Gariskan **TIGA (3)** faktor yang mempengaruhi kadar tindak balas.*

[3 marks]

[3 markah]

CLO2

- (ii) Categorize whether the following reactions are homogeneous or heterogeneous.
Kategorikan sama ada tindakbalas berikut adalah homogen atau heterogen.



[3 marks]

[3 markah]

CLO2

- (iii) Consider the following endothermic reaction:

Pertimbangkan tindak balas endotermik berikut:



By using Le Chatelier's principle, interpret the shift in equilibrium position (if any) if the system is disturbed when CO is removed, temperature of the system is increased and pressure of the system is increased.

Dengan menggunakan prinsip Le Chatelier, tafsirkan perubahan dalam kedudukan keseimbangan (jika ada) sekiranya sistem diganggu apabila CO dikeluarkan, suhu sistem meningkat dan tekanan sistem meningkat.

[3 marks]

[3 markah]

CLO2

- (c) (i)
- N_2O_4
- with initial concentration of 0.129 mol/L react to produce
- NO_2
- . Given that
- K_c
- value for this reaction is
- 1.07×10^{-5}
- . Calculate the concentration of
- NO_2
- at equilibrium.

N_2O_4 dengan kepekatan awal sebanyak 0.129 mol/L bertindak balas menghasilkan NO_2 . Diberikan nilai K_c bagi tindak balas ini adalah 1.07×10^{-5} . Kira kepekatan NO_2 pada keseimbangan.

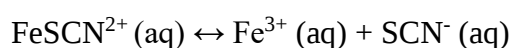
[4 marks]

[4 markah]

CLO2

- (ii) The initial concentration of
- FeSCN^{2+}
- is 0.1M has dropped to 0.02M after two hours of reaction. Using equation below, calculate the concentration of
- Fe^{3+}
- and
- SCN^-
- ions present at equilibrium and find the value of
- K_c
- .

Kepekatan awal FeSCN^{2+} ialah 0.1M telah menurun kepada 0.02M selepas dua jam tindak balas. Dengan menggunakan persamaan di bawah, hitung kepekatan ion Fe^{3+} dan SCN^- yang hadir pada keseimbangan dan cari nilai K_c .



[10 marks]

[10 markah]

SOALAN TAMAT