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 proton number and nucleon number.

Takrifkan nombor proton dan nombor nukleon.

[2 marks]

[*2 markah*]

CLO1 (ii) State the correct isotope notation ($^{A}_{Z}X$) for the elements as shown in Table 1(a).

Nyatakan notasi isotop yang tepat bagi elemen yang ditunjukkan dalam Jadual 1(a).

Table 1(a) / Jadual 1(a)

Element / *elemen*	Number of/ *Bilangan*	
	Protons/*Proton*	Neutrons/*Neutron*
A	9	10

[2 marks]

[*2 markah*]

CLO1 (b) (i) Explain the arrangement of all elements in the periodic table.

Terangkan susunan semua elemen dalam jadual berkala.

[3 marks]

[*3 markah*]

CLO1

(ii) Fill the following table by giving the correct period and group for each element.

Isikan jadual di bawah dengan kala dan kumpulan yang tepat bagi setiap elemen.

Elements/*Elemen*	Period/*Kala*	Group/*Kumpulan*
Q: $1s^2\ 2s^2\ 2p^3$		
R: $1s^2\ 2s^2\ 2p^6\ 3s^2$		
S: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^4$		

[3 marks]

[*3 markah*]

$1s^2\ 2s^2\ 2p^6\ 3s^2$ [ ] [ ] [ ]

(a) (b) (c)

Diagram 1(b) / Rajah 1(b)

CLO1

(iii) Based on diagram 1(b), element X contains 24 electrons. Fill in the electron configuration above with the correct energy level.

Berdasarkan rajah 1(b), elemen X mengandungi 24 elektron. Isikan konfigurasi electron di atas dengan tahap tenaga yang betul.

[3 marks]

[*3 markah*]

(c) Silicon dioxide, SiO_2 reacts with powdered carbon at high temperature to produce silicon carbide, SiC and carbon monoxide.
Silikon dioksida, SiO_2 bertindak balas dengan serbuk karbon pada suhu tinggi untuk menghasilkan silikon karbida, SiC dan karbon monoksida.

$$SiO_2 + C \rightarrow SiC + CO$$

If 19.1 g of silicon dioxide reacts with 11.3 g of carbon to produce 10 g of silicon carbide solid,
Jika 19.1 g silikon dioksida diperuntukkan untuk bertindak balas dengan 11.3 g C untuk menghasilkan 10 g pepejal silikon karbida,

CLO1 (i) show the balancing equation for the chemical reaction above.
tunjukkan keseimbangan persamaan bagi tindakbalas kimia di atas.

[2 marks]
[*2 markah*]

CLO1 (ii) calculate the limiting and excess reactant.
kirakan bahan tindak balas terhad dan bahan tindak balas berlebihan.

[6 marks]
[*6 markah*]

CLO1 (iii) calculate the theoretical yield and percentage yield of silicon carbide.
kirakan hasil teori dan peratusan hasil bagi silikon karbida.

[4 marks]
[*4 markah*]

[Relative atomic mass: Si = 28, C = 12, O = 16]
[Jisim atom relatif; Si=28, C=12, O=16]

QUESTION 2

SOALAN 2

CLO 1

(a) (i) Indicate Lewis dot symbols to represent the formation of $MgBr_2$.

Tunjukkan simbol titik Lewis untuk mewakili pembentukan $MgBr_2$.

[Proton Number; *Nombor Proton;* Mg = 12, Br = 35]

[4 marks]

[*4 markah*]

CLO 1

(ii) Describe **THREE (3)** properties of ionic compound.

*Jelaskan **TIGA (3)** ciri-ciri sebatian ionik.*

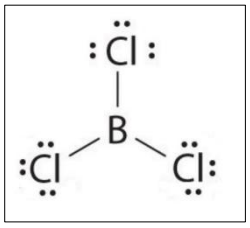
[3 marks]

[*3 markah*]

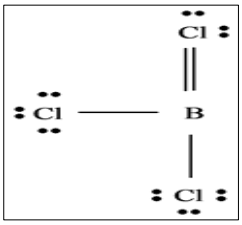
CLO 1

(b) (i) Express the formal charge for all atoms in the following structures.

Tentukan cas formal untuk semua atom dalam struktur berikut.



Structure 1/*Struktur 1*



Structure 2/*Struktur 2*

Given: Proton number, B = 5, Cl =17

Diberi: Nombor proton, B = 5, Cl =17

[4 marks]

[*4 markah*]

CLO 1

(ii) Provide an explanation regarding the most stable structure of BCl_3.

Berikan penjelasan mengenai struktur BCl_3 yang paling stabil.

[2 marks]

[*2 markah*]

CLO 1

(c) (i) Elaborate the definition of acid and base according to the Bronsted-Lowry theory.

Huraikan definisi asid dan alkali berdasarkan teori Bronsted-Lowry.

[4 marks]

[*4 markah*]

CLO 1

(ii) 38.2 ml of hydrochloric acid solution is required to titrate completely with 25 ml of 0.102 M sodium carbonate solution as represented by the following equation:

38.2 ml larutan asid hidroklorik diperlukan untuk mentitrasi sepenuhnya dengan 25 ml larutan 0.102 M natrium karbonat seperti yang diwakili oleh persamaan berikut:

$$Na_2CO_3 + 2HCl \rightarrow 2NaCl + CO_2 + H_2O$$

Calculate of the concentration for hydrochloric acid.

Kirakan kepekatan bagi asid hidroklorik.

[4 marks]

[*4 markah*]

CLO 1

(iii) A sample of sea water was found to have a pH of 8.5. Calculate the hydronium ion, H_3O^+ and hydroxide ion, OH^- concentrations in this sample of sea water. Given, $Kw = 1 \times 10^{-14}$.

Satu sampel air laut didapati mempunyai pH 8.50. Kirakan ion hidronium, H_3O^+ dan kepekatan ion hidroksida, OH- dalam sampel air laut ini. Diberi, $Kw = 1 \times 10^{-14}$.

[4 marks]

[*4 markah*]

QUESTION 3

SOALAN 3

CLO2 (a) i) Define redox reaction.

Takrifkan tindak balas redok.

[2 marks]

[*2 markah*]

CLO2 ii) Express the oxidation number of monoatomic ions below:

Nyatakan nombor pengoksidaan ion monoatomik di bawah:

O^{2-}

Mg^{2+}

[2 marks]

[*2 markah*]

CLO2 (b) i) Choose the oxidizing agent and reducing agent in the following reaction:

Pilih agen pengoksidaan dana gen penurunan dalam tindak balas yang berikut:

$$Cu^{2+} + Mg \rightarrow Cu + Mg^{2+}$$

[3 marks]

[*3 markah*]

CLO2 ii) Compare the oxidation numbers of the manganese below with detail calculation:

Bandingkan nombor pengoksidaan mangan di bawah dengan pengiraan terperinci:

$\underline{Mn}O_2$

$K_2\underline{Mn}O_4$

[4 marks]

[*4 markah*]

(c) By referring to the half-cell equation below:
Berpandukan persamaan setengah di bawah:

$Zn^{2+}(aq) + 2e^- \rightarrow Zn$ $E^o = -0.76$

$Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$ $E^o = +0.34$

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.

[3 marks]
[*3 markah*]

QUESTION 4

SOALAN 4

CLO2 (a) Define homogeneous reaction.

Takrifkan tindak balas homogen.

[2 marks]

[*2 markah*]

CLO2 (b) i) Compare the equilibrium constant K_c and K_p.

Bandingkan pemalar keseimbangan K_c dan K_p.

[3 marks]

[*3 markah*]

CLO2 ii) Express the K_c and K_p for the following equation:

Ungkapkan K_c dan K_p bagi persamaan berikut:

$$2H_2O_2(g) \leftrightarrow 2H_2O(g) + O_2(g)$$

[3 marks]

[*3 markah*]

CLO2 iii) A reaction contains nitrogen, N_2, hydrogen, H_2 and ammonia, NH_3 at equilibrium. The forward reaction is exothermic. According to the Le Chatelier's principle, discuss the shift of the equilibrium when the system is cooled down.

Satu tindak balas seimbang mengandungi nitrogen, N_2, hidrogen, H_2 and ammonia, NH_3. Tindak balas kedepan adalah ekzotermik. Menurut prinsip Le Chatelier, bincangkan perubahan dalam keseimbangan yang berlaku jika sistem tersebut disejukkan.

$$N_2 + 3H_2 \leftrightarrow 2NH_3$$

[3 marks]

[*3 markah*]

(c) Sulphur trioxide gas (SO_3) is decomposed to sulphur dioxide gas (SO_2) and oxygen gas (O_2) as represented in the following reaction. If a 1.0 L flask containing 1.50 mol SO_3 is heated to 120°C, 0.625 mol O_2 is collected at equilibrium,

Gas sulfur trioksida (SO_3) terurai kepada gas sulfur dioksida (SO_2) dan gas oksigen (O_2) seperti yang ditunjukkan dalam tindak balas berikut. Jika kelalang 1.0L yang mengandungi 1.50 mol SO_3 dipanaskan hingga 120°C, 0.625 mol O_2 dikumpulkan pada keseimbangan,

$$SO_3\,(g) \rightleftharpoons SO_2\,(g) + O_2(g)$$

CLO2

i) Calculate the concentration of SO_3 by balancing the chemical reaction.
Hitung kepekatan SO_3 dengan menyeimbangkan persamaan tindak balas.

[4 marks]
[*4 markah*]

CLO2

ii) Calculate the concentration for each gas at equilibrium and the equilibrium constant, K_c at 120°C.
Hitung kepekatan bagi setiap gas pada keseimbangan dan pemalar keseimbangan, K_c pada 120°C.

[10 marks]
[*10 markah*]

SOALAN TAMAT