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) State the correct isotope notation ($^{A}_{Z}X$) for each element as shown in the following table.

Nyatakan notasi isotop yang tepat bagi setiap elemen yang ditunjukkan dalam jadual berikut.

Table 1(a) (i): Number of protons and neutrons for A and B

***Jadual 1(a) (i)**: Nombor proton dan neutron bagi A dan B*

Element/ *Elemen*	Number of/ *Bilangan*	
	Protons/*Proton*	Neutrons/*Neutron*
A	1	0
B	12	12

[4 marks]

[*4 markah*]

CLO1

ii) Molecule and compound can be differentiated based on their characteristics. Discuss the difference in the characteristics along with examples for each compound and molecule.

Molekul dan sebatian boleh dibezakan berdasarkan ciri-cirinya. Bincangkan perbezaan ciri-ciri tersebut berserta contoh bagi setiap sebatian dan molekul.

[3 marks]

[*3 markah*]

CLO1 (b) i) Calculate the number of atoms in 0.8 mol of magnesium.
Kira bilangan atom dalam 0.8 mol magnesium.

[2 marks]
[*2 markah*]

CLO1 ii) Discuss the concept of molecular mass with examples.
Bincangkan konsep jisim molekul bersama contoh.

[3 marks]
[*3 markah*]

(c) Calcium hydroxide is reacted with hydrochloric acid to form calcium chloride in the form of salt and water as shown in the equation below:
Kalsium hidroksida bertindak balas dengan asid hidroklorik untuk membentuk kalsium klorida dalam bentuk garam dan air seperti yang ditunjukkan dalam persamaan berikut:

$$Ca(OH)_2 + HCl \rightarrow CaCl_2 + H_2O$$

18.1 g of calcium hydroxide reacts with 10.3 g of hydrochloric acid to produce 9 g of calcium chloride solid.
18.1 g kalsium hidroksida bertindak balas dengan 10.3 g asid hidroklorik untuk menghasilkan 9 g pepejal kalsium klorida.
[Relative atomic mass: Ca = 40, H = 1, Cl = 35.5, O = 16]
[*Jisim atom relatif: Ca = 40, H = 1, Cl = 35.5, O = 16*]

CLO1 i) Express the balanced equation between the reaction of calcium hydroxide and hydrochloric acid.
Nyatakan persamaan seimbang antara tindak balas kalsium hidroksida dan asid hidroklorik.

[3 marks]
[*3 markah*]

CLO1

ii) Calculate the limiting reactant and excess reactant.
Kirakan bahan tindak balas terhad dan bahan tindak balas berlebihan.

[6 marks]
[*6 markah*]

CLO1

iii) Calculate the theoretical yield and the percentage yield of calcium chloride.
Kirakan hasil teori dan peratusan hasil bagi kalsium klorida.

[4 marks]
[*4 markah*]

QUESTION 2

SOALAN 2

CLO 1

(a) (i) Define acids and bases with example for each strong acid and strong base.

Takrifkan asid dan bes berserta contoh bagi setiap asid kuat dan bes kuat.

[4 marks]

[*4 markah*]

CLO 1

(ii) Identify the acid, base and conjugate acid of the following reaction.

Kenal pasti asid, bes dan konjugat asid bagi tindak balas berikut.

$$H_2PO_4^- + NH_3 \rightleftharpoons HPO_4^{2-} + NH_4^+$$

[3 marks]

[*3 markah*]

(b) Molarity, M is the concentration of a solution expressed as the number of moles of solute per liter of solution. The concentration of OH^- ions in a certain household ammonia cleaning solution is 0.0025 M.

Kemolaran, M ialah kepekatan larutan yang dinyatakan sebagai bilangan mol zat terlarut per liter larutan. Kepekatan ion OH^- dalam penyelesaian pembersihan amonia rumah ialah 0.0025 M.

CLO 1

(i) Approximate the value of pH and pOH

Anggarkan nilai pH and pOH.

[4 marks]

[*4 markah*]

CLO 1

(ii) Approximate the concentration of H^+ ions in the solution.

Anggarkan kepekatan ion H^+ dalam larutan tersebut.

[4 marks]

[*4 markah*]

(c) Calcium hydroxide is an inorganic compound with the chemical formula $Ca(OH)_2$, dissociates completely in water with the pH of 11.64 and the volume of solution is 2.55 L.

Kalsium hidroksida adalah sebatian organik dengan formula kimia $Ca(OH)_2$, terpisah sepenuhnya dalam air dengan pH 11.64 dan isipadu larutan adalah 2.55 L.

CLO 1

(i) Show the balanced equation for the dissociation of calcium hydroxide to form calcium ion and hydroxyl ion.

Tunjukkan persamaan keseimbangan untuk pemisahan kalsium hidroksida yang membentuk ion kalsium dan ion hidroksil.

[2 marks]

[*2 markah*]

CLO 1

(ii) Calculate the concentration of OH^- in the solution.

Kirakan kepekatan OH^- dalam larutan.

[4 marks]

[*4 markah*]

CLO 1

(iii) Calculate the mass of calcium hydroxide in the solution.

Kirakan jisim kalsium hidroksida dalam larutan.

(Given / *Diberi* : Ca = 40, O = 16, H = 1)

[4 marks]

[*4 markah*]

QUESTION 3

SOALAN 3

CLO1 (a) (i) Define redox reaction.

Takrifkan tindak balas redok.

[2 marks]

[*2 markah*]

CLO1 (ii) Express the oxidation number for Cl^- and Mg^{2+}.

Nyatakan nombor pengoksidaan bagi Cl^- and Mg^{2+}.

[2 marks]

[*2 markah*]

CLO1 (b) (i) Choose the oxidizing agent and reducing agent for the following reaction:

Pilih agen pengoksidaan dan agen penurunan bagi tindak balas yang berikut:

$$H_2S\ (g) + Cl_2\ (g) \rightarrow S\ (s) + 2\ HCl\ (g)$$

[3 marks]

[*3 markah*]

CLO1 (ii) Approximate the oxidation numbers of manganese below with detail calculation:

Anggarkan nombor pengoksidaan mangan di bawah dengan pengiraan terperinci:

$MnSO_4$

$K\underline{Mn}O_4$

[4 marks]

[*4 markah*]

(c) A voltaic cell is constructed using electrodes based on the following half reactions:

Sel voltan dihasilkan menggunakan elektrod berdasarkan tindak balas separuh berikut:

$$Pb^{2+}(aq) + 2e^- \rightarrow Pb(s)$$

$$Au^{3+}(aq) + 3e^- \rightarrow Au(s)$$

CLO1

(i) Sketch the functional voltaic cell along with label of anode, cathode, electrodes, solutions and all parts of the cell.

Lakarkan sel voltan berfungsi bersama-sama dengan label anod, katod, elektrod, larutan dan semua bahagian sel.

[8 marks]

[*8 markah*]

CLO1

(ii) Write the equations of reaction occurred at the anode, cathode and overall reaction.

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

[3 marks]

[*3 markah*]

CLO1

(iii) Calculate the cell potential.

Kirakan nilai potensi sel.

(Given / *Diberi* : $E^o_{Pb^{2+}/Pb} = -0.13v$, $E^o_{Au^{3+}/Au} = +1.50v$)

[3 marks]

[*3 markah*]

QUESTION 4

SOALAN 4

CLO1

(a) Define reversible reaction.

Takrifkan tindak balas boleh balik.

[2 marks]

[*2 markah*]

CLO1

(b) (i) Discuss the rules in writing equilibrium constant expression.

Bincangkan peraturan dalam menulis ungkapan pemalar keseimbangan.

[3 marks]

[*3 markah*]

CLO1

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

Nyatakan K_c dan K_p bagi persamaan berikut:

$$N_2\,(g) + 3\,H_2\,(g) \leftrightarrow 2\,NH_3\,(g)$$

[3 marks]

[*3 markah*]

$$2\,SO_2\,(g) + O_2\,(g) \leftrightarrow 2\,SO_3\,(g)$$

CLO1

(iii) Discuss the shift of the equilibrium when the exothermic system is cooled down based on Le Chatelier's principle.

Bincangkan perubahan dalam keseimbangan yang berlaku jika sistem eksotermik tersebut disejukkan menurut prinsip Le Chatelier.

[3 marks]

[*3 markah*]

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

(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. 1.0 L flask containing 1.50 mol SO_3 is heated up to 120 °C to produce 0.625 mol O_2 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. Kelalang 1.0 L yang mengandungi 1.50 mol SO_3 dipanaskan sehingga 120 ^oC untuk menghasilkan 0.625 mol O_2 pada keseimbangan.

CLO1

i) Show the balanced equation through the calculation of SO_3 concentration of the reaction above.

Tunjukkan persamaan seimbang melalui pengiraan kepekatan SO_3 bagi tindak balas di atas.

[4 marks]

[*4 markah*]

CLO1

ii) Calculate the concentration for each gas at equilibrium and the equilibrium constant, K_c at 120 °C.

Kirakan kepekatan bagi setiap gas pada keseimbangan dan pemalar keseimbangan, K_c pada 120 ^oC.

[10 marks]

[*10 markah*]

SOALAN TAMAT