SULIT

POLITEKNIK MALAYSIA

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

JABATAN KEJURUTERAAN PETROKIMIA

PEPERIKSAAN AKHIR

SESI I : 2022 / 2023

DGP10022 : APPLIED CHEMISTRY

TARIKH : 15 DISEMBER 2022
MASA : 2.30 PETANG – 4.30 PETANG (2 JAM)

Kertas ini mengandungi **SEPULUH (10)** halaman bercetak.

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Tiada

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

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

a) Diagram A1(a) shows the relative atomic size of elements in the periodic table.
Rajah A1(a) menunjukkan saiz atom relatif untuk unsur-unsur di dalam jadual berkala.

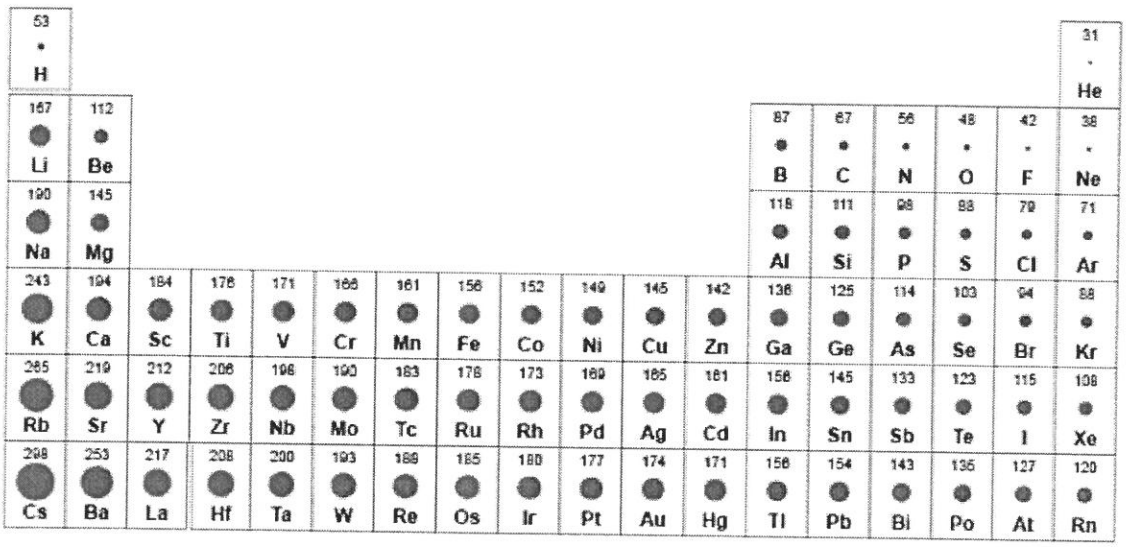

Diagram 1(a) / *Rajah 1(a)*

CLO1
C1

i. From diagram 1(a), state **TWO (2)** examples of element in d-block.
*Berdasarkan rajah 1(a), nyatakan **DUA (2)** contoh elemen di dalam blok-d.*

[2 marks]
[*2 markah*]

CLO1
C1

ii. Describe the trend of electronegativity across the period and down the group.
Huraikan tren keelektronegatifan merentasi kala dan menuruni kumpulan.

[2 marks]
[*2 markah*]

b) Electronic configuration and orbital diagram must be written according to its principles or rules.
Konfigurasi elektronik dan rajah orbit harus ditulis dengan perpandukan prinsip atau peraturan.

CLO1 C2

i. An element L^{2-} contain 17 electrons number. Express the correct group, period and block for *L*.
Elemen L^{2-} mengandungi 17 elektron. Nyatakan kumpulan, kala dan blok untuk L .

[3 marks]
[*3 markah*]

CLO1 C2

ii. Explain **THREE (3)** rules and its reasons that has been violated by orbital diagram in diagram 1(b).
*Terangkan **TIGA (3)** peraturan beserta sebab yang telah dilanggar oleh rajah orbit dalam rajah 1(b).*

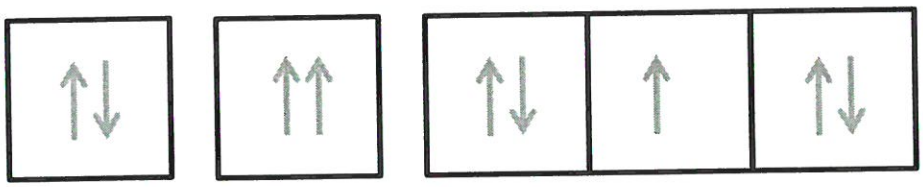

Diagram 1(b) / *Rajah 1(b)*

[6 marks]
[*6 markah*]

c) Limiting reactant can determine the number of products formed. The reaction below shows carbon monoxide reacts with hydrogen gas to produce methanol.
Reaktan mengehad dapat menentukan jumlah produk yang akan terhasil. Tindak balas dibawah menunjukkan karbon monoksida bertindakbalas dengan gas hidrogen untuk menghasilkan metanol.

$$CO(g) + H_2(g) \rightarrow CH_3OH(l)$$

CLO1
C3

i. From the reaction, 3.5g carbon monoxide reacts with 5.5g hydrogen. Calculate the limiting reactant. Given atomic mass C = 12, O = 16, H = 1.
Berdasarkan tindak balas, 3.5g karbon monoksida bertindak balas dengan 5.5g hidrogen, kirakan reaktan mengehad. Diberi berat atom C = 12, O = 16, H = 1.

[8 marks]
[*8 markah*]

$$2Al(s) + 3S(s) \rightarrow Al_2S_3(s)$$

CLO1
C3

ii. From the chemical reaction, 0.05 mol of Al_2S_3 was produced during the reaction process. The process only yields 75 percent from the theoretical data. Calculate the theoretical yield given the atomic mass Al =27, S = 32.
Daripada tincak balas kimia, 0.05 mol Al_2S_3 dihasilkan semasa tindak balas proses. Proses tersebut hanya menghasilkan *75 peratus daripada data teori. Kirakan* ***hasil teori****, diberi berat atom Al =27, S = 32.*

[4 marks]
[*4 markah*]

QUESTION 2
SOALAN 2

a) The formation of atomic bond is closely related to metal and nonmetal elements. Diagram 2(a) shows two types of atomic bonding.
Pembentukan ikatan atom adalah berkait rapat dengan unsur logam dan bukan logam. Diagram 2(a) menunjukkan 2 jenis ikatan atom.

Diagram 2(a) / *Rajah 2(a)*

CLO1
C1

i. Identify the type of atomic bond for Structure A, Structure B, Structure C and Structure D.
Kenal pasti jenis ikatan atom bagi Struktur A, Struktur B, Struktur C dan Struktur D.

[4 marks]
[*4 markah*]

CLO1
C1

ii. State **THREE (3)** properties of ionic bond.
*Nyatakan **TIGA (3)** ciri-ciri ikatan ionik.*

[3 marks]
[*3 markah*]

b) Hybridization is a process of mixing atomic orbitals to form a more stable structure. Diagram 2(b) is the Lewis structure of carbon monoxide CO_2 that undergoes hybridization.
Penghibridan merupakan proses campuran petala atom untuk menghasilkan struktur yang lebih setabil. Rajah 2(b) adalah struktur Lewis bagi karbon monoksida CO_2 yang mengalami penghibridan.

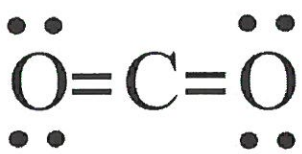

Diagram 2(b) / *Rajah 2(b)*

CLO1
C2

i. Based on diagram 2(b), explain the hybridization type that occurs at C and O based on number of groups.
Berdasarkan diagram 2(b), terangkan jenis penghibridan yang di alami pada C dan O berdasarkan jumlah kumpulan.

[4 marks]
[*4 markah*]

CLO1
C3

ii. Based on diagram 2(b), calculate the number of sigma bond and pi bond form.
Berdasarkan diagram 2(b), kirakan bilangan ikatan sigma dan ikatan pi.

[2 marks]
[*2 markah*]

c) pH is a great topic in chemistry as it can be related to basic experiment such as titration and dilution. The reaction below displays an example of titration reaction.
pH adalah topik kimia yang menarik kerana boleh di kaitkan dengan eksperimen asas seperti pentitratan dan pencairan. Tindak balas di bawah menunjukkan contoh bagi tindak balas titration.

$$NaOH(aq) + HCl(aq) \rightarrow NaCl(aq) + H_2O(l)$$

CLO1
C2

i. Compare between strong acid and strong base based on Bronsted Lowry theory.
Bandingkan asid kuat dan bes kuat berdasarkan teoori Bronsted Lowry.

[4 marks]
[*4 markah*]

CLO1
C3

ii. Calculate the pOH and pH of 4.55 g sodium hydroxide NaOH in 1750mL of solution. Given atomic mass Na = 23, O = 16, H = 1
Kirakan pOH dan pH bagi 4.55 g NaOH di dalam 1750mL larutan. Diberi berat atom Na = 23, O = 16, H = 1

[4 marks]
[*4 markah*]

CLO1
C3

iii. In an experiment, hydrochloric acid HCl with the pH of 1.5 was used for titration with sodium hydroxide NaOH. Calculate the concentration of 55.0mL NaOH solution needed to neutralize 25.5mL of HCl solution.
Dalam satu eksperimen, asid klorida HCl dengan pH 1.5 digunakan dalam pentitratan bersama natrium hidroksida NaOH. Kirakan kepekatan larutan 55.0 mL NaOH yang diperlukan untuk meneutralkan 22.5mL larutan HCl.

[4 marks]
[*4 markah*]

QUESTION 3
SOALAN 3

a) The reaction below is a chemical reaction involving oxidation and reduction.
Tindak balas di bawah menunjukkan tindak balas kimia yang melibatkan pengoksidaan dan penurunan.

$$2Al + 3Cu^{2+} \longrightarrow 2Al^{3+} + 3Cu$$

CLO2
C1

i. State the oxidizing agent and reducing agent from reaction above.
Nyatakan ajen pengoksidaan dan ajen penurunan daripada tindak balas di atas.

[2 marks]
[*2 markah*]

CLO2
C2

ii. Explain oxidation and reduction on the changes of electron.
Terangkan pengoksidaan dan penurunan dalam perubahan elektron.

[2 marks]
[*2 markah*]

b) Cell notation is a shorthand description of a galvanic cell. Diagram 3(b) below displays an example of cell notation of a zinc and copper electrode.
Sel notasi merupakan diskripsi ringkas bagi sebuah sel galvanik. Rajah 3(b) di bawah menunjukkan contoh bagi sel notasi bagi zink dan kuprum elektrod.

CLO2 C2

i. Express **THREE (3)** similarities of galvanic cell and electrolytic cell.
*Nyatakan **TIGA (3)** persamaan antara sel galvanic dan sel elektrolisis.*

[3 marks]
[*3 markah*]

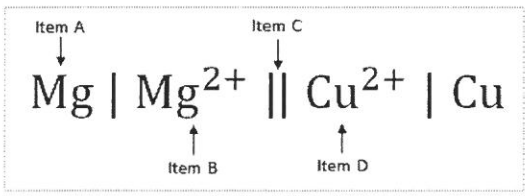

Diagram 3(b) / *Rajah 3(b)*

CLO2 C2

ii. From diagram 3(b), explain Item A, Item B, Item C and Item D in cell notation.
Berdasarkan Rajah 3(b), terangkan Item A, Item B, Item C and Item D dalam sel notasi.

[4 marks]
[*4 markah*]

c) Redox reaction can be used to generate chemical energy to electrical energy.
Tindak balas redok boleh digunakan untuk menghasilkan tenaga kimia kepada tenaga elektrik.

Solution: 1M aqueous solution of copper (II) sulfate CuSO4	Solution: 1M aqueous solution of silver nitrate $AgNO_3$
Electrode: copper bar Cu	*Electrode:* silver bar Ag
$Cu^{2+}(aq) + 2e \rightarrow Cu(s)$, $E° = +0.34$	$Ag^{+}(aq) + e^{-} \rightarrow Ag(s)$, $E° = +0.80$

Table 3(c) / *Jadual 3(c)*

CLO2 C3

i. Draw the galvanic cell including anode, cathode, electrolyte and electron flow according to Table 3(c).
Lukiskan sel galvanik termasuk anod, katod, elektrolit dan pergerakan electron berpandukan jadual 3(c).

[8 marks]
[*8 markah*]

CLO2 C3

Write the half-cell reaction and overall chemical reaction that occur at the cell.
Tuliskan tindak balas sel separuh dan tindak balas keseluruhan kimia yang berlaku pada sel tersebut.

[3 marks]
[*3 markah*]

CLO2 C3

ii. Calculate the electrode potential from the given standard reduction potential.
Kirakan keupayaan elektrod daripada keupayaan elektrod piawai yang diberikan.

[3 marks]
[*3 markah*]

QUESTION 4

SOALAN 4

CLO2 C1

a) State **ONE (1)** difference between homogeneous and heterogeneous reaction.
*Nyatakan **SATU (1)** perbezaan antara tindak balas homogen dan heterogeny.*

[2 marks]
[*2 markah*]

b) Explain the equilibrium system if the stated disturbances occurred during the Haber process on reaction below.
Terangkan sistem keseimbangan jika gangguan dinyatakan berlaku semasa proses Haber pada reaction dibawah.

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$$

CLO2 C2

i. Decreasing N_2 from the system.
Mengurangkan N_2 daripada sistem. [3 marks]
[*3 markah*]

CLO2 C2

ii. Increase the volume of the system.
Menambahkan isipadu sistem. [3 marks]
[*3 markah*]

CLO2 C2

iii. Add the catalyst to the system.
Menambahkan pemangkin kedalam sistem. [3 marks]
[*3 markah*]

c) Dynamic equilibrium can be achieved when concentration of reactant and product stop changing.

Keseimbangan dinamik akan dapat dicapai apabila kepekatan reaktan dan produk berhenti berubah.

$$HCO_3^-(aq) + H^+(aq) \rightleftharpoons H_2CO_3(aq)$$

CLO2 C3

i. K_C for the reaction above is 2.5×10^3. If the equilibrium concentrations of HCO_3^- and H_2CO_3 are 0.15 M and 3.50 M respectively, calculate the equilibrium concentrations of H^+.

Kc untuk Tindak balas diatas adalah 2.5×10^3. *Jika kepekatan keseimbangan bagi* HCO_3^- *dan* H_2CO_3 *ialah 0.15 M and 3.50 M. Kirakan kepekatan keseimbangan bagi* H^+.

[4 marks]
[*4 markah*]

CLO2 C3

From reaction below, 0.05M bromine gas Br_2 and 0.04M chlorine gas Cl_2 is sealed in a 2.00L reaction vessel and heated at 200°C. At equilibrium, the concentration of Br_2 has dropped to 0.03M. Using ICE table, calculate the concentration of Br_2, Cl_2 and BrCl ions that are present at equilibrium and the value of Kc.

Berdasarkan tindak balas dibawah 0.05M gas bromin Br_2 *dan 0.04M gas klorin* Cl_2 *disimpan dalam bejana tindak balas 2.00 L dan dipanaskan pada suhu 200 °C. Pada kepekatan keseimbangan, kepekatan* Br_2 *telah menurun kepada 0.03M. Dengan menggunakan jadual ICE, hitung kepekatan* Br_2, Cl_2 *and BrCl yang terdapat pada keseimbangan dan nilai Kc.*

$$Br_2(g) + Cl_2(g) \rightleftharpoons BrCl(g)$$

[10 marks]
[*10 markah*]

SOALAN TAMAT