

SULIT



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

JABATAN KEJURUTERAAN PETROKIMIA

PEPERIKSAAN AKHIR

SESI II : 2021/2022

DGP10022 : APPLIED CHEMISTRY

TARIKH : 30 JUN 2022

MASA : 8.30 AM – 10.30 AM (2 JAM)

Kertas ini mengandungi **SEMBILAN (9)** 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)** structured questions. Answer **ALL** questions.

ARAHAN:

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

QUESTION 1**SOALAN 1**

CLO1
C1

- (a) (i) Describe the structure of an atom.

Huraikan struktur atom.

[2 marks]

[2 markah]

CLO1
C1

- (ii) Identify the number of electrons and neutrons in each of the following species:

Kenal pasti bilangan elektron dan neutron dalam setiap spesies berikut:



[2 marks]

[2 markah]

CLO1
C2

- (b) (i) The table below shows elements and their respective proton number.

Jadual di bawah menunjukkan elemen dan nombor proton masing-masing.

Table 1(c)(i) Proton Number of Elements/ *Jadual 1(c)(i) Nombor proton unsur*

Element/ <i>Unsur</i>	Proton Number/ <i>Nombor Proton</i>
P	8
Q	10
R	11
S	13

Express the arrangement of these elements in ascending order of atomic radius and ionization energy with appropriate explanation.

Tentukan susunan elemen-elemen ini mengikut tertib menaik berdasarkan jejari atom dan tenaga pengionan dengan penjelasan yang sesuai.

[6 marks]

[6 markah]

CLO1
C2

- (ii) Fill the corresponding values of n and l for each of the following orbital designations.

Isikan nilai n dan l yang sepadan bagi setiap sebutan orbit berikut.

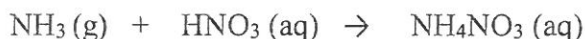
Orbital/ <i>Orbit</i>	n	l
4s		
3p		
5f		

[3 marks]

[3 markah]

- (c) Ammonium nitrate, NH_4NO_3 is produced from the reaction of ammonia, NH_3 and nitric acid as given by the following equation.

Ammonium nitrat, NH_4NO_3 telah dihasilkan daripada tindak balas ammonia, NH_3 dan asid nitrik seperti yang diberi dalam persamaan di bawah.



If 8.5 g of ammonia reacts with 50.4 g of nitric acid,

Sekiranya 8.5 g ammonia bertindak balas dengan 50.4 g asid nitrik,

CLO1
C3

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

[6 marks]

[6 markah]

CLO1
C3

- (ii) calculate the amount of NH_4NO_3 (in grams) produced.
kirakan jisim NH_4NO_3 (dalam gram) yang terhasil.

[4 marks]

[4 markah]

CLO1
C2

- (iii) locate the yield percentage of ammonium nitrate if 38.6 g of ammonium nitrate is actually obtained from the reaction.

carikan peratusan hasil ammonium nitrat jika 38.6 g ammonium nitrat sebenarnya diperoleh daripada tindak balas.

[2 marks]

[2 markah]

[Relative atomic mass: N = 14, H = 1, O = 16]

[Jisim atom relatif; N=14, H=1, O=16]

QUESTION 2**SOALAN 2**CLO 1
C1

- (a) (i) Describe Lewis structure with appropriate example.
Jelaskan struktur Lewis dengan contoh yang bersesuaian.

[4 marks]

[4 markah]

CLO 1
C1

- (ii) Highlight Lewis dot symbols to represent the formation of Sodium Chloride (NaCl) and Chlorine gas (Cl₂).

Tunjukkan simbol titik Lewis untuk mewakili pembentukan Natrium Klorida (NaCl) dan gas Klorin (Cl₂).

[Proton Number; Nombor Proton; Na = 11, Cl = 17]

[3 marks]

[3 markah]

CLO 1
C3

- (b) (i) Show the ground state, excited state and hybridized state of the central atom in MgCl₂.

Tunjukkan 'ground state', 'excited state' dan 'hybridized state' bagi atom pusat untuk MgCl₂.

Given: Proton number, Mg = 12, Cl=17

Diberi: Nombor proton, Mg = 12, Cl =17

[2 marks]

[2 markah]

CLO 1
C2

- (ii) Fill the number of bonds formed and the molecular geometry of the hybridized orbitals in the following table.

Isikan bilangan ikatan yang terbentuk dan geometri molekul bagi orbital hibrid pada jadual di bawah.

Hybridised Orbital/ <i>orbital</i> <i>hibrid</i>	Number of bonds formed/ <i>Bilangan</i> <i>ikatan terhasil</i>	Molecular Geometry/ <i>Geometri Molekular</i>
sp		
sp ²		
sp ³		

[4 marks]

[4 markah]

CLO 1
C3

- (c) (i) Write the definition of acid and base according to the Bronsted-Lowry theory.
Tuliskan definisi asid dan bes berdasarkan teori Bronsted-Lowry.

[4 marks]

[4 markah]

CLO 1
C3

- (ii) For a 500 ml solution that contains 0.025 mol nitric acid, HNO₃, calculate the pH of the solution.

Untuk larutan 500 ml yang mengandungi 0.025 mol asid nitrik, HNO₃, kirakan pH larutan.

[4 marks]

[4 markah]

CLO 1
C2

- (iii) A sample of concentrated ethanoic acid, CH_3COOH with 92% by mass and density of 1.23 g ml^{-1} is used to prepare diluted ethanoic acid. Locate the molarity of the concentrated ethanoic acid.

Satu sampel asid etanoik pekat, CH_3COOH dengan 92% jisim dan ketumpatan 1.23 g ml^{-1} digunakan untuk menyediakan asid etanoik cair. Carikan kemolaran asid etanoik pekat tersebut.

[4 marks]

[4 markah]

Given: Relative atomic mass, C = 12, H=1, O = 16

Diberi: Jisim atom relatif, C = 12, H=1, O = 16

QUESTION 3

SOALAN 3

CLO 2
C1

- (a) (i) Identify the oxidation number of underlined element in these compound.
Kenalpasti nombor pengoksidaan unsur yang bergaris dalam sebatian ini.

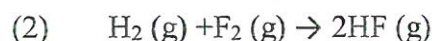
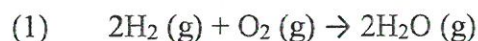


[2 marks]

[2 markah]

CLO 2
C2

- (ii) Choose the oxidizing agent and reducing agent in each of the following reaction.
Pilih agen pengoksidaan dan agen penurunan dalam setiap tindak balas berikut.



[2 marks]

[2 markah]

CLO 2
C2

- (b) (i) Oxidation number of H in CaH_2 is -1 and not +1. Comment about this statement with appropriate explanation.

Nombor pengoksidaan H dalam CaH_2 ialah -1 dan bukan +1. Komen tentang pernyataan ini dengan penjelasan yang sesuai.

[3 marks]

[3 markah]

SULIT

CLO 2
C2

- (ii) A solution containing oxalate, $\text{C}_2\text{O}_4^{2-}$ ions was titrated with KMnO_4 solution in acidic medium. $\text{C}_2\text{O}_4^{2-}$ ions were oxidized to CO_2 and MnO_4^- ions were reduced to Mn^{2+} ions. Express a balanced equation for the titration.

Larutan yang mengandungi oksalat, ion $\text{C}_2\text{O}_4^{2-}$ dititrasikan dengan larutan KMnO_4 dalam medium berasid. Ion $\text{C}_2\text{O}_4^{2-}$ telah dioksidakan kepada CO_2 dan ion MnO_4^- diturunkan kepada ion Mn^{2+} . Nyatakan persamaan seimbang untuk pentitratan tersebut.

[4 marks]

[4 markah]

- (c) A galvanic cell consists of an Al electrode in 1.0 M $\text{Al}(\text{NO}_3)_3$, a Pb electrode in 1.0 M $\text{Pb}(\text{NO}_3)_2$ and a KCl salt bridge.

Sel galvanik terdiri daripada elektrod Al dalam 1.0 M $\text{Al}(\text{NO}_3)_3$, elektrod Pb dalam 1.0 M $\text{Pb}(\text{NO}_3)_2$ dan jambatan garam KCl.

CLO 2
C3

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

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

[8 marks]

[8 markah]

CLO 2
C3

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

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

[3 marks]

[3 markah]

CLO 2
C3

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

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

[3 marks]

[3 markah]

Given, $E^\circ \text{Al}^{3+}|\text{Al} = -1.66 \text{ V}$, $E^\circ \text{Pb}^{2+}|\text{Pb} = -0.126 \text{ V}$

Diberi, $E^\circ \text{Al}^{3+}|\text{Al} = -1.66 \text{ V}$, $E^\circ \text{Pb}^{2+}|\text{Pb} = -0.126 \text{ V}$

QUESTION 4

SOALAN 4

CLO 2
C2

- (a) (i) Discuss TWO(2) differences between endothermic and exothermic reaction.
Bincangkan DUA(2) perbezaan antara tindak balas endotermik dan eksotermik.

[3 marks]

[3 markah]

CLO 2
C2

- (ii) Consider the following endothermic reaction:
Pertimbangkan tindak balas endotermik berikut:



Relate the changes made with the direction of equilibrium when CO is removed and temperature of the system is increased.

Hubungkan perubahan yang dibuat dengan arah keseimbangan apabila CO dikeluarkan dan suhu sistem dinaikkan.

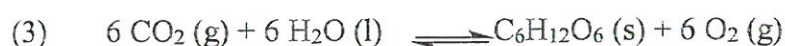
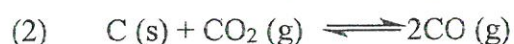
[3 marks]

[3 markah]

CLO 2
C2

- (iii) Express the equilibrium constant expression, K_c for each of the following reactions:

Tunjukkan ungkapan pemalar keseimbangan bagi setiap tindak balas di bawah:

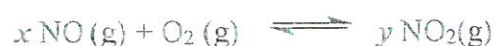


[3 marks]

[3 markah]

- (b) When the nitrogen monoxide gas reacts with oxygen gas, nitrogen dioxide gas is formed according to the following equation:

Apabila gas nitrogen monoksida bertindak balas dengan gas oksigen, gas nitrogen dioksida terbentuk berdasarkan persamaan berikut:



If 0.154 mol of NO gas is mixed with 0.25 mol of O₂ gas in a 2.0 litre evacuated flask at 30°C, the equilibrium concentration of O₂ gas is found as 0.089 M.

Jika 0.154 mol gas NO dicampur dengan 0.25 mol gas O₂ dalam kelalang kosong berisipadu 2.0 liter pada 30°C, kepekatan keseimbangan gas O₂ yang didapati adalah 0.089 M.

CLO 2
C1

- (i) identify the value of x and y in the above equation.
kenalpasti nilai x dan y pada persamaan di atas.

[2 marks]

[2 markah]

CLO 2
C3

- (ii) calculate the initial molarity of NO, and O₂.
kirakan kepekatan permulaan bagi NO, dan O₂.

[4 marks]

[4 markah]

CLO 2
C3

- (iii) calculate the molarity of NO, O₂ and NO₂ at equilibrium and equilibrium constant, K_c for this reaction.
kirakan kemolaran bagi NO, O₂ dan NO₂ pada keseimbangan dan pemalar keseimbangan, K_c bagi tindak balas ini.

[10 marks]

[10 markah]

SOALAN TAMAT

