

INSTRUCTION:

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

ARAHAN :

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

QUESTION 1**SOALAN 1**CLO1
C1

- a) Silicon (Si) is essential to the computer industry as major component of semi – conductor chips. It has two naturally occurring isotopes: ^{28}Si and ^{29}Si . Identify the numbers of protons and neutrons in each silicon isotope given that atomic number of silicon is 14.

Silikon (Si) adalah penting bagi industri komputer sebagai bahan utama bagi cip semi konduktor. Bahan ini mempunyai dua isotop semulajadi: ^{28}Si dan ^{29}Si . Tentukan nombor proton dan nutron bagi setiap isotop silikon jika nombor atomik bagi silikon adalah 14.

[4 marks]

[4 markah]

CLO1
C2

- b) Gases are everywhere. The gaseous envelop that surrounds the planet is a colorless and odorless mixture of nearly 20 elements and compounds that extends from the surface upward more than 500km.

Gas terletak di mana – mana. Gas yang mengelilingi planet kita adalah tidak berwarna, tidak berbau dan campuran tidak kurang dari 20 unsur dan sebatian yang merangkumi dari permukaan ke atas sehingga 500km.

- i. From your knowledge in chemistry, elaborate **TWO (2)** examples of gas physical properties.

*Dari pengetahuan anda dalam kimia, jelaskan **DUA (2)** contoh sifat fizikal gas.*

[2 marks]

[2 markah]

CLO1
C3

- ii. A steel tank has a volume of 438L and is filled with 0.885kg of O₂. Using ideal gas law, approximate the pressure of O₂ at 21°C. (Atomic mass: O₂ = 16.00)

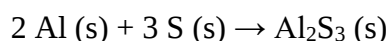
Satu tanki keluli dengan isipadu 438 L diisi dengan 0.885 kg O₂. Menggunakan peraturan gas ideal, jangkakan tekanan O₂ pada suhu 21°C. (Berat atomic O₂ = 16.00)

[6 marks]

[6 markah]

- c) Use this equation to answer the following questions:

Jawab soalan berikut berpandukan persamaan di bawah:



- i. Calculate the amount of solid aluminum sulfide that can be prepared by the reaction of 10.0g of aluminum and 15.0g of sulfur.

Kirakan jumlah pepejal aluminum sulfida yang boleh disediakan dari tindak balas 10.0g aluminum dengan 15.0g sulfur.

[10 marks]

[10 markah]

- ii. Calculate the amount of non-limiting reactant in excess after the reaction. (Atomic mass: Al = 26.98, S = 32.07)

Kirakan baki reaktan tidak terhad yang tinggal selepas tindakbalas.

(Berat atomic: Al = 26.98, S = 32.07)

[3 marks]

[3 markah]

QUESTION 2

SOALAN 2

CLO1
C1

- a) The term Aufbau derives from the German word “aufbau” which means to build up. With the knowledge of Aufbau’s principle, state the electron configuration for sodium, Na and vanadium ion, V^+ . (Atomic number: Na = 11, V = 23)

Terma “Aufbau” datang dari perkataan Jerman “aufbau” yang bermaksud untuk membina. Dengan pengetahuan anda mengenai prinsip Aufbau, nyatakan konfigurasi elektron bagi sodium, Na dan ion vanadium, V^+ . (Nombor atomik: Na = 11, V = 23)

[4 marks]

[4 markah]

CLO1
C2

- b) Chemical bonding lowers the potential energy between positive and negative particles, whether those particles are oppositely charged ions or atomic nuclei and the electrons between them.

Ikatan kimia akan mengurangkan tenaga potensi antara zarah positif dan negative, sama ada zarah tersebut mempunyai ion berlainan cas atau nuklius atomik dan elektron di antara mereka.

- i. Discuss the type of bonding that is expected in N_2 and LiCl. (Atomic number: N = 7, Li = 3, Cl = 17)

Bincangkan jenis ikatan yang dijangkakan dalam N_2 dan LiCl.

(Nombor atomik: N = 7, Li = 3, Cl = 17)

[6 marks]

[6 markah]

- ii. Use Lewis electron dot symbol to express the monoatomic ions formed from Al and F. (Atomic number: Al = 13, F = 9)

Gunakan struktur Lewis untuk mengekspresikan ion monoatomik yang terbentuk dari Al dan F. (Nombor atomic: Al = 13, F = 9)

[3 marks]

[3 markah]

CLO1
C3

- c) Use orbital diagrams to describe the mixing of atomic orbitals on the central atoms leads to the hybrid orbitals of NH_3 and BF_3 . (Atomic number: N = 7, H = 1, B = 5, F = 9)

Gunakan gambarajah orbital untuk menerangkan percampuran orbital atomik dalam atom tengah yang menyebabkan penghibridan orbital bagi NH_3 dan BF_3 . (Nombor atomic: N = 7, H = 1, B = 5, F = 9)

[12 marks]

[12 markah]

QUESTION 3

SOALAN 3

CLO1
C1

- a) In a Bronsted – Lowry acid – base reaction, protons are transferred from one reactant to another. Define Bronsted – Lowry acid, base, conjugate acid and conjugate base.

Dalam tindak balas asid - bes Bronsted – Lowry, proton berpindah dari satu reaktan kepada reaktan yang lain. Berikan definisi asid, bes, asid konjugat dan bes konjugat Bronsted – Lowry.

[4 marks]

[4 markah]

CLO1 C2	b) Approximate the pH of 1.0×10^{-3} M NaOH. From the pH value, interpret whether the solution is basic or acidic. <i>Ramalkan nilai pH bagi 1.0×10^{-3} M NaOH. Dari nilai pH, berikan intepretasi sama ada larutan anda adalah bes atau asid.</i> [9 marks] [9 markah]
CLO1 C3	c) Titration is the controlled addition and the measurement of the amount of a solution of known concentration required to react completely with a measured amount of a solution of unknown concentration. <i>Pentitratan adalah pertambahan terkawal dan pengukuran bagi jumlah larutan dengan kepekatan yang diketahui untuk bertindak balas sepenuhnya dengan mengukur berdasarkan larutan yang diketahui kepekatanya.</i> i. Illustrate the basic apparatus set up of an acid and base titration. <i>Gambarkan susunan asas alat radas bagi pentitratan asid dan bes.</i> [5 marks] [5 markah] ii. Calculate the mass of sodium hydroxide required to prepare 1000mL of 1.0 M sodium hydroxide solution. (Atomic mass: Na = 23, O = 16, H = 1.01) <i>Kirakan berat sodium hidroksida yang diperlukan bagi menyediakan 1000 mL 1.0M larutan sodium hidroksida. (Berat atomic: Na = 23, O = 16, H = 1.01)</i> [3 marks] [3 markah]

- iii. In a titration, 27.4mL of 0.0154M NaOH is added to a 20.0mL sample of HCl solution of unknown concentration. Calculate the molarity of the acid solution.

Dalam suatu pentitratan, 27.4mL 0.0154M NaOH ditambah dalam 20.0 mL sampel larutan HCl dengan kepekatan tidak diketahui. Kirakan kemolaran bagi larutan asid tersebut.

[4 marks]

[4 markah]

QUESTION 4

SOALAN 4

CLO2
C1

- a) Define oxidation in terms of:

Berikan definisi pengoksidaan dari segi:

- i. Change in oxidation number.

Perubahan nombor pengoksidaan.

[1 mark]

[1 markah]

- ii. Transfer of electrons.

Pertukaran elektron.

[1 mark]

[1 markah]

- iii. Presence of oxygen molecule/atom.

Kehadiran molekul/atom oksigen.

[1 mark]

[1 markah]

CLO2
C2

- b) Electrochemistry is the study of the relationship between chemical change and electrical work.

Elektrokimia adalah kajian mengenai hubungan antara perubahan kimia dan elektrik.

- i. Discuss **THREE (3)** differences between electrolytic cell and galvanic cell.

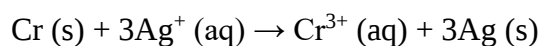
*Bincangkan **TIGA (3)** perbezaan antara sel elektrolit dan galvanik.*

[3 marks]

[3 markah]

- ii. Write half reaction equation that occurs in:

Tulis persamaan tindak balas separa yang berlaku dalam:

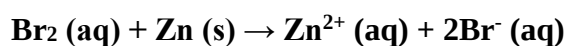


[2 marks]

[2 markah]

- iii. A voltaic cell houses the reaction between aqueous bromine and zinc metal according to equation below. Approximate E°_{Bromine} given that $E^\circ_{\text{Zinc}} = -0.76\text{V}$ and $E^\circ_{\text{cell}} = 1.83\text{V}$.

Sebuah sel voltek mengandungi tindak balas antara bromin akues dan logam zink mengikut persamaan dibawah. Jangkakan E°_{Bromine} jika diberikan $E^\circ_{\text{Zinc}} = -0.76\text{V}$ dan $E^\circ_{\text{cell}} = 1.83\text{V}$.



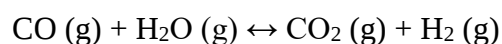
[4 marks]

[4 markah]

CLO2
C3

- c) Fuel engineers use the extent of the change from CO and H₂O to CO₂ and H₂ to regulate the proportions of synthetic fuel mixtures. If 0.250 mol of CO and 0.250 mol of H₂O are placed in a 125 mL flask at 900K, calculate the composition of the equilibrium mixture. At this temperature, K_c is 1.56 for the equation:

Jurutera bahan api menggunakan perubahan CO dan H₂O kepada CO₂ dan H₂ untuk mengawal selia peredaran campuran bahan api sintetik. Jika 0.250 mol CO dan 0.250 mol H₂O diletakkan dalam 125mL kelalang pada 900K, kirakan komposisi campuran keseimbangan. Pada suhu ini, nilai K_c adalah 1.56 mengikut persamaan di bawah:



[13 marks]

[13 markah]

SOALAN TAMAT