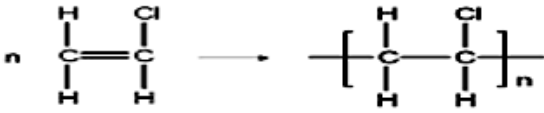
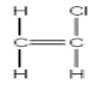
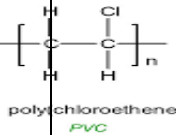


MPP3 TAHUN 2023
SIJIL PELAJARAN MALAYSIA
4541/2 CHEMISTRY / KIMIA
Kertas / paper 2

| Question Number | | Mark Scheme | | Sub marks | Marks |
|-----------------|-----|-------------|---|-----------|----------|
| 1 | (a) | | Molekul <i>Molecule</i> | | 1 |
| | (b) | (i) | 80 °C | | 1 |
| | | (ii) | Cecair <i>Liquid</i> | | 1 |
| | (c) | | Tenaga haba yang dibebaskan semasa zarah-zarah menarik satu sama lain (untuk membentuk pepejal) seimbang dengan tenaga haba yang hilang ke persekitaran. <i>Heat energy released when particles attract each other (to form solid) is balance to the heat energy loss to the surrounding</i> | 1 1 | 2 |
| Total | | | | | 5 |

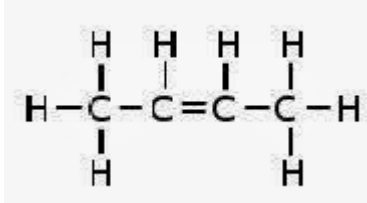
| Question Number | | Mark Scheme | | Sub marks | Marks |
|-----------------|-----|-------------|---|-----------|----------|
| 2 | (a) | | Bahan yang ditambah ke dalam makanan untuk menambah rasa, ketahanan dan rupabentuk makanan. <i>Substance that added into the food to enhance the taste, preserve longer and garnish of food.</i> | 1 | 1 |
| | (b) | | Asid askorbik // garam <i>Ascorbic acid// salt</i> Pengantioksida // pengawet <i>Antioxidant// preservative</i> | 1 1 | 2 |
| | (c) | | Alergik <i>Alergic</i> Antialergi <i>Anti allergies</i> | 1 1 | 2 |
| Total | | | | | 5 |

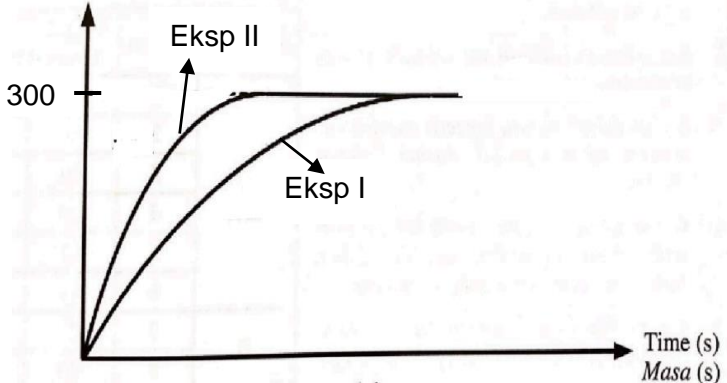
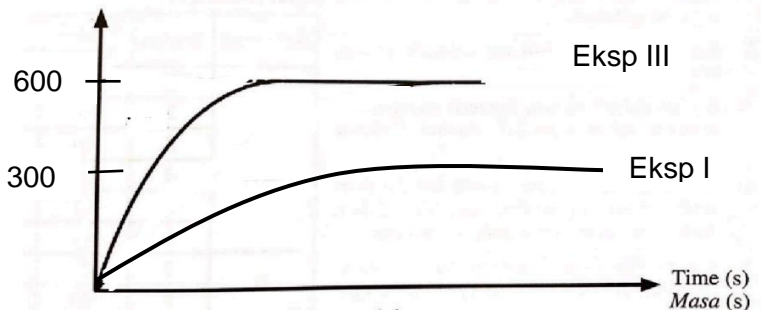
| | | | | |
|--|--|---|---|----------|
| | | Kuantitatif/ <i>quantitative</i> : 1 mol X oksida/ XO/ Kuprum(II) oksida/ CuO bertindak balas dengan 1 mol gas hidrogen/ H ₂ menghasilkan 1 mol X/ kuprum/ Cu dan 1 mol air/ H ₂ O 1 mole of X oxide / XO/ copper(II) oxide/ CuO react with 1 mole of hydrogen gas/ H ₂ produces 1 mole of X/ copper / Cu and 1 mole of water / H ₂ O | 1 | 2 |
| | | TOTAL | | 7 |

| Question Number | | Mark Scheme | Sub Marks | Total marks | | | | | | | |
|---|--|--|---|-------------------------------------|--------------------------------------|--|---|---|--|-------------|----------|
| 5 | (a) | Molekul berantai panjang yang terbentuk daripada gabungan banyak ulangan unit asas / monomer. <i>A long chain molecule made up of a large number of small repeating basic units/ monomers</i> | 1 | 1 | | | | | | | |
| | (b) | Pempolimeran penambahan // <i>Addition polymerisation</i> | 1 | 1 | | | | | | | |
| | (c) (i) | Kloroetena // Vinil klorida <i>Chloroethene // Vinyl chloride</i> | 1 | 1 | | | | | | | |
| | (i) | <div style="text-align: center;">  </div> <p>Struktur monomer yang betul// <i>correct monomer structure</i> Persamaan pempolimeran seimbang// <i>Balance polymerization equation</i></p> | <div style="background-color: #00FF00; padding: 2px; text-align: center; font-weight: bold;">Addition polymers</div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> n  chloroethene </div> <div style="font-size: 2em;">→</div> <div style="text-align: center;">  poly(chloroethene) <i>PVC</i> </div> </div> | 1 1 2 | | | | | | | |
| (d) | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Getah X / Rubber X</td> <td>Getah Y / Rubber Y</td> </tr> <tr> <td>Lebih kenyal <i>More elastic</i></td> <td>Kurang kenyal <i>Less elastic</i></td> </tr> <tr> <td>Mempunyai rangkai silang sulfur <i>Has sulphur cross link</i></td> <td>Tiada rangkai silang sulfur <i>No sulphur cross link</i></td> </tr> <tr> <td>Polimer-polimer getah sukar menggelongsor <i>Rubber polymer difficult to slide</i></td> <td>Polimer-polimer getah mudah menggelongsor <i>Rubber polymer easily to slide</i></td> </tr> </table> | Getah X / Rubber X | Getah Y / Rubber Y | Lebih kenyal <i>More elastic</i> | Kurang kenyal <i>Less elastic</i> | Mempunyai rangkai silang sulfur <i>Has sulphur cross link</i> | Tiada rangkai silang sulfur <i>No sulphur cross link</i> | Polimer-polimer getah sukar menggelongsor <i>Rubber polymer difficult to slide</i> | Polimer-polimer getah mudah menggelongsor <i>Rubber polymer easily to slide</i> | 1 1 1 | 3 |
| Getah X / Rubber X | Getah Y / Rubber Y | | | | | | | | | | |
| Lebih kenyal <i>More elastic</i> | Kurang kenyal <i>Less elastic</i> | | | | | | | | | | |
| Mempunyai rangkai silang sulfur <i>Has sulphur cross link</i> | Tiada rangkai silang sulfur <i>No sulphur cross link</i> | | | | | | | | | | |
| Polimer-polimer getah sukar menggelongsor <i>Rubber polymer difficult to slide</i> | Polimer-polimer getah mudah menggelongsor <i>Rubber polymer easily to slide</i> | | | | | | | | | | |
| Total | | | | 8 | | | | | | | |

| Question Number | | Mark scheme | Sub marks | Total Marks |
|-----------------|-----|---|-------------|-------------|
| 6 | (a) | Baris mengufuk dalam Jadual Berkala Unsur <i>The horizontal rows in the Periodic Table of Elements</i> | 1 | 1 |
| | (b) | Semua atom mempunyai 3 petala berisi elektron <i>All atoms have 3 shells occupied with electrons</i> | 1 | 1 |
| | (c) | Saiz / jejari atom berkurang (dari kiri ke kanan) Daya tarikan nukleus atom terhadap elektron bertambah kuat// Nukleus atom semakin kuat menarik elektron <i>Size/ atomic radius decrease (from left to right)</i> <i>Nucleus force of attraction of atom towards electron is stronger // The strength of the nucleus atom to attract electron is stronger</i> | 1 1 | 2 |
| | (d) | (i) Natrium oksida bersifat bes Natrium oksida bertindak balas dengan asid nitrik Natrium oksida tidak bertindak balas dengan larutan natrium hidroksida. <i>Sodium oxide is a basic oxide</i> <i>Sodium oxide reacts with nitric acid</i> <i>Sodium oxide does not react with sodium hydroxide solution</i> | 1 1 1 | 3 |
| | | (ii) $\text{Na}_2\text{O} + 2\text{HNO}_3 \longrightarrow 2\text{NaNO}_3 + \text{H}_2\text{O}$ [Correct formula of reactants and product] [Balanced equation] | 1 1 | 2 |
| Total | | | | 9 |

| Question Number | | | Mark Scheme | Sub marks | Marks | | | | | | |
|---|---|-------|--|-------------------------------------|---------------------------------------|--|--|---|---|------------|---|
| 7 | (a) | (i) | Bahan kimia yang mengion dalam air menghasilkan ion hidrogen/ H ⁺ // <i>Chemical substance that ionises in water to produce hydrogen ions/ H⁺</i> | 1 | 1 | | | | | | |
| | | (ii) | Ion hidrogen <i>Hydrogen ion</i> | 1 | 1 | | | | | | |
| | | (iii) | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Eksperimen I <i>Experiment I</i></th> <th style="width: 50%;">Eksperimen II <i>Experiment II</i></th> </tr> </thead> <tbody> <tr> <td>Asid oksalik menunjukkan sifat keasidannya <i>Oxalic acid shows its acidic property</i></td> <td>Asid oksalik tidak menunjukkan sifat keasidannya <i>Oxalic acid does not show its acidic property</i></td> </tr> <tr> <td>Asid oksalik mengion dalam air // kehadiran ion H⁺ <i>Oxalic acid ionizes in water // H⁺ ion presence</i></td> <td>Asid oksalik tidak mengion dalam propanon // tiada ion H⁺ hadir <i>Oxalic acid does not ionize in propanone // No H⁺ ion presence</i></td> </tr> </tbody> </table> | Eksperimen I <i>Experiment I</i> | Eksperimen II <i>Experiment II</i> | Asid oksalik menunjukkan sifat keasidannya <i>Oxalic acid shows its acidic property</i> | Asid oksalik tidak menunjukkan sifat keasidannya <i>Oxalic acid does not show its acidic property</i> | Asid oksalik mengion dalam air // kehadiran ion H ⁺ <i>Oxalic acid ionizes in water // H⁺ ion presence</i> | Asid oksalik tidak mengion dalam propanon // tiada ion H ⁺ hadir <i>Oxalic acid does not ionize in propanone // No H⁺ ion presence</i> | 1 1 | 2 |
| Eksperimen I <i>Experiment I</i> | Eksperimen II <i>Experiment II</i> | | | | | | | | | | |
| Asid oksalik menunjukkan sifat keasidannya <i>Oxalic acid shows its acidic property</i> | Asid oksalik tidak menunjukkan sifat keasidannya <i>Oxalic acid does not show its acidic property</i> | | | | | | | | | | |
| Asid oksalik mengion dalam air // kehadiran ion H ⁺ <i>Oxalic acid ionizes in water // H⁺ ion presence</i> | Asid oksalik tidak mengion dalam propanon // tiada ion H ⁺ hadir <i>Oxalic acid does not ionize in propanone // No H⁺ ion presence</i> | | | | | | | | | | |
| | (b) | (i) | Asid nitrik // Asid hidroklorik <i>Nitric acid // Hydrochloric acid</i> | 1 | 1 | | | | | | |
| | | (ii) | $\text{HNO}_3 + \text{NaOH} \rightarrow \text{NaNO}_3 + \text{H}_2\text{O} //$ $\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}$ $\frac{\text{Ma} \times 25}{0.5 \times 50} = \frac{1}{1}$ $\text{Ma} = 1.0 \text{ mol dm}^{-3}$ | 1 1 1 | 3 | | | | | | |
| | (c) | | Guna ubat gigi// serbuk penaik(natrium bikarbonat) Alkali lemah// meneutralkan sengatan lebah bersifat asid // tidak menghakis <i>Use toothpaste/ baking powder (sodium bicarbonate)</i> <i>Weak alkali // neutralizes acidic bee stings // non-corrosive</i> | 1 1 | 2 | | | | | | |
| Total | | | | | 10 | | | | | | |

| Question Number | | Mark Scheme | Sub Marks | Total marks |
|-----------------|---------------------------------|---|-----------|-------------|
| 8 | (a) | Sebatian yang mengandungi karbon dan hidrogen sahaja. <i>Compound that contain carbon and hydrogen only.</i> | 1 | 1 |
| | (b) (i) | Alkena // <i>alkene</i> | 1 | 1 |
| | (ii) |  | 1 | 1 |
| | (c) | $\text{C}_4\text{H}_8 + 6\text{O}_2 \longrightarrow 4\text{CO}_2 + 4\text{H}_2\text{O}$ Formula kimia yang betul / <i>correct chemical formula</i> Persamaan seimbang / <i>Balanced equation</i> | 1 1 | 2 |
| | (d) (i) | Penambahan bromin // Pembrominan <i>Addition of bromine // Bromination</i> | 1 | 1 |
| | (ii) | Alirkan sebatian P ke dalam tabung uji yang mengandungi air bromin. Goncang tabung uji itu. <i>Flow compound P into a test tube containing bromine water</i> <i>Shake the test tube.</i> | 1 1 | 2 |
| (e) (i) | $\text{C}_4\text{H}_9\text{OH}$ | 1 | 1 | |
| | (ii) | Butil etanoat // <i>Butyl ethanoate</i> | 1 | 1 |
| Total | | | | 10 |

| Question Number | | Mark Scheme | Sub marks | Total Marks |
|-----------------|-----|---|------------------------------|-------------|
| 9 | (a) | Mangkin/ <i>catalyst</i> Kepekatan asid/ <i>concentration of acid</i> | 1 1 | 2 |
| | (b) | $\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$ Bilangan mol $\text{HNO}_3 = \frac{0.5 \times 50}{1000}$ // 0.025 mol <i>Number of mol</i> 2 mol HCl : 1 mol H_2 // 0.025 mol HNO_3 : 0.0125 mol H_2 Isipadu/ <i>Volume of</i> $\text{H}_2 = 0.0125 \times 24 \text{ dm}^3$ // 0.3 dm^3 // 300 cm^3 | 1 + 1 1 1 1 | 5 |
| | (c) | 1. Paksi bertajuk dan unit betul 2. bentuk graf dan label yang betul <u>Graf Eksperimen I dan II</u> Volume of gas (cm^3) <i>Isi padu gas (cm^3)</i>  ATAU <u>Graf</u> <u>Eksperimen I dan III</u> Volume of gas (cm^3) <i>Isi padu gas (cm^3)</i>  | 1 1 + 1 | 3 |

| Question Number | | Mark Scheme | | Sub marks | Total Marks | | | | | | | | |
|--|---|---|--|--------------------------|-------------------|--|---|---|---|--|---|---------------------------|---|
| 10 | (a) | Agen pengoksidaan / <i>an oxidising agent</i> : Argentum nitrat / <i>silver nitrate</i> Agen penurunan / <i>a reducing agent</i> : zink / <i>zinc</i> Nombor pengoksidaan zink bertambah dari 0 ke +2 Nombor pengoksidaan argentum berkurang dari +1 ke 0 <i>Oxidation number of zinc increases from 0 to +2</i> <i>Oxidation number of silver in silver nitrate decreases from +1 to 0</i> | | 1 1 1 1 | 4 | | | | | | | | |
| | (b) | (i) | Katod / <i>cathode</i> : Hidrogen / <i>hydrogen</i> Anod / <i>anode</i> : Oksigen / <i>oxygen</i> | 1 1 | 2 | | | | | | | | |
| | | (ii) | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Sel I Cell I</th> <th style="text-align: center;">Sel II Cell II</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Gas oksigen terbebas <i>Oxygen gas released</i></td> <td style="text-align: center;">Gas klorin terbebas <i>Chlorine gas released</i></td> </tr> <tr> <td style="text-align: center;">Ion hidroksida/ OH⁻ dipilih untuk dinyahcas <i>Hydroxide ion/ OH⁻ selectively discharged</i></td> <td style="text-align: center;">Ion klorida/ Cl⁻ dipilih untuk dinyahcas <i>Chloride ion/ Cl⁻ selectively discharged</i></td> </tr> <tr> <td style="text-align: center;">Niai E⁰ ion hidroksida kurang positif daripada nilai E⁰ ion klorida <i>E⁰ value of hydroxide ion is less positive than E⁰ value of chloride ion</i></td> <td style="text-align: center;">Kepekatan ion klorida lebih tinggi daripada ion hidroksida dalam larutan <i>Concentration of chloride ion is higher than hydroxide ions in solution</i></td> </tr> </tbody> </table> | Sel I Cell I | Sel II Cell II | Gas oksigen terbebas <i>Oxygen gas released</i> | Gas klorin terbebas <i>Chlorine gas released</i> | Ion hidroksida/ OH ⁻ dipilih untuk dinyahcas <i>Hydroxide ion/ OH⁻ selectively discharged</i> | Ion klorida/ Cl ⁻ dipilih untuk dinyahcas <i>Chloride ion/ Cl⁻ selectively discharged</i> | Niai E ⁰ ion hidroksida kurang positif daripada nilai E ⁰ ion klorida <i>E⁰ value of hydroxide ion is less positive than E⁰ value of chloride ion</i> | Kepekatan ion klorida lebih tinggi daripada ion hidroksida dalam larutan <i>Concentration of chloride ion is higher than hydroxide ions in solution</i> | 1+1 1+1 1+1 | 6 |
| Sel I Cell I | Sel II Cell II | | | | | | | | | | | | |
| Gas oksigen terbebas <i>Oxygen gas released</i> | Gas klorin terbebas <i>Chlorine gas released</i> | | | | | | | | | | | | |
| Ion hidroksida/ OH ⁻ dipilih untuk dinyahcas <i>Hydroxide ion/ OH⁻ selectively discharged</i> | Ion klorida/ Cl ⁻ dipilih untuk dinyahcas <i>Chloride ion/ Cl⁻ selectively discharged</i> | | | | | | | | | | | | |
| Niai E ⁰ ion hidroksida kurang positif daripada nilai E ⁰ ion klorida <i>E⁰ value of hydroxide ion is less positive than E⁰ value of chloride ion</i> | Kepekatan ion klorida lebih tinggi daripada ion hidroksida dalam larutan <i>Concentration of chloride ion is higher than hydroxide ions in solution</i> | | | | | | | | | | | | |
| | | (iii) | Sel / <i>Cell I</i> : 4OH ⁻ → 2H ₂ O + O ₂ + 4e Sel / <i>Cell II</i> : 2Cl ⁻ → Cl ₂ + 2e [setengah persamaan betul & seimbang// correct half equation & balanced] | 1 1 | 2 | | | | | | | | |
| | (c) | (i) | 2x + 3(-2) = 0 X = +3 Ferum(III) oksida // <i>Ferum(III) oxide</i> | 1 1 | 2 | | | | | | | | |
| | | (ii) | JFR / <i>relative formula mass</i> Fe ₂ O ₃ = 160 Bil mol / no of moles of Fe ₂ O ₃ = $\frac{320\,000}{160}$ // 2000 mol 2 mol Fe ₂ O ₃ → 4 mol Fe // 2000 mol Fe ₂ O ₃ → 4000 mol Fe Jisim Fe yang dihasilkan / <i>Mass of Fe produced</i> (4000 x 56) g // 224 000 g // 224 kg | 1 1 1 1 | 4 | | | | | | | | |
| TOTAL | | | | | 20 | | | | | | | | |

| Question Number | | Mark Scheme | Sub marks | Total Marks |
|-----------------|-----|---|-----------------------|-------------|
| 11 | (a) | Perubahan haba apabila 1 mol air terbentuk apabila asid bertindak balas dengan alkali <i>Heat change when 1 mole of water produced from reaction between acid and alkali.</i> | 1 | 1 |
| | (b) | HX- asid hidroklorik/ HCl // asid nitrik/ HNO ₃ // <i>hydrochloric acid/ HCl // nitric acid/ HNO₃</i> HY- asid etanoik/ CH ₃ COOH <i>ethanoic acid/ CH₃COOH</i> | 1 1 | 2 |
| | (c) | 1. $n = \frac{(1.0 \times 100)}{1000}$ // 0.1 mol 2. $Q = 57000 \times 0.1$ // 5700 J 3. Perubahan suhu = $5700 / (100+100)(4.2)$ = 6.79 °C 4. Suhu tertinggi = $27.0 + 6.79 = 33.79$ °C (berunit) | 1 1 1 1 | 4 |
| | (d) | 1. Haba peneutralan tindak balas I lebih tinggi daripada tindak balas II 2. HCl ialah asid kuat manakala asid etanoik ialah asid lemah. 3. HCl mengion lengkap dalam air, semua molekul asid HCl mengion kepada ion hydrogen. 4. Asid etanoik mengion separa dalam air, sebahagian masih kekal sebagai molekul. 5. Sebahagian tenaga haba diserap semula untuk mengionkan molekul asid sepenuhnya. <i>1. Heat of neutralisation reaction I is higher than reaction II. 2. HCl is a strong acid, ethanoic acid is a weak acid. 3. HCl ionise completely in water, all molecules of HCl is ionise to hydrogen ions. 4. Ethanoic acid ionise partially in water, a part still as a molecules. 5. Some of heat reabsorbed to ionise acid molecules completely.</i> | 1 1 1 1 1 | 5 |
| | (e) | <u>Nilai bahan api/ Fuel value</u> 1. Nilai bahan api etanol 30 kJ g ⁻¹ <i>Fuel value of ethanol 30 kJ g⁻¹</i> 2. Nilai bahan api kerosin 37 kJ g ⁻¹ <i>Fuel value of kerosene 37 kJ g⁻¹</i> 3. Kerosin lebih baik <i>Kerosen is better</i> 4. Kerana mempunyai nilai bahan api lebih tinggi <i>Because it has higher fuel value</i> | 1 1 1 1 | |

| | | | | | |
|--|--|--|--|---|-----------|
| | | | <u>Kesan terhadap alam sekitar / effects on environment</u> | | |
| | | | 5. Peratus jisim C per molekul etanol 52.17% <i>Percentage of C mass per molecule of ethanol 52.17%</i> | 1 | |
| | | | 6. Peratus jisim C per molekul kerosin <i>Percentage of C mass per molecule of kerosene 84.71%</i> | 1 | |
| | | | 7. Etanol lebih baik <i>Ethanol is better.</i> | 1 | |
| | | | 8. Menghasilkan jelaga yang lebih sedikit <i>Produced less sooty.</i> | 1 | 8 |
| | | | TOTAL | | 20 |

**PERATURAN PEMARKAHAN TAMAT
END OF MARKING SCHEME**