

**CADANGAN JAWAPAN MODUL KECEMERLANGAN SPM KIMIA 2023**

**DAERAH TANGKAK**

Soalan		Cadangan Jawapan	Markah
1.	(a)	Campuran dua atau lebih unsur yang mana unsur yang utama ialah logam  <i>Mixture of two or more elements where the main element is a metal</i>	1
	(b) (i)	Keluli / <i>Steel</i>	1
	(b) (ii)	Logam tulen : Ferum//Besi// <i>Iron</i>	1
		Logam asing : Karbon// <i>Carbon</i>	1
(c)	Lebih kuat dan keras <i>Stronger and harder</i>	1	
<b>JUMLAH</b>			<b>5</b>

Soalan		Cadangan Jawapan	Markah
2.	(a) (i)	Bilangan proton di dalam nukleus sesuatu atom  <i>Number of protons in the nucleus of an atom</i>	1
	(a)(ii)	Proton, neutron	2
	(b)(i)	2.8.2	1
	(b)(ii)	$X^{2+}$	1
<b>JUMLAH</b>			<b>5</b>

Soalan		Cadangan Jawapan	Markah
3.	(a)	X : Penghidrogenan <i>Hydrogenation</i>	1
		Y : Nikel//platinum <i>Nickel//platinum</i>	1
	(b)	<ul style="list-style-type: none"> <li>• Lemak tepu</li> <li>• Lemak tepu wujud sebagai pepejal pada suhu bilik</li> <li>• Lemak berkumpul di dinding arteri</li> <li>• Arteri menjadi sempit atau tersumbat</li> </ul> <ul style="list-style-type: none"> <li>• <i>Saturated fats</i></li> <li>• <i>Saturated fats exist as solid at room temperature</i></li> <li>• <i>Fats accumulate at the wall of arteries</i></li> <li>• <i>Narrow or block the arteries</i></li> </ul>	1 1 1 1
<b>JUMLAH</b>			<b>6</b>

Soalan	Cadangan Jawapan	Markah									
4. (a)	Formula kimia yang menunjukkan nisbah paling ringkas bagi bilangan atom setiap jenis unsur dalam suatu sebatian  <i>Chemical formula that shows the simplest ratio of the number of atoms of each element in a compound</i>	1									
(b)	Magnesium//aluminium//zink  <i>Magnesium//aluminium//zinc</i>	1									
(c) (i)	Jisim oksigen : $28.0 - 26.4 = 1.6 \text{ g}$  Jisim logam X : $26.4 - 24.0 = 2.4 \text{ g}$	1  1									
(c) (ii)	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Unsur</th> <th>X</th> <th>O</th> </tr> </thead> <tbody> <tr> <td>Bil mol</td> <td><math>\frac{2.4}{24} = 0.1</math></td> <td><math>\frac{1.6}{16} = 0.1</math></td> </tr> <tr> <td>Nisbah mol</td> <td>1</td> <td>1</td> </tr> </tbody> </table> Formula empirik : XO	Unsur	X	O	Bil mol	$\frac{2.4}{24} = 0.1$	$\frac{1.6}{16} = 0.1$	Nisbah mol	1	1	1  1  1
Unsur	X	O									
Bil mol	$\frac{2.4}{24} = 0.1$	$\frac{1.6}{16} = 0.1$									
Nisbah mol	1	1									
<b>JUMLAH</b>		<b>7</b>									

Soalan	Cadangan Jawapan	Markah
5. (a)	$\text{SO}_4^{2-}$ , $\text{Cl}^-$	1
(b)	Kation : $\text{Ca}^{2+}$  Anion : $\text{SO}_4^{2-}$	1  1
(c)(i)	$\text{Mg}^{2+}$ // $\text{Ca}^{2+}$	1
(c) (ii)	<ul style="list-style-type: none"> <li>• Tambah larutan kalium karbonat ke dalam air sungai</li> <li>• Mendakan putih terbentuk</li> <li>• Turas campuran</li> <li>• Baki turasan ialah magnesium karbonat, ion magnesium disingkirkan</li> </ul> <ul style="list-style-type: none"> <li>• <i>Add potassium carbonate solution into the river water</i></li> <li>• <i>White precipitate is formed</i></li> <li>• <i>Filter the mixture</i></li> <li>• <i>Residue is magnesium carbonate, magnesium ion is removed</i></li> </ul>	1 1 1 1
<b>JUMLAH</b>		<b>8</b>

Soalan		Cadangan Jawapan	Markah
6.	(a) (i)	Molekul berantai panjang yang terhasil daripada pencantuman banyak ulangan unit asas//monomer  <i>Long chain molecule that is made from a combination of many repeating basic units//monomer</i>	1
	(a) (ii)	Etena <i>Ethene</i>	1
	(b)	<ul style="list-style-type: none"> <li>• Kitar semula//Pembakaran//Pembuangan ke tapak pelupusan sampah (terima mana-mana dua jawapan)</li> <li>• Pembebasan gas beracun menyebabkan pencemaran udara</li> <li>• <i>Recycle//Burning//Dispose to landfill or junkyard (accept any two answers)</i></li> <li>• <i>Release of poisonous gas cause air pollution</i></li> </ul>	1 1 1
	(c)	<ul style="list-style-type: none"> <li>• Getah Y lebih kenyal</li> <li>• Getah Y ialah getah tervulkan</li> <li>• Rangkai silang sulfur yang kuat dalam getah tervulkan menghalang polimer getah daripada menggelongsor apabila diregang dan</li> <li>• dapat kembali semula ke bentuk asal selepas diregangkan</li> <li>• <i>Rubber Y is more elastic</i></li> <li>• <i>Rubber Y is vulcanised rubber</i></li> <li>• <i>Strong sulphur cross-link in vulcanised rubber prevents rubber polymer from sliding when it is stretched and</i></li> <li>• <i>return to its original shape when released</i></li> </ul>	1 1 1 1
<b>JUMLAH</b>			<b>9</b>

Soalan		Cadangan Jawapan	Markah
7.	(a)	Biru <i>Blue</i>	1
	(b)	$\text{Cu}^{2+}$ , $\text{H}^+$	1
	(c) (i)	$\text{Zn(p)} \mid \text{Zn}^{2+} (\text{ak}, 1.0 \text{ mol dm}^{-3}) \parallel \text{Cu}^{2+} (\text{ak}, 1.0 \text{ mol dm}^{-3}) \mid \text{Cu (p)}$	2
	(c) (ii)	$(+0.34) - (-0.76) = +1.10 \text{ V}$	1
	(c) (iii)	<ul style="list-style-type: none"> <li>• Ganti elektrod zink dengan elektrod magnesium</li> <li>• Ganti larutan zink nitrat dengan larutan magnesium nitrat</li> <li>• Nilai <math>E^0</math> magnesium lebih besar daripada zink</li>   <li>• <i>Replace zink electrode with magnesium electrode</i></li> <li>• <i>Replace zink nitrate solution with magnesium nitrate solution</i></li> <li>• <i><math>E^0</math> Value of magnesium is bigger than zinc</i></li> </ul>	1 1 1
(d)	<ul style="list-style-type: none"> <li>• Gas kuning kehijauan dibebaskan di Set I, gas tidak berwarna dibebaskan di Set II</li> <li>• Ion <math>\text{Cl}^-</math> dinyahcas di anod Set I kerana kepekatan ion <math>\text{Cl}^-</math> lebih tinggi, ion <math>\text{OH}^-</math> dinyahcas di anod Set II kerana nilai <math>E^0</math> lebih negatif dari ion <math>\text{Cl}^-</math></li>   <li>• <i>Yellow greenish gas is released at Set I, colourless gas is released at Set II</i></li> <li>• <i><math>\text{Cl}^-</math> ion is discharged at anode Set I because concentration of <math>\text{Cl}^-</math> ion is higher, <math>\text{OH}^-</math> ion is discharged at anode Set II because <math>E^0</math> value is more negative than <math>\text{Cl}^-</math> ion</i></li> </ul>	1 1	
<b>JUMLAH</b>			<b>10</b>

Soalan		Cadangan Jawapan	Markah
8.	(a) (i)	Kuning <i>Yellow</i>	1
	(a) (ii)	Eksp I : $\frac{1}{40} = 0.025 \text{ s}^{-1}$	1
		Eksp II : $\frac{1}{20} = 0.05 \text{ s}^{-1}$	1
	(a) (iii)	Kadar tindak balas Eksperimen II lebih tinggi  <i>Rate of reaction of Experiment I is higher</i>	1
(a) (iv)	<ul style="list-style-type: none"> <li>• Suhu larutan natrium tiosulfat dalam Eksperimen II lebih tinggi</li> <li>• Tenaga kinetik zarah lebih tinggi</li> <li>• Frekuensi perlanggaran berkesan antara ion tiosulfat dan ion hidrogen lebih tinggi</li>   <li>• <i>Temperature of sodium thiosulphate solution in Experiment II is higher</i></li> <li>• <i>Kinetic energy of particles is higher</i></li> <li>• <i>Effective frequency of collision between thiosulphate ion and hydrogen ion is higher</i></li> </ul>	1 1 1	
(b)	<ul style="list-style-type: none"> <li>• Situasi II</li> <li>• Suhu lebih tinggi</li> <li>• Tenaga kinetik molekul air lebih tinggi</li>   <li>• <i>Situation II</i></li> <li>• <i>Temperature is higher</i></li> <li>• <i>Kinectic energy of water molecule is higher</i></li> </ul>	1 1 1	
<b>JUMLAH</b>			<b>10</b>



		<ul style="list-style-type: none"> <li>- <i>The electron arrangement of P atom is 2.4, R atom is 2.6</i></li> <li>- <i>P atom needs 4 electrons, R atom needs 2 electrons to achieve stable octet electron arrangement</i></li> <li>- <i>One P atom contribute 4 electrons, one R atom contribute 2 electrons for sharing</i></li> <li>- <i>One P atom and two R atoms share electrons</i></li> <li>- <i>Formula of compound A: PR<sub>2</sub></i></li> </ul> <p>Sebatian B</p> <ul style="list-style-type: none"> <li>- <i>Susunan elektron atom R ialah 2.6, susunan elektron atom Q ialah 2.8.1</i></li> <li>- <i>mencapai susunan elektron oktet yang stabil</i></li> <li>- <i>Atom R terima 2 elektron membentuk ion R<sup>2-</sup>, atom Q membebaskan 1 elektron membentuk Q<sup>+</sup></i></li> <li>- <i>Ion Q<sup>+</sup> dan dan ion R<sup>2-</sup> tertarik antara satu sama lain dengan daya tarikan elektrostatik</i></li> <li>- <i>Formula sebatian B : Q<sub>2</sub>R</i></li> </ul> <ul style="list-style-type: none"> <li>- <i>The electron arrangement of R atom is 2.6, Q atom is 2.8.1</i></li> <li>- <i>To achieve stable octet electron arrangement</i></li> <li>- <i>R atom receive 2 electrons to form R<sup>2-</sup> ion, Q atom release 1 electron to form Q<sup>+</sup> ion</i></li> <li>- <i>Q<sup>+</sup> ion and one R<sup>2-</sup> ion attracted to each other by electrostatic force</i></li> <li>- <i>Formula of compound B: Q<sub>2</sub>R</i></li> </ul>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>
	(b) (iii)	<ul style="list-style-type: none"> <li>• <i>Daya tarikan elektrostatik antara ion dalam sebatian B adalah kuat, lebih banyak tenaga haba diperlukan untuk mengatasi daya tarikan</i></li> <li>• <i>Daya tarikan van der Waals antara molekul dalam sebatian A adalah lemah, kurang tenaga haba diperlukan untuk mengatasi daya tarikan</i></li> <li>• <i>Electrostatic attraction force between ions in compound B is strong, more heat energy is needed to overcome the force</i></li> <li>• <i>Van der Waals attraction force between molecules in compound A is weak, less heat energy is needed to overcome the force</i></li> </ul>	<p>1</p> <p>1</p>
<b>JUMLAH</b>			<b>20</b>

Soalan	Cadangan Jawapan	Markah
10.	<p>(a)</p> <p>HA : asid etanoik//<i>ethanoic acid</i></p> <p>HB : asid nitrik/asid hidroklorik//<i>nitric acid/hydrochloric acid</i> (reject formula)</p> <p> <math>\text{CH}_3\text{COOH} + \text{KOH} \longrightarrow \text{CH}_3\text{COOK} + \text{H}_2\text{O} //</math>  <math>\text{HCl} + \text{KOH} \longrightarrow \text{KCl} + \text{H}_2\text{O} //</math>  <math>\text{HNO}_3 + \text{KOH} \longrightarrow \text{KNO}_3 + \text{H}_2\text{O}</math> </p> <ul style="list-style-type: none"> <li>• Asid etanoik ialah asid lemah</li> <li>• Mengion separa dalam air dan sebahagian wujud sebagai molekul</li> <li>• Sebahagian haba yang dibebaskan diserap dan digunakan untuk mengion molekul asid selengkapnya</li> <li>• <i>Ethanoic acid is weak acid</i></li> <li>• <i>Ionise partially in water and some exists as molecules</i></li> <li>• <i>Some of the heat released is absorbed and used to ionise acid molecules completely</i></li> </ul>	<p>1</p> <p>1</p> <p>2</p> <p>1</p> <p>1</p> <p>1</p>
	<p>(b) (i)</p> <p>Haba yang dibebaskan apabila 1 mol bahan dibakar dengan lengkap dalam oksigen berlebihan <i>Heat released when 1 mol of a substance is completely burnt in excess oxygen</i></p> <ul style="list-style-type: none"> <li>• Bilangan atom karbon per molekul propanol lebih tinggi</li> <li>• haba pembakaran propanol lebih tinggi</li> <li>• Lebih banyak molekul karbon dioksida dan air dibebaskan</li> <li>• Lebih banyak haba dibebaskan apabila pembentukan ikatan terbentuk</li> <li>• <i>The number of atom carbon per molecule in propanol is higher</i></li> <li>• <i>Heat of combustion of propanol is higher</i></li> <li>• <i>More carbon dioxide and water molecules are released</i></li> <li>• <i>More heat is released when the formation of bond is formed</i></li> </ul> <p>1375 kJ mol<sup>-1</sup></p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>



	(b) (ii)	$\text{C}_3\text{H}_7\text{OH} + \frac{9}{2} \text{O}_2 \longrightarrow 3\text{CO}_2 + 4\text{H}_2\text{O}$ <p>Bil mol propanol = <math>\frac{1.08}{60}</math> = 0.02 mol</p> <p>1 mol propanol membebaskan 2000 kJ mol<sup>-1</sup> haba</p> <p>2000 x 0.02 = 40kJ mol<sup>-1</sup></p>	2  1  1  1
	(b)	<p>Nilai bahan api butana = <math>\frac{2880}{58}</math> = 49.66 kJ g<sup>-1</sup></p> <p>Nilai bahan api butanol = <math>\frac{2679}{74}</math> = 36.20kJ g<sup>-1</sup></p> <p>Butana//<i>Buthane</i> Nilai bahan api yang lebih tinggi//<i>Fuel value is higher</i></p>	1  1
		<b>TOTAL</b>	<b>20</b>



	(c)	Y : $C_2H_4 + 3O_2 \longrightarrow 2CO_2 + 2H_2O$	2
		Z : $C_2H_5OH + 3O_2 \longrightarrow 2CO_2 + 3H_2O$	2
		1 mol $C_2H_5OH \longrightarrow 2$ mol $CO_2$	1
		0.02 mol $C_2H_5OH \longrightarrow 0.04$ mol $CO_2$	
		Isipadu = $0.04 \times 24$ = $0.96 \text{ dm}^3$	1
<b>TOTAL</b>			<b>20</b>