

MPP3 – Peperiksaan Percubaan 2020  
 SIJIL PELAJARAN MALAYSIA  
 4541/2 CHEMISTRY / KIMIA  
 Paper / Kertas 2

Section A / Bahagian A

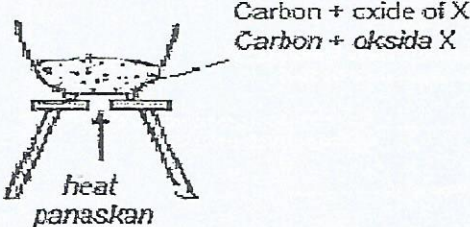
1	(a)	(i)	Sodium// Magnesium// Aluminium <i>Natrium // Magnesium // Aluminium</i> <i>Reject: formula</i>		1
		(ii)	Sodium: Group 1// <i>Natrium : Kumpulan 1</i>  Magnesium: Group 2// <i>Magnesium : Kumpulan 2</i>  Aluminium: Group 13 <i>Aluminium : Kumpulan 13</i>		1
	(b)	(i)	Argon		1
		(ii)	Atom argon achieved octet electron arrangement// Atom argon has 8 valence electrons <i>Atom argon telah mencapai susunan elektron octet //</i> <i>Atom argon mempunyai 8 elektron valens</i>		1
	(c)	(i)	$\text{Cl}_2 + \text{H}_2\text{O} \longrightarrow \text{HCl} + \text{HOCl}$  <i>Correct formulae of reactants and products</i> <i>Balanced equation</i>	1 1	2
		(ii)	Sodium: red litmus paper turns to blue Chlorine: blue litmus paper turns to red <i>Natrium : kertas litmus merah menjadi biru</i> <i>Klorin : kertas litmus biru menjadi merah</i>	1 1	2
	(d)		Atomic size decreases <i>Saiz atom berkurang</i>	1	1
			<b>TOTAL</b>		<b>9</b>

2	(a)	(i)	Chemical formulae that shows the simplest ratio of each atom of the elements in the compound. <i>Formula kimia yang menunjukkan nisbah teringkas setiap atom semua unsur dalam sesuatu sebatian.</i>	1	1												
		(ii)	X is a reactive metal <i>X adalah logam reaktif</i>	1	1												
		(iii)	To allow oxygen gas to enter into the crucible and react with X. <i>Untuk membenarkan gas oksigen masuk dan bertindakbalas dengan X</i>	1	1												
		(iv)	The heating, cooling and weighing process is repeated until a constant mass is obtained. <i>Proses pemanasan, penyejukan dan penimbangan diulang sehingga jisim tetap diperolehi.</i>	1	1												
		(v)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Element Unsur</th> <th style="text-align: center;"><del>Zinc</del> <del>Zink</del> X</th> <th style="text-align: center;">Oxygen Oksigen</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Mass (g) Jisim</td> <td style="text-align: center;">6.5</td> <td style="text-align: center;">1.6</td> </tr> <tr> <td style="text-align: center;">No. of mole (mol) Bil. mol</td> <td style="text-align: center;">0.1</td> <td style="text-align: center;">0.1</td> </tr> <tr> <td style="text-align: center;">Ratio of mol Nisbah mol</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> </tr> </tbody> </table> <p style="margin-top: 5px;">Formula empiric : <del>ZnO</del> X O <i>Formula empirik</i></p>	Element Unsur	<del>Zinc</del> <del>Zink</del> X	Oxygen Oksigen	Mass (g) Jisim	6.5	1.6	No. of mole (mol) Bil. mol	0.1	0.1	Ratio of mol Nisbah mol	1	1	1 1 1	....3
Element Unsur	<del>Zinc</del> <del>Zink</del> X	Oxygen Oksigen															
Mass (g) Jisim	6.5	1.6															
No. of mole (mol) Bil. mol	0.1	0.1															
Ratio of mol Nisbah mol	1	1															
	(b)		Reactant : Aluminium/Al and oxygen/O <sub>2</sub> and <i>Bahan tindak balas : Aluminium/Al dan oksigen/O<sub>2</sub></i> Product: Aluminium oxide/Al <sub>2</sub> O <sub>3</sub> <i>Hasil tindak balas : Aluminium oksida/Al<sub>2</sub>O<sub>3</sub></i>  4 mole of aluminium/Al reacts with 3 moles of oxygen/O <sub>2</sub> produced 2 mol of aluminium oxide/Al <sub>2</sub> O <sub>3</sub> <i>4 mol aluminium/Al bertindak balas dengan 3 mol oksigen/O<sub>2</sub></i> <i>menghasilkan 2 mol aluminium oksida/Al<sub>2</sub>O<sub>3</sub></i>	1 1	...2												
<b>TOTAL</b>					<b>9</b>												

3	(a)	(i)	Compound formed when the hydrogen ion, $H^+$ from the acid is replaced with metal ion or ammonium ion, $NH_4^+$ <i>Sebatian yang terbentuk apabila ion hidrogen, <math>H^+</math> dalam asid digantikan dengan ion logam atau ion ammonium, <math>NH_4^+</math></i>		1
		(ii)	[ Any insoluble salts ] // [ Mana- mana garam tak terlarutkan ]		1
		(iii)	Carbon dioxide // <i>Karbon dioksida</i>		1
	(b)	(i)	Double decomposition reaction // Precipitation reaction <i>Tindak balas penguraian ganda dua // Tindak balas pemendakan</i>		1
		(ii)	Lead (II) chloride // <i>Plumbum (II) klorida</i>		1
		(iii)	$Pb(NO_3)_2 + 2NaCl \longrightarrow PbCl_2 + 2NaNO_3$ [Correct formula] // [Formula betul] [Balanced equation] // [Seimbang]	1 1	...2
		(iv)	1. Number of mole of NaCl // <i>Bilangan mol NaCl</i> 2. Ratio of mole // <i>Nisbah mol</i> 3. Correct mass of $PbCl_2$ with unit // <i>Jisim <math>PbCl_2</math> dengan unit</i>  Number of mole of NaCl = $\frac{0.2 \times 50}{1000}$ // 0.01 mol <i>Bilangan mol NaCl</i>  2 mol of NaCl : 1 mol of $PbCl_2$ // 0.01 mol of NaCl : 0.005 mol of $PbCl_2$  Mass of $PbCl_2$ = $0.005 \times 278$ // 1.39 g <i>Jisim <math>PbCl_2</math></i>	1  1  1	...3
TOTAL					10

4	(a)		Na <sup>+</sup> , NO <sub>3</sub> <sup>-</sup> , H <sup>+</sup> , OH <sup>-</sup>		1
	(b)	(i)	Electrode that is connected to the negative terminal of cell // Electrode in which reduction occurs <i>Elektrod yang disambungkan kepada terminal negatif sel// Elektrod di mana penurunan berlaku</i>		1
		(ii)	Hydrogen gas // H <sub>2</sub> <i>Gas hidrogen</i>		1
		(iii)	Sodium ion and hydrogen ion move to the cathode Hydrogen ion is selected to be discharged because hydrogen ion is lower than sodium ion in electrochemical series <i>Ion natrium dan ion hidrogen bergerak ke katod. Ion hidrogen dipilih untuk dinyahcaskan kerana ion hidrogen lebih rendah daripada ion natrium dalam siri elektrokimia</i>	1 1	2
	(c)		4OH <sup>-</sup> → O <sub>2</sub> + 2H <sub>2</sub> O + 4e		2
	(d)		Electroplating of key with copper by using copper(II) sulphate solution as an electrolyte Key as a cathode Copper as an anode <i>Penyaduran kunci dengan kuprum menggunakan larutan kuprum (II) sulfat sebagai elektrolit Kunci sebagai katod Kuprum sebagai anod</i>	1 1 1	3
				<b>TOTAL</b>	<b>10</b>

5	(a)	$\text{CaCO}_3 + 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{H}_2\text{O} + \text{CO}_2$ Correct formulae of reactants and products Balanced equation	1 1... 2
	(b)(i)	All the hydrochloric acid/all the hydrogen ion has completely reacted with calcium carbonate Semua asid hidroklorik/semua ion hydrogen telah lengkap bertindak balas dengan kalsium karbonat	1
	(b)(ii)	Mass of unreacted zinc = 2.5 g Jisim zink yang tidak bertindak balas = 2.5 g	1
	(c)	<div style="text-align: center;"> </div> Functional diagram Labelled [ calcium carbonate, hydrochloric acid, water ]	1 1...2
	(d)(i)	Mass of calcium carbonate (g) Jisim kalsium karbonat (g) 	2
	(d)(ii)	1. Temperature increase causes kinetic energy of particle increases 2. Frequency of collision particle between ion hydrogen and calcium carbonate increases 3. Frequency of effective collision increases  1. Suhu meningkat menyebabkan tenaga kinetik zarah-zarah meningkat 2. Frekuensi perlanggaran antara ion hidrogen dan kalsium karbonat meningkat 3. Frekuensi perlanggaran berkesan meningkat	1 1 1
	(e)	Copper(II) sulphate solution as a catalyst // Used calcium carbonate powder Mangkin larutan kuprum(II) sulfat// Menggunakan serbuk kalsium karbonat //saiz	1
Total			11

6	(a)	(i)	Oxidation and reduction that occur at the same time / simultaneously <i>Pengoksidaan dan penurunan berlaku pada masa yang sama / serentak</i>		1
		(ii)	$3C + 2Fe_2O_3 \longrightarrow 3CO_2 + 4Fe$ ( correct chemical formula ) ( balanced equation )	1 1	2
		(iii)	+3 to 0		1
		(iv)	Iron(III) oxide // $Fe_2O_3$ // $Fe^{3+}$ <i>Ferum (III) oksida</i>		1
	(b)		Reaction occur in Set II but reaction does not occur in Set III // Carbon can reduce X from oxide of X Carbon is more reactive than X but less reactive than magnesium/ Mg  <i>Tindak balas berlaku dalam Set II tetapi tindak balas tidak berlaku dalam Set III// Karbon boleh menurunkan X dari oksida X Karbon lebih reaktif daripada X tetapi kurang reaktif daripada magnesium/Mg.</i>	1 1	2
	(c)	(i)	Mg , C , Fe , X		1
		(ii)	Copper / <i>Kuprum</i>		1
	(d)		 <p>Carbon + oxide of X Carbon + oksida X</p> <p>heat panaskan</p> <p>Functional diagram Labelled</p>	1 1	2
				TOTAL	11

## Section B / Bahagian B

7	(a)	<table border="1"> <thead> <tr> <th>Food additive <i>Bahan tambah makanan</i></th> <th>Type of food additive <i>Jenis bahan tambah makanan</i></th> <th>Function <i>Fungsi</i></th> </tr> </thead> <tbody> <tr> <td>Sunset yellow <i>Sunset yellow</i></td> <td>Colouring agent <i>Agen pewarna</i></td> <td>To improve the appearance of a food <i>Meningkatkan rupa makanan</i></td> </tr> <tr> <td>Vanilla flavour <i>Perisa vanilla</i></td> <td>Flavouring agent <i>Agen perisa</i></td> <td>To improve the taste of a food <i>Meningkatkan rasa makanan</i></td> </tr> <tr> <td>Sugar <i>Gula</i></td> <td>Preservative <i>pengawet</i></td> <td>To make a food last longer <i>Makanan tahan lama</i></td> </tr> <tr> <td>Soy lecithin <i>Lesitin soya</i></td> <td>Stabiliser agent <i>Agen penstabil</i></td> <td>To allow oil and water mixing <i>Membenarkan minyak dan air bercampur</i></td> </tr> </tbody> </table>	Food additive <i>Bahan tambah makanan</i>	Type of food additive <i>Jenis bahan tambah makanan</i>	Function <i>Fungsi</i>	Sunset yellow <i>Sunset yellow</i>	Colouring agent <i>Agen pewarna</i>	To improve the appearance of a food <i>Meningkatkan rupa makanan</i>	Vanilla flavour <i>Perisa vanilla</i>	Flavouring agent <i>Agen perisa</i>	To improve the taste of a food <i>Meningkatkan rasa makanan</i>	Sugar <i>Gula</i>	Preservative <i>pengawet</i>	To make a food last longer <i>Makanan tahan lama</i>	Soy lecithin <i>Lesitin soya</i>	Stabiliser agent <i>Agen penstabil</i>	To allow oil and water mixing <i>Membenarkan minyak dan air bercampur</i>	1+1+1	
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		( any two )																	
<p>Advantage :</p> <p>Make food last longer // more attractive // more flavour <i>Kebaikan :</i> <i>Membuatkan makanan tahan lama// lebih menarik// lebih lazat</i></p> <p>(any one )</p>	1																		
<p>disadvantage :</p> <p>cause ( disease ) such as cancer / asthma / allergy / hyperactive <i>menyebabkan ( penyakit ) seperti kanser / asma / alergi / hiperaktif</i></p> <p>(any one )</p>	1																		
		8																	

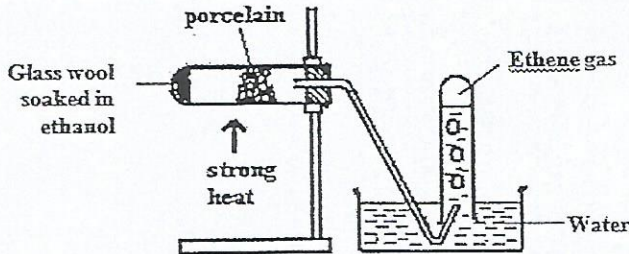
(b)	(i)	X : Ginger Halia Y : Garlic Bawang putih	1	4
	(ii)	Type of medicine : Antibiotics Jenis ubat : Antibiotik  Function : destroy microorganisms // prevent the growth of microorganisms membunuh mikroorganisma // menghalang pertumbuhan mikroorganisma	1  1	
(c)	Cleaning agent A – detergent Cleaning agent B - soap		1  1	8
	Cleaning agent A Agen pencuci A	Cleaning agent B Agen pencuci B	1+1	
	Oily stain remove Kesan minyak hilang	Oily stain remain Kesan minyak kekal		
	Effective in hard water Berkesan dalam air liat	Not effective in hard water Tidak berkesan dalam air liat	1	
	Hard water contains calcium ion// Ca <sup>2+</sup> and magnesium ion// Mg <sup>2+</sup> Air liat mengandungi ion kalsium// Ca <sup>2+</sup> dan ion magnesium// Mg <sup>2+</sup>		1	
	Anion cleaning agent A // detergent react with calcium ion or magnesium ion in hard water Anion agen pencuci A // detergen bertindak balas dengan ion kalsium// Ca <sup>2+</sup> atau ion magnesium // Mg <sup>2+</sup> dalam air liat	Anion cleaning agent B // soap react with calcium ion or magnesium ion in hard water Anion agen pencuci B // sabun bertindak balas dengan ion kalsium// Ca <sup>2+</sup> atau ion magnesium // Mg <sup>2+</sup> dalam air liat	1	
	Formed soluble salt // no scum formed Membentuk garam terlarutkan // tidak membentuk kekat	Formed insoluble salt // scum formed Membentuk garam tak terlarutkan // kekat terbentuk	1	
			TOTAL	20

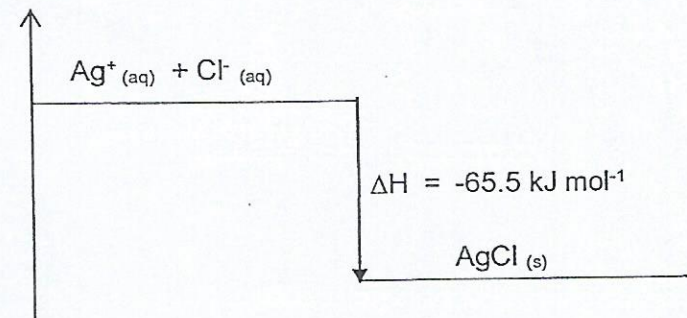


8	(a)	$\text{H}_2\text{SO}_4 + 2\text{NaOH} \rightarrow \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$ Correct formulae of reactants and products Balanced equation	1 1	
		$\frac{X(10)}{(1.0)(20)} = \frac{1}{2}$ $X = 1.0 \text{ mol dm}^{-3}$	1 1	
		-Still have free moving ions in the beaker <i>Masih mempunyai ion-ion yang bergerak bebas dalam bikar</i> -The ions carried the electric charge <i>Ion-ion membawa cas elektrik</i>	1 1	...6
	(b) (i)	Acid P : Ethanoic acid // (any name of weak acid) <i>Asid P : asid etanoik // (mana-mana asid lemah)</i> Acid Q : Hydrochloric acid // nitric acid // sulphuric acid <i>Asid Q : Asid hidroklorik // asid nitric // asid sulfurik</i>	1 1	...2
	(ii)	P1: Acid P/ Ethanoic acid is a weak acid / ionised partially in water P2: produce low concentration of hydrogen ions P3: release low volume of carbon dioxide gas P4: Low rate of reaction P5: Acid Q/ Nitric acid is strong acid / ionises completely in water P6: produce high concentration of hydrogen ions P7: release more volume of carbon dioxide gas P8: High rate of reaction  <i>P1 : Asid P / Asid etanoik ialah asid lemah/ mengion separa dalam air</i> <i>P2 : menghasilkan kepekatan ion hidrogen yang rendah</i> <i>P3 : membebaskan isipadu gas karbon dioksida yang rendah</i> <i>P4 : Kadar tindak balas rendah</i> <i>P5 : Asid Q/ Asid nitrik ialah asid kuat/ mengion lengkap dalam air</i> <i>P6 : menghasilkan kepekatan ion hidrogen yang tinggi</i> <i>P7 : membebaskan lebih banyak isipadu gas karbon dioksida</i> <i>P8 : Kadar tindak balas tinggi</i>	1 1 1 1 1 1 1 1 1	...8
	(c)	P1: Sodium hydroxide is a strong alkali and ammonia solution is a weak alkali P2: Sodium hydroxide ionises completely in water // produce higher concentration of hydroxide ions P3: Ammonia ionised partially in water // produce low concentration of hydroxide ions P4: The higher the concentration of hydroxide ion, the higher the pH value  <i>P1 : Natrium hidroksida ialah alkali kuat dan larutan ammonia ialah alkali lemah</i> <i>P2 : Natrium hidroksida mengion lengkap dalam air // menghasilkan kepekatan ion hidroksida yang tinggi</i> <i>P3 : Ammonia mengion separa dalam air // menghasilkan kepekatan ion hidroksida yang rendah</i> <i>P4 : Semakin tinggi kepekatan ion hidroksida, semakin tinggi nilai pH</i>	1 1 1 1	...4
			TOTAL	20

## Section C / Bahagian C

9	(a)	(i)	P-any acid/ethanoic acid // <i>asid/asid etanoik</i> Q- any alkali/ ammonia solution // <i>alkali/larutan ammonia</i>	1 1.....2
		(ii)	<p>Set 1</p> <ol style="list-style-type: none"> <li>Ethanoic acid/acid P contains hydrogen ions</li> <li>H<sup>+</sup> ions neutralise the negative charge of protein membrane</li> <li>Rubber particles collide</li> <li>Protein membrane break and rubber molecules combined together</li> </ol> <p>Set 2:</p> <ol style="list-style-type: none"> <li>Ammonia solution containing hydroxide ions</li> <li>OH<sup>-</sup> neutralise H<sup>+</sup> ions produced by bacterias.</li> </ol> <p>Set 1</p> <ol style="list-style-type: none"> <li><i>Asid etanoik/ asid P mengandungi ion hidrogen</i></li> <li><i>Ion Hidrogen meneutralkan cas negatif pada membran protein</i></li> <li><i>Zarah getah berlanggar</i></li> <li><i>Membran protein pecah dan molekul getah akan bergabung bersama</i></li> </ol> <p>Set 2</p> <ol style="list-style-type: none"> <li><i>Larutan ammonia mengandungi ion hidroksida</i></li> <li><i>Ion hidroksida meneutralkan ion hidrogen yang dihasilkan oleh bakteria</i></li> </ol>	1 1 1 1  1 1.....6
	(b)	(i)	<p>Alcohol // <i>alkohol</i></p> <ul style="list-style-type: none"> <li>Burnt in oxygen to produced CO<sub>2</sub> and H<sub>2</sub>O // <i>Terbakar dalam oksigen menghasilkan karbon dioksida dan air</i></li> <li>Oxidised by oxidising agent to produced carboxylic acids // <i>Teroksida oleh agen pengoksidaan menghasilkan asid karboksilik.</i></li> </ul>	1 1 1.....3
		(ii)	<p>Procedures</p> <ol style="list-style-type: none"> <li>Place glass wool into the boiling tube</li> <li>Soak the glass wool with 2 cm<sup>3</sup> of ethanol</li> <li>Place pieces of porcelain chips in the boiling tube</li> <li>Heat the porcelain chips strongly</li> <li>Heat glass wool gently</li> </ol> <p><i>Prosedur</i></p> <p><i>Masukkan wul kaca ke dalam tabung didih</i></p> <ol style="list-style-type: none"> <li><i>Rendamkan wul kaca dalam 2 cm<sup>3</sup> etanol</i></li> <li><i>Letakkan ketulan porselin ke dalam tabung didih</i></li> <li><i>Panaskan ketulan porselin dengan kuat</i></li> <li><i>Panaskan wul kaca perlahan - lahan</i></li> </ol>	1 1 1 1 1

		 <p>[Functional diagram//Gambar rajah berfungsi] [Label]</p> <p><b>Chemical test</b></p> <ol style="list-style-type: none"> <li>1. Add few drops of bromine water// <i>Tambahkan beberapa titis air bromin</i></li> <li>2. Brown colour change to colourless//<i>Warna perang menjadi tak bewarna</i></li> </ol>	<p>1 1 1 1....9</p>
<b>TOTAL</b>			<b>20</b>

10	(a)	<p>Energy Energy</p>  <p>1. Y-axes : energy <i>Paksi- Y : Tenaga</i></p> <p>2. Two different level of energy <i>Dua aras tenaga berbeza</i></p> <p>3. energy content of reactants is higher // products have less energy content <i>kandungan tenaga bahan tindak balas lebih tinggi // kandungan tenaga hasil tindak balas lebih rendah</i></p> <p>4. heat is released during the experiment // this is exothermic reaction <i>haba dibebaskan semasa eksperimen // Tindak balas eksotermik</i></p>	1 1 1 1	.....4
	(b)	(i)	1 1 1	
		(ii)	1 1	

		<p>3. <u>Experiment III</u> :</p> <p>2 mol of H<sup>+</sup> ion reacts with 2 mol of OH<sup>-</sup> ion produced 2 mol of water ; heat released 2 × 57 kJ  2 mol ion H<sup>+</sup> bertindak balas dengan 2 mol ion OH<sup>-</sup> menghasilkan 2 mol air ; 2 x 57 kJ haba dibebaskan</p>	1	.....6
(c)		<p><u>Materials</u> : Methanol / Ethanol / Propanol  <u>Bahan</u> : Metanol/ Etanol/ Propanol</p> <p><u>P</u> <u>Procedure</u> :  <u>Prosedur</u> :</p> <ol style="list-style-type: none"> <li>[100-250 cm<sup>3</sup>] of water is measured and poured into a copper can and the copper can is placed on a tripod stand.  [100-250 cm<sup>3</sup>] air disukat dan dituangkan ke dalam bekas kuprum dan bekas kuprum diletakkan di atas tungku kaki tiga</li> <li>The initial temperature of the water is measured and recorded.  Suhu awal air disukat dan direkodkan.</li> <li>A spirit lamp with ethanol is weighed and its mass is recorded.  Lampu spirit dengan etanol ditimbang dan jisimnya direkodkan.</li> <li>The lamp is then placed under the copper can and the wick of the lamp is lighted up immediately.  Lampu diletakkan di bawah bekas kuprum dan sumbu lampu dinyalakan dengan cepat.</li> <li>The water in the can is stirred continuously until the temperature of the water increases by about 30 °C.  Air dalam bekas dikacau berterusan sehingga suhu air meningkat sebanyak 30 °C.</li> <li>The flame is put off and the <b>highest temperature</b> reached by the water is recorded.  Nyalaan dimatikan dan <b>suhu tertinggi</b> air direkodkan.</li> <li>The lamp and its content are weighed immediately and the mass is recorded.  Lampu dan kandungannya ditimbang dengan segera dan jisim direkodkan.</li> </ol>	1	
			1	
			1	
			1	
			1	
			1	

		<u>Data:</u>		
		The highest temperature of water = $t_2$ <i>Suhu tertinggi air</i>	}	1
		The initial temperature of water = $t_1$ <i>Suhu awal air</i>		
		Increase in temperature, $\theta$ = $t_2 - t_1$ <i>Kenaikan suhu</i>		
		Mass of lamp after burning = $m_2$ <i>Jisim lampu selepas pembakaran</i>	}	1
		Mass of lamp before burning = $m_1$ <i>Jisim lampu sebelum pembakaran</i>		
		Mass of ethanol burnt, $m$ = $m_1 - m_2$ <i>Jisim etanol dibakar</i>		
		<u>Calculation :</u>		
		Number of mole of ethanol, $C_2H_5OH$ , $n = \frac{m}{46}$ <i>Bilangan mol etanol</i>		
		The heat energy given out during combustion by ethanol = <i>Tenaga haba yang dibebaskan semasa pembakaran etanol</i>		1
		the heat energy absorbed by water = $100 \times c \times \theta$ J <i>tenaga haba diserap oleh air</i>		
		Heat of combustion of ethanol = $\frac{m\theta c}{n}$ kJ mol <sup>-1</sup> <i>Haba pembakaran etanol</i>		
		= - Y kJ mol <sup>-1</sup>		Max ..10
			<b>TOTAL</b>	<b>20</b>

MODUL PERKEMBANGAN PEMBELAJARAN (MPP3) - TRIAL 2020  
4541/3 KIMIA  
KERTAS 3

Question	Mark Scheme	Score												
1 (a)	Able to record all the readings with one decimal place and unit accurately.  <u>Answer:</u>	3												
	<table border="1"> <thead> <tr> <th>Experiment/ <i>Eksperimen</i></th> <th>Initial reading of thermometer/ <i>Bacaan awal termometer</i></th> <th>Highest temperature / <i>Suhu tertinggi</i></th> </tr> </thead> <tbody> <tr> <td>I</td> <td>29.0 °C <i>29.9°C</i></td> <td>57.9 °C</td> </tr> <tr> <td>II</td> <td>29.0 °C <i>29.9°C</i></td> <td>59.5 °C</td> </tr> <tr> <td>III</td> <td>29.0 °C <i>29.9°C</i></td> <td>64.7 °C</td> </tr> </tbody> </table>		Experiment/ <i>Eksperimen</i>	Initial reading of thermometer/ <i>Bacaan awal termometer</i>	Highest temperature / <i>Suhu tertinggi</i>	I	29.0 °C <i>29.9°C</i>	57.9 °C	II	29.0 °C <i>29.9°C</i>	59.5 °C	III	29.0 °C <i>29.9°C</i>	64.7 °C
	Experiment/ <i>Eksperimen</i>		Initial reading of thermometer/ <i>Bacaan awal termometer</i>	Highest temperature / <i>Suhu tertinggi</i>										
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II	29.0 °C <i>29.9°C</i>	59.5 °C												
III	29.0 °C <i>29.9°C</i>	64.7 °C												
Able to record four readings with one decimal place accurately // record ALL the readings with two decimal places// without unit  <u>Sample answer:</u>	2													
<table border="1"> <thead> <tr> <th>Experiment/ <i>Eksperimen</i></th> <th>Initial reading of thermometer/ <i>Bacaan awal termometer</i></th> <th>Highest temperature / <i>Suhu tertinggi</i></th> </tr> </thead> <tbody> <tr> <td>I</td> <td>29.0 °C // 29.0</td> <td>57.90 °C // 57.9</td> </tr> <tr> <td>II</td> <td>29.0 °C // 29.0</td> <td>59.50 °C // 59.5</td> </tr> <tr> <td>III</td> <td>29.0 °C // 29.0</td> <td>64.70 °C // 64.7</td> </tr> </tbody> </table>		Experiment/ <i>Eksperimen</i>	Initial reading of thermometer/ <i>Bacaan awal termometer</i>	Highest temperature / <i>Suhu tertinggi</i>	I	29.0 °C // 29.0	57.90 °C // 57.9	II	29.0 °C // 29.0	59.50 °C // 59.5	III	29.0 °C // 29.0	64.70 °C // 64.7	
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II	29.0 °C // 29.0	59.50 °C // 59.5												
III	29.0 °C // 29.0	64.70 °C // 64.7												
Able to record at least two reading with one decimal place accurately	1													
No response given / wrong response	0													

Question	Mark Scheme	Score
1 (b)	Able to state the <b>three</b> variables correctly.	3
	<u>Sample answer</u> Manipulated variable : Metals above copper in electrochemical series// Iron,Zinc,Magnesium// Metals more electropositive than copper // <i>Jenis logam</i> Responding variable : Heat of displacement// Temperature rise Constant variable : Copper (II) sulphate solution// Type of solution	
	<i>Pemboleh ubah dimanipulasi : Logam yang berada di atas kuprum dalam siri elektrokimia// Ferum, Zink, Magnesium// Logam yang lebih elektropositif dari kuprum</i>	
	<i>Pemboleh ubah bergerak balas: Haba penyesaran// Kenaikan suhu</i>	
	<i>Pemboleh ubah dimalarkan : Larutan kuprum (II) sulfat// Jenis larutan</i>	
Able to state any <b>two</b> variables correctly.	2	
Able to state any <b>one</b> variable correctly.	1	
No response given / wrong response	0	

Question	Mark Scheme	Score
1 (c)	Able to state hypothesis correctly  <u>Sample answer</u> The higher the position of metals in electrochemical series compared copper, the higher the heat of displacement.// The higher the position of metals in electrochemical series compared copper, the higher the temperature rise. <i>Semakin tinggi kedudukan logam dalam siri elektrokimia berbanding kuprum, semakin tinggi haba penyesaran yang terhasil// Semakin tinggi kedudukan logam dalam siri elektrokimia berbanding kuprum, semakin tinggi kenaikan suhu.</i>	3
	Able to state hypothesis less correctly  <u>Sample answer:</u> The higher the position of metals in electrochemical series, the higher the heat of displacement. <i>Semakin tinggi kedudukan logam dalam siri elektrokimia, semakin tinggi haba penyesaran yang terhasil</i>	2
	Able to state an idea of the hypothesis  <u>Sample answer:</u> The higher the position of metals in electrochemical series, the higher the rise of temperature. <i>Semakin tinggi kedudukan logam dalam siri elektrokimia, semakin tinggi kenaikan suhu</i>	1
	No response given / wrong response	0

Question	Mark Scheme	Score
1 (d)	Able to state observations for this reaction correctly.  <u>Sample answer:</u> 1. Temperature of mixture increases/ <i>Suhu campuran meningkat.</i> // 2. Brown solid produced/ <i>Pepejal perang dihasilkan.</i> // 3. Iron powder dissolves/ <i>Serbuk ferum melarut.</i> // 4. Blue solution turns colourless/ <i>Larutan biru menjadi tak berwarna.</i>	3
	Able to state observations for this reaction less correctly.  <u>Sample answer:</u> 1. Container will be hot/ <i>Bekas menjadi panas.</i> // 2. Brown solid deposited/ <i>Pepejal perang terenal.</i> // 3. Colourless solution produced/ <i>Larutan tak berwarna terhasil.</i>	2
	Able to state an idea of the observation  <u>Sample answer:</u> 1. Solution change colour/ <i>Larutan bertukar warna.</i> // 2. Precipitate produced/ <i>Mendakan terhasil</i>	1
	No response given / wrong response	0



Question	Mark Scheme	Score
1 (e)	Able to state inference correctly  <u>Sample answer</u> 1. Exothermic reaction. / <i>Tindakbalas eksotermik.</i> 2. Heat is released into the surroundings // <i>Haba dibebaskan ke persekitaran.</i> 3. Iron displaced copper from its salt solution/ copper (II) sulphate solution. / <i>Ferum menyesarkan kuprum dari larutan garamnya/ larutan kuprum (II) sulfat.</i>	3
	Able to state inference less correctly  <u>Sample answer:</u> 1. Heat is released. // <i>Haba dibebaskan.</i>	2
	Able to state an idea of the inference.  <u>Sample answer:</u> 1. Heat change // <i>Perubahan haba</i>	1
	No response given / wrong response	0

Question	Mark Scheme	Score
1 (f)	Able to state the relationship correctly  <u>Sample answer:</u> The higher the position of metals in electrochemical series, the higher the temperature rise. <i>Semakin tinggi kedudukan logam dalam siri elektrokimia, semakin tinggi kenaikan suhu.</i>	3
	Able to state the relationship less correctly  <u>Sample answer:</u> The higher the position of metals in electrochemical series // the higher the temperature rise. <i>Semakin tinggi kedudukan logam dalam siri elektrokimia / semakin tinggi kenaikan suhu.</i>	2
	Able to give a relevant idea  <u>Sample answer:</u> Temperature changes. <i>Suhu berubah.</i>	1
	No response given / wrong response	0

Question	Mark Scheme	Score
	<p>Able to calculate all 4 steps of the heat of displacement for the reaction accurately with unit.</p> <p><u>Sample answer :</u>            1. <math>Q = mc\theta</math>  <math>= 50 \times 4.2 \times 30.5</math> <del><math>= 6405 \text{ J} / 6.405 \text{ kJ}</math></del> <math>(57.9 - 29.9) = 50 \times 4.2 \times 28</math>  <math>= 5880 \text{ J}</math></p> <p>2. <math>\text{Mol} = MV/1000</math>  <math>= 0.5 \times 50/1000</math>  <math>= 0.025 \text{ mol}</math></p> <p>3. <math>\text{Fe} + \text{Cu}^{2+} \rightarrow \text{Fe}^{2+} + \text{Cu}</math>            1 mol <math>\text{Cu}^{2+}</math> : 1 mol Cu            0.025 mol <math>\text{Cu}^{2+}</math> : 0.025 mol <math>\text{Cu}^{2+}</math></p> <p>4. <math>\Delta H = Q/\text{mol}</math>  <math>= 6.405/0.025</math>  <math>= -256.2 \text{ kJ/mol}</math></p> <p style="text-align: right;"><math>\Delta H = \frac{5880}{0.025} = 235200 \text{ J} = -235.2 \text{ kJ/mol}^{-1}</math></p>	3
1 (g)	<p>Able to calculate the heat of displacement for the reaction accurately without unit. // at least 2 steps correctly.</p> <p><u>Sample answer :</u>  <math>Q = mc\theta</math>  <math>= 50 \times 4.2 \times 30.5</math>  <math>= 6405</math></p> <p><math>\text{Mol} = MV/1000</math>  <math>= 0.5 \times 50/1000</math>  <math>= 0.025</math></p> <p><math>\Delta H = Q/\text{mol}</math>  <math>= 6.405/0.025</math>  <math>= 256.2</math></p>	2
	<p>Able to write an idea of calculation.</p> <p><u>Sample answer :</u>  <math>Q = mc\theta</math>  <math>= 50 \times 4.2 \times 30.5</math>  <math>= 6405</math></p>	1
	No response given / wrong response	0

Question	Mark Scheme	Score
1 (h)	Able to predict heat of displacement accurately.  Sample answer: $[ (336-210) \div 2 ] + 210 = 273 \text{ kJ mol}^{-1}$	3
	Able to predict heat of displacement less correctly.  Sample answer: $210 < \Delta H < 336 \text{ kJ mol}^{-1}$	2
	Able to state an idea of heat of displacement.  Sample answer: More than 210 kJ mol <sup>-1</sup>	1
	No response given / wrong response	0

K  
Na  
Ca  
Mg — 336  
Al  
Zn — 210  
Fe  
Sn  
Pb  
H  
Cu  
Ag  
Au.

Question	Mark Scheme	Score
1 (i)	Able to write the ionic equation for the Experiment 3 accurately.  Sample answer : $\text{Mg} + \text{Cu}^{2+} \rightarrow \text{Mg}^{2+} + \text{Cu}$	3
	Able to write the chemical equation for the reaction less correctly  Sample answer : $\text{Mg} + \text{Cu}^{2+} // \text{Mg}^{2+} + \text{Cu}$	2
	Able to write an idea of chemical equation  Sample answer : $\text{Mg} + \text{CuSO}_4 \rightarrow \text{MgSO}_4 + \text{Cu}$	1
	No response given / wrong response	0

Question	Mark Scheme	Score
1 (j)	<p>Able to state the operational definition for the heat displacement accurately with the following criteria:</p> <p>i) What should be done ii) What should be observed</p> <p>Sample answer Temperature increases/ thermometer reading when 1 mole of copper displaced from copper (II) sulphate solution by other metals. // <i>Suhu/ bacaan termometer meningkat hasil apabila 1 mol kuprum disesarkan dari larutan kuprum (II) sulfat oleh logam lain.</i></p> <p>When metals added to copper (II) sulphate solution, the increase in temperature produced when 1 mole of copper displaced. <i>Apabila logam ditambahkan ke dalam larutan kuprum (II) sulfat, peningkatan suhu terhasil apabila 1 mol kuprum disesarkan.</i></p>	3

	Able to state the operational definition for the reactivity of alkali metals less correctly  <u>Sample answer</u> Temperature/ thermometer reading increases. // <i>Suhu / bacaan thermometer meningkat.</i>	2
	When metals added to copper (II) sulphate solution. <i>Apabila logam ditambahkan ke dalam larutan kuprum (II) sulfat.</i>	
	Able to give an idea of operational definition for the reactivity of alkali metals  <u>Sample answer</u> Heat released <i>Haba yang dibebaskan</i>	1
	No response given / wrong response	0

Question	Mark Scheme	Score						
1 (k)	<p>Able to classify all metals correctly.</p> <p><u>Sample answer:</u></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;"> <b>Metals that can displace lead from lead (II) sulphate solution.</b>  <i>Logam yang dapat menyasarkan plumbum daripada larutan plumbum (II) sulfat</i> </td> <td style="text-align: center;"> <b>Metals that cannot displace lead from lead (II) sulphate solution.</b>  <i>Logam yang tidak dapat menyasarkan larutan plumbum daripada plumbum (II) sulfat</i> </td> </tr> <tr> <td style="text-align: center;">           Aluminum, Al  <i>Aluminium, Al</i> </td> <td style="text-align: center;">           Copper, Cu  <i>Kuprum, Cu</i> </td> </tr> <tr> <td style="text-align: center;">           Zinc, Zn  <i>Zink, Zn</i> </td> <td style="text-align: center;">           Silver, Ag  <i>Argentum, Ag</i> </td> </tr> </table>	<b>Metals that can displace lead from lead (II) sulphate solution.</b> <i>Logam yang dapat menyasarkan plumbum daripada larutan plumbum (II) sulfat</i>	<b>Metals that cannot displace lead from lead (II) sulphate solution.</b> <i>Logam yang tidak dapat menyasarkan larutan plumbum daripada plumbum (II) sulfat</i>	Aluminum, Al <i>Aluminium, Al</i>	Copper, Cu <i>Kuprum, Cu</i>	Zinc, Zn <i>Zink, Zn</i>	Silver, Ag <i>Argentum, Ag</i>	3
<b>Metals that can displace lead from lead (II) sulphate solution.</b> <i>Logam yang dapat menyasarkan plumbum daripada larutan plumbum (II) sulfat</i>	<b>Metals that cannot displace lead from lead (II) sulphate solution.</b> <i>Logam yang tidak dapat menyasarkan larutan plumbum daripada plumbum (II) sulfat</i>							
Aluminum, Al <i>Aluminium, Al</i>	Copper, Cu <i>Kuprum, Cu</i>							
Zinc, Zn <i>Zink, Zn</i>	Silver, Ag <i>Argentum, Ag</i>							
	Able to classify any <b>three</b> metals correctly	2						
	Able to classify any <b>two</b> metals correctly or give <b>opposite answer</b>	1						
	No response given / wrong response	0						

Question	Rubric	Score
2 (a)	Able to give the statement of the problem correctly  <u>Sample answer:</u> How does the chemical property of lithium, sodium and potassium when react with water? // Does the lithium, sodium and potassium show the different reactivity when reacting with water? <i>Bagaimana sifat kimia litium, natrium dan kalium apabila bertindak balas dengan air? // adakah litium, natrium dan kalium menunjukkan kereaktifan yang berbeza terhadap air?</i>	3
	Able to give the statement of the problem less correctly  <u>Sample answer:</u> How does the chemical property of metals differ? <i>Bagaimana sifat kimia logam-logam berbeza?</i>	2
	Able to state an idea the statement of problem  <u>Sample answer:</u> To study the chemical properties of metals in Group 1 <i>Untuk mengkaji sifat kimia logam Kumpulan 1</i>	1
	No response given / wrong response	0

Question	Rubric	Score
2 (b)	Able to state <b>All</b> variables correctly  <u>Sample answer:</u> Manipulated variable: Lithium, Sodium, Potassium <i>Pembolehubah dimanipulasikan : Litium, natrium, kalium</i> Responding variable: Reactivity of the alkali metals towards water <i>Pembolehubah bergerak balas : Kereaktifan logam alkali terhadap air</i> Constant variable : Water // Size of the alkali metals <i>Pembolehubah dimalarkan : Air // Saiz logam alkali</i>	3
	Able to state any <b>two</b> variables correctly	2
	Able to state any <b>one</b> variable correctly	1
	No response given / wrong response	0

Question	Rubric	Score
2 (c)	Able to state the relationship between manipulated variable and responding variable correctly  <u>Sample answer:</u> The lower the position of metal in Group 1, the higher the reactivity towards water // Going down the group 1, the higher the reactivity towards water <i>Semakin bawah kedudukan logam Kumpulan 1, semakin tinggi kereaktifan logam terhadap air // Semakin menuruni Kumpulan 1, semakin tinggi kereaktifan terhadap air.</i>	3

	<p>Able to state the relationship between manipulated variable and responding variable less correctly</p> <p><u>Sample answer:</u> The higher the reactivity towards water, the lower the position of metal in group 1 // The more reactive the reaction, the lower the position of the metal in group 1. <i>Semakin tinggi kereaktifan terhadap air, semakin rendah kedudukan logam Kumpulan 1 // Semakin reaktif tindak balas, semakin ke bawah kedudukan logam dalam Kumpulan 1.</i></p>	2
	<p>Able to state an idea of the hypothesis</p> <p><u>Sample answer:</u> Metals in Group 1 can react with water // Position of alkali metal affect the reactivity // The reactivity of metal in Group 1 is different toward water. <i>Logam Kumpulan 1 boleh bertindak balas dengan air // Kedudukan logam alkali mempengaruhi kereaktifan. // Kereaktifan logam Kumpulan 1 terhadap air berbeza</i></p>	1
	No response given / wrong response	0

Question Number	Rubric	Score
2 (d)	<p>Able to give the list of the apparatus and materials correctly and completely</p> <p><u>Sample answer:</u> List of apparatus and materials <i>Senarai radas dan bahan ;</i> Knife, forceps <i>Pisau, forsep</i> Water, basin, filter paper, sodium, potassium, lithium and litmus paper. <i>Air, besen, kertas turas, natrium, kalium, litium dan kertas litmus.</i></p>	3
	Able to give at least <b>two</b> substances and <b>two</b> apparatus	2
	Able to give at least <b>one</b> substance and <b>one</b> apparatus	1
	No response given / wrong response	0

Question	Rubric	Score	
2 (e)	<p>Able to state all procedures correctly</p> <p><u>Sample answer:</u></p> <ol style="list-style-type: none"> <li>1. Half fill a basin with water. <i>Isi basin separuh penuh dengan air.</i></li> <li>2. Cut a piece of lithium with a knife <i>Potong litium dengan menggunakan pisau.</i></li> <li>3. Dry the oil on surface of metal by pressing it between pieces of filter paper. <i>Keringkan minyak pada permukaannya dengan menekannya di antara dua kertas turas.</i></li> <li>4. Drop the lithium into the water in the basin. <i>Jatuhkan litium ke dalam air di dalam basin.</i></li> <li>5. Observe and record the reactivity of lithium with water. <i>Perhatikan dan rekodkan kereaktifan litium terhadap air.</i></li> <li>6. Test the water in the basin with a piece of red litmus paper when the reaction stops. <i>Uji air di dalam basin dengan kertas litmus merah apabila tindak balas berhenti.</i></li> <li>7. Repeat the experiment by using sodium and potassium of the same size. <i>Ulang eksperimen menggunakan natrium dan kalium yang sama saiz.</i></li> </ol>	3	
	<p>Able to state 4 steps of procedures correctly</p> <p>Steps 1, 2, 4, 5 and 6 <i>Langkah 1,2,4, 5 dan 6</i></p>		2
	<p>Able to state 3 steps of procedures correctly</p> <p>Steps 1, 2,4 <i>Langkah 1,2 dan 4</i></p>		1
	<p>No response given / wrong response</p>		0

Question	Rubric	Score								
2 (f)	<p>Able to exhibit the tabulation of data correctly            Tabulation of data has the following elements:            1. 2 columns and 4 rows</p> <p>Sample answer:</p> <table border="1" data-bbox="500 317 1101 562"> <thead> <tr> <th>Type of metal <i>Jenis logam</i></th> <th>Observation <i>Pemerhatian</i></th> </tr> </thead> <tbody> <tr> <td>Lithium <i>Litium</i></td> <td></td> </tr> <tr> <td>Sodium <i>Natrium</i></td> <td></td> </tr> <tr> <td>Potassium <i>Kalium</i></td> <td></td> </tr> </tbody> </table>	Type of metal <i>Jenis logam</i>	Observation <i>Pemerhatian</i>	Lithium <i>Litium</i>		Sodium <i>Natrium</i>		Potassium <i>Kalium</i>		2
	Type of metal <i>Jenis logam</i>	Observation <i>Pemerhatian</i>								
Lithium <i>Litium</i>										
Sodium <i>Natrium</i>										
Potassium <i>Kalium</i>										
<p>Able to exhibit the tabulation of data less accurately            Tabulation of data has the following elements:</p> <p>Sample answer:</p> <table border="1" data-bbox="500 688 1101 821"> <thead> <tr> <th>Type of metal <i>Jenis logam</i></th> <th>Observation <i>Pemerhatian</i></th> </tr> </thead> <tbody> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </tbody> </table>	Type of metal <i>Jenis logam</i>	Observation <i>Pemerhatian</i>					1			
Type of metal <i>Jenis logam</i>	Observation <i>Pemerhatian</i>									
	No response given / wrong response	0								

END OF MARKING SCHEME