

**CONFIDENTIAL**

4541/3  
Chemistry  
Paper 3  
August  
2019



**SIJIL PENDIDIKAN  
MAKTAB RENDAH SAINS MARA  
2019**

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**CHEMISTRY**

Paper 3

**MARKING SCHEME**

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**ATTENTION**

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The marking scheme consists of 17 printed pages

**MARKING GUIDELINES**  
**SIJIL PENDIDIKAN**  
**MAKTAB RENDAH SAINS MARA**  
**2019**  
**PAPER 3**

<b>Symbol</b>	<b>Meaning</b>
//	- replace the whole sentence
/	- replace the previous word
[ ]	- can be summarized from explanation
___ or bold	- key word
adp	- avoid double penalty

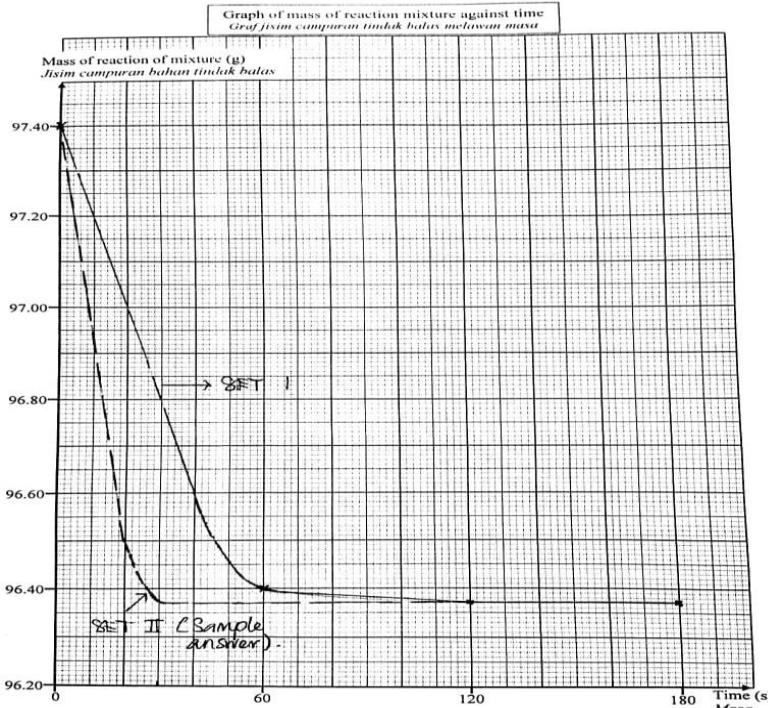
Question	Mark Scheme	Mark										
1(a)	<p><b>[Able to record mass of reaction mixture at 0 second, 60 seconds, 120 seconds and 180 seconds, correct to two decimal places.</b></p> <p><u>Answers</u></p> <table border="1"> <tr> <td>Time/s</td> <td>0</td> <td>60</td> <td>120</td> <td>180</td> </tr> <tr> <td>Mass of reaction mixture/g</td> <td>97.40</td> <td>96.40</td> <td>96.37</td> <td>96.37</td> </tr> </table>	Time/s	0	60	120	180	Mass of reaction mixture/g	97.40	96.40	96.37	96.37	3
Time/s	0	60	120	180								
Mass of reaction mixture/g	97.40	96.40	96.37	96.37								
	<b>[Able to record mass of reaction mixture, 3 reading correctly]</b>	<b>2</b>										
	<b>[Able to give any 1 reading]</b>	<b>1</b>										
	<b>No response or wrong response</b>	<b>0</b>										

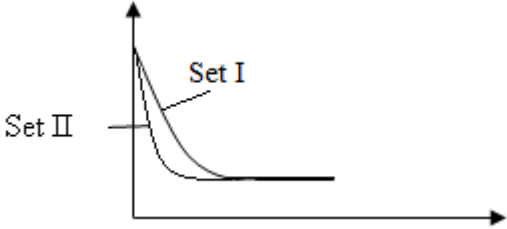
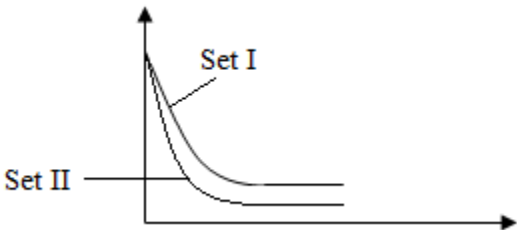
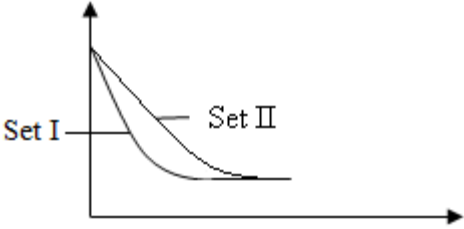
Question	Mark Scheme	Mark
1(b)(i)	<p><b>[Able to state all three variables correctly]</b></p> <p><u>Sample answer</u></p> <p><b>Manipulated variable</b> The presence of catalyst / copper(II) sulphate solution</p> <p><b>Responding variable</b> Changes/decrease of mass of reaction mixture per unit time // rate of reaction</p> <p><b>Fixed variable</b> Volume and concentration of hydrochloric acid//mass of magnesium // Temperature</p>	3
	<b>[Able to state any 2 variables correctly or 1 variable correctly and idea of two variables]</b>	<b>2</b>
	<b>[Able to state any 1 variable correctly or idea of three variables]</b>	<b>1</b>
	<b>No response or wrong response</b>	<b>0</b>

Question	Mark Scheme	Mark
1(c)	<p><b>Able to state the relationship between the manipulated variable and the responding variable with direction correctly</b>  <u>Sample answer</u></p> <p>1. When catalyst /copper(II) sulphate solution is presence, the rate of reaction is higher //</p> <p>2. When no catalyst is used, the rate of reaction is lower.</p>	<b>3</b>
	<p><b>Able to state the relationship between the manipulated variable and the responding variable without direction</b>  <u>Sample answer</u></p> <p>Catalyst/copper(II) sulphate solution affects the rate of reaction</p>	<b>2</b>
	<p><b>Able to give an idea of hypothesis</b>  <u>Sample answer</u></p> <p>Rate of reaction differs</p>	<b>1</b>
	<b>No response or wrong response</b>	<b>0</b>

Question	Mark Scheme	Mark	
1(d)(i)	<b>Able to state one observation for the experiment correctly</b> <u>Sample answer</u> 1. Gas bubbles / Effervescence at 0 second / 60s // 2. No gas bubbles / effervescence at 120 seconds /180 seconds	3	
	<b>Able to state one observation for the experiment</b> <u>Sample answer</u> 1. Gas bubbles // 2. Air bubbles // 3. Mass of mixture decreases		2
	<b>Able to give an idea for the observation</b> <u>Sample answer</u> 1. Gas is seen // foam 2. Container becomes warm // 3. Mass of magnesium decreases		1
	<b>No response or wrong response</b>		0

Question	Mark Scheme	Mark
1(d)(ii)	<b>Able to give the corresponding inference correctly</b> <u>Sample answer</u> Hydrogen gas is produced	<b>3</b>
	<b>Able to give the corresponding inference</b> <u>Sample answer</u> 1. Reaction occurs // 2. Gas is released // Colourless gas is released	<b>2</b>
	<b>Able to give an idea of an inference</b> <u>Sample answer</u> 1. Carbon dioxide gas / Oxygen (any gas) / air // Exothermic reaction  a: [Inference based on the observation in the experiment]	<b>1</b>
	<b>No response or wrong response</b>	<b>0</b>

Question	Mark Scheme	Mark
1(e)(i)	<p><b>Able to plot the graph with the following criteria:</b></p> <ol style="list-style-type: none"> <li>1. 4 points transferred correctly</li> <li>2. Correct curve</li> <li>3. Smooth curve</li> </ol> <p><i>[Refer graph]</i></p> 	3
	<p><b>Able to plot the graph of mass of reaction mixture against time for Set I with the following aspects:</b></p> <ol style="list-style-type: none"> <li>1. At least 3 points transferred correctly</li> <li>2. Correct curve</li> </ol>	2
	<p><b>Able to give an idea to sketch the graph</b></p> <ol style="list-style-type: none"> <li>1. Correct curve (sketch without plotting)</li> </ol>	1
	<p><b>No response or wrong response</b></p>	0

Question	Mark Scheme	Mark
1(e)(ii)	<p><b>Able to sketch the graph of the mass of reaction mixture against time for Set II in the same axis of the graph of Set I correctly</b></p> <p><u>Sample answer</u></p> 	3
	<p><b>Able to show on the graph of the mass of reaction mixture against time for Set II in the same axis of the graph of Set I correctly <u>but does not remain constant as in Set I</u></b></p> 	2
	<p><b>Able to give an idea in prediction</b></p> 	1
	<p><b>No response or wrong response</b></p>	0



Question	Mark Scheme	Mark
1(f)	<p><b>Able to state the change of mass of reaction mixture with time in experiment Set I correctly</b></p> <p><u>Sample answer</u></p> <p>Mass of reaction mixture decreases with time and <u>remain constant at 120 s</u></p>	3
	<p><b>Able to state the change of mass of reaction mixture with time in experiment Set I correctly</b></p> <p><u>Sample answer</u></p> <ol style="list-style-type: none"> <li>1. Mass of magnesium/reactant decreases with time and remain constant at 120 s</li> <li>2. Mass of reaction mixture decreases with time /inversely proportional with time /</li> <li>3. Decreases and then constant</li> </ol>	2
	<p><b>Able to give an idea the change of mass of reaction mixture with time in experiment Set I</b></p> <p><u>Sample answer</u></p> <ol style="list-style-type: none"> <li>1. Mass of mixture decreases</li> <li>2. Decreases</li> <li>3. <u>Inversely</u> proportional</li> </ol>	1
	<p><b>No response or wrong response</b></p>	0

Question	Mark Scheme	Mark
1(g)	<p><b>Able to state the correct operational definition for the rate of reaction in this experiment with the following aspects</b></p> <p>1. What must be done [measure and record at 60 s interval] and 2. What is observed [ change in mass of reaction mixture]</p> <p><u>Sample answer</u></p> <p>1. (Change in the mass of reaction mixture) that (is measured at 60 s intervals)</p>	<b>3</b>
	<p><b>Able to state the correct operational definition for the rate of reaction in this experiment with the following aspects</b></p> <p>1. What must be done [measure and record at 60 s interval] <b>OR</b> 2. What is observed [change in mass of reaction mixture]</p> <p><u>Sample answer</u></p> <p>1. Change in quantity of reactant/product against time // 2. Mass of reaction mixture per time // 3. Electronic balance reading at 60 s intervals //</p>	<b>2</b>
	<p><b>Able to give an idea of the operational definition.</b></p> <p><u>Sample answer</u></p> <p>.</p> <p>1. 1 / time 2. Speed of the reaction</p>	<b>1</b>
	<b>No response or wrong response</b>	<b>0</b>

Question	Mark Scheme	Mark
1(h)	<p><b>Able to state the difference of rate of reaction in Set I and Set II and give the reason correctly</b></p> <p><u>Sample answer</u></p> <p>1. The rate of reaction in Set II is higher than in Set I</p> <p>Reason:</p> <p>1. Gradient of graph in Set II is higher than Set I //</p> <p>2. Presence of catalyst/copper(II) sulphate solution in (Set II) //</p> <p>3. Graph in Set II is steeper</p> <p style="text-align: right;">[ any one reason]</p>	<b>3</b>
	<p><b>Able to state the difference of rate of reaction in Set I and Set II <u>OR</u> give the reason correctly</b></p> <p><u>Sample answer</u></p> <p>1. Set II take a shorter time //</p> <p>2. Rate of reaction in Set II is faster</p> <p style="text-align: center;"><b>OR</b></p> <p>Reason:</p> <p>1. Presence of catalyst in Set II</p>	<b>2</b>
	<p><b>Able to give an idea the difference OR reason of rate of reaction in Set I and Set II</b></p> <p><u>Sample answer</u></p> <p>1. The rate of reaction in Set II is <u>high</u></p> <p>2. Rate of reaction is different</p> <p>3. Lower activation energy in Set II</p>	<b>1</b>
	<b>No response or wrong response</b>	<b>0</b>

Question	Mark Scheme	Mark						
1(i)	<p><b>Able to classify all four substances into compounds and elements</b></p> <p>1. Correct headings 2. List of substance</p> <p><u>Sample answers</u></p> <table border="1" data-bbox="376 520 1281 636"> <thead> <tr> <th data-bbox="376 520 834 562">Element</th> <th data-bbox="834 520 1281 562">Compound</th> </tr> </thead> <tbody> <tr> <td data-bbox="376 562 834 598">Magnesium // Mg</td> <td data-bbox="834 562 1281 598">Hydrochloric acid // HCl</td> </tr> <tr> <td data-bbox="376 598 834 636">Hydrogen // H<sub>2</sub></td> <td data-bbox="834 598 1281 636">Magnesium chloride// MgCl<sub>2</sub></td> </tr> </tbody> </table> <p># Score 1: if reverse</p>	Element	Compound	Magnesium // Mg	Hydrochloric acid // HCl	Hydrogen // H <sub>2</sub>	Magnesium chloride// MgCl <sub>2</sub>	3
	Element	Compound						
	Magnesium // Mg	Hydrochloric acid // HCl						
	Hydrogen // H <sub>2</sub>	Magnesium chloride// MgCl <sub>2</sub>						
	Able to classify any 3 substances correctly	2						
Able to classify any 2 substances correctly *reverse classifying	1							
No response or wrong response	0							

Question	Mark Scheme	Mark
2(a)	<b>Able to state the problem statement correctly</b> <u>Sample answer</u> 1. Is the electrical conductivity of ionic and covalent compound different?// 2. Does molten ionic compound / molten lead(II) bromide conduct electricity while molten covalent compound/ molten naphthalene does not?// 3. Does molten ionic compound / molten lead(II) bromide lights up the bulb while molten covalent compound/ molten naphthalene does not?	<b>3</b>
	<b>Able to state the problem statement</b> <u>Sample answer</u> 1. Is the electrical conductivity different when using different compound?// 2. To differentiate the electrical conductivity between ionic and covalent compound	<b>2</b>
	<b>Able to give an idea of the problem statement</b> <u>Sample answer</u> 1.To differentiate electrical conductivity// 2. Is the electrical conductivity different?	<b>1</b>
	<b>No response or wrong response</b>	<b>0</b>

Question	Mark Scheme	Mark
2(b)	<b>Able to state the variables correctly</b> <u>Sample answer</u> <b>Manipulated variable:</b> Ionic and covalent compound// naphthalene and lead(II) bromide <b>Responding variable :</b> Electrical conductivity // Bulb lights up/does not lights up <b>Fixed variable :</b> Carbon electrode // Batteries	<b>3</b>
	<b>[Able to state any 2 variables correctly OR 1 variable correctly and idea of two variables]</b>	<b>2</b>
	<b>[Able to state any 1 variable correctly OR idea of three variables]</b>	<b>1</b>
	<b>No response or wrong response</b>	<b>0</b>

Question	Mark Scheme	Mark
2 (c)	<p><b>Able to state the relationship between the manipulated variable and the responding variable with direction</b></p> <p><u>Sample answer</u></p> <p>1. Ionic compound [lead(II) bromide] can conduct electricity while covalent compound [naphthalene] cannot conduct electricity.            2. When ionic compound [lead(II) bromide] is used, the bulb lights up while when covalent compound [naphthalene] is used, the bulb does not light up</p>	3
	<p><b>Able to state the relationship between the manipulated variable and the responding variable</b></p> <p><u>Sample answer</u></p> <p>1. Electricity can be conducted by ionic compound, electricity cannot be conducted by covalent compound//            2. Ionic compound [lead(II) bromide] can conduct electricity //            3. Covalent compound [naphthalene] cannot conduct electricity</p>	2
	<p><b>Able to state an idea of hypothesis</b></p> <p><u>Sample answer</u></p> <p>1. Different compound has different electrical conductivity //            2. Compound affect the electrical conductivity</p>	1
	<p><b>No response or wrong response</b></p>	0

Question	Mark Scheme	Mark
2(d)	<p><b>Able to list all the materials and apparatus completely</b></p> <p><u>Sample answer</u></p> <p><b>Apparatus</b></p> <p>1. Crucible 2. carbon electrodes 3. Batteries 4. Connecting wires 5. Bulb 6. Tripod stand 7. Bunsen burner 8. Pipe clay triangle 9. Spatula # No Bunsen burner score 0</p> <p><b>Materials</b></p> <p>1. Naphthalene 2. Lead(II) bromide</p>	<b>3</b>
	<p><b>Able to list materials and apparatus</b></p> <p><u>Sample answer</u></p> <p><b>Apparatus</b></p> <p>1. [any suitable container] 2. carbon electrodes 3. Batteries 4. Wires 5. Bulb 6. Tripod stand 7. Bunsen burner</p> <p><b>Materials</b></p> <p>Naphthalene // Lead(II) bromide</p>	<b>2</b>
	<p><b>Able to list the minimum materials and apparatus</b></p> <p><u>Sample answer</u></p> <p><b>Apparatus</b></p> <p>1. [any container] 2. carbon electrodes 3. Batteries 4. Wires 5. Bulb 6. Bunsen burner</p> <p><b>Materials</b></p> <p>1. [any compound]</p>	<b>1</b>
	<p><b>No response or wrong response</b></p>	<b>0</b>

Question	Mark Scheme	Mark
2 (e)	<p><b>Able to state the procedure of the experiment correctly</b></p> <p><u>Sample answer</u></p> <p>√<sub>1</sub> 1. Fill a crucible with solid lead(II) bromide until it is half full/ [5-10g].</p> <p>√<sub>2</sub> 2. Put the crucible with its content on the tripod stand.</p> <p>√<sub>3</sub> 3. Dip two carbon electrode into lead(II) bromide.</p> <p>√<sub>4</sub> 4. Connect the carbon electrodes to batteries, bulb and switch by using wires</p> <p>√<sub>5</sub> 5. Heat the solid lead(II) bromide until it melts.</p> <p>√<sub>6</sub> 6. Observe and record whether the bulbs light up or not.</p> <p>√<sub>7</sub> 7. Repeat step 1 to 6 by using naphthalene to replace lead(II) bromide.</p>	<b>3</b>
	<p><b>Able to state steps 1, 3, 4, 5, 6</b></p>	<b>2</b>
	<p><b>Able to state steps 3, 4, 5</b></p>	<b>1</b>
	<p><b>No response or wrong response</b></p>	<b>0</b>



Question	Mark Scheme	Mark						
2 (f)	<p><b>Able to tabulate the data which consists of:</b></p> <p>1. Manipulated variable 2. Responding variable</p> <p><u>Sample answer</u></p> <table border="1" data-bbox="342 520 1243 636"> <thead> <tr> <th>Type of compound// substance</th> <th>Observation// bulbs light up</th> </tr> </thead> <tbody> <tr> <td>Lead(II) bromide</td> <td></td> </tr> <tr> <td>Naphthalene</td> <td></td> </tr> </tbody> </table>	Type of compound// substance	Observation// bulbs light up	Lead(II) bromide		Naphthalene		2
Type of compound// substance	Observation// bulbs light up							
Lead(II) bromide								
Naphthalene								
	<p><b>Able to construct a table with correct heading</b></p> <p><u>Sample answer</u></p> <table border="1" data-bbox="396 894 1187 1129"> <thead> <tr> <th>Compound</th> <th>Observation</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </tbody> </table>	Compound	Observation					1
Compound	Observation							
	<b>No response or wrong response</b>	<b>0</b>						

**PERATURAN PEMARKAHAN TAMAT**

**TEST SPECIFICATION TABLE  
CHEMISTRY PAPER 3  
SIJIL PENDIDIKAN MRSM 2019**

<b>ELEMENT CODE</b>	<b>TOPIC</b>	<b>ASPECT CODE</b>	<b>ASPECT</b>	<b>QUESTION</b>	<b>SCORE</b>
KK05	Form 5 Chapter 1:  Rate of reaction	KK0501	Making Observation	1 (d) (i)	3
		KK0502	Classification	1 (i)	3
		KK0503	Measure and Using Numbers	1 (a)	3
		KK0504	Making Inference	1 (d) (ii)	3
		KK0505	Making Prediction	1 (e) (ii)	3
		KK0506	Communication	1 (e) (i)	3
		KK0507	Space time relationship	1 (f)	3
		KK0508	Interpreting data	1 (h)	3
		KK0509	Defining Operationally	1 (g)	3
		KK05010	Controlling Variables	1 (b) (i) (ii) (iii)	3
	KK05011	Making Hypothesis	1 (c)	3	
	Form 4 Chapter 6:  Electrochemistry	KK05012	KK0512 (Statement of problem)	2 (a)	3
			KK0512 (All the variables)	2 (b)	3
			KK0512 (Statement of hypothesis)	2 (c)	3
			KK)512 ( List of substances and apparatus)	2 (d)	3
			KK0512 (Procedure of the experiment)	2 (e)	3
	KK0512 (Tabulation of data)	2 (f)	3		
	<b>TOTAL</b>				<b>50</b>