

4541/3 (PP)
Chemistry
Kertas 3
Oktober
2022



MAKTAB RENDAH SAINS MARA

PEPERIKSAAN AKHIR SIJIL PENDIDIKAN MRSM 2022

CHEMISTRY

Kertas 3

Peraturan Pemarkahan

Untuk Kegunaan Pemeriksa Sahaja

Peraturan Pemarkahan ini mengandungi 4 halaman bercetak

Mark Scheme

No.	Answer	Mark	Total mark															
(a)	<p>[Able to record all temperature correctly]</p> <p>P1. One decimal point for all reading</p> <p>P2. Initial temperature [26.0-30.0 °C]</p> <p>P3. Highest temperature [Set II is higher than Set I]</p> <p>P4. Temperature change [Temperature change Set II higher than Set I]</p> <table border="1" data-bbox="327 600 1129 1003"> <thead> <tr> <th>Set</th> <th>I</th> <th>II</th> </tr> </thead> <tbody> <tr> <td>Metal powder</td> <td>Zink</td> <td>X</td> </tr> <tr> <td>Initial temperature of copper(II) sulphate solution (°C)</td> <td>30.0</td> <td>30.0</td> </tr> <tr> <td>Highest temperature mixture (°C)</td> <td>33.0</td> <td>35.0</td> </tr> <tr> <td>Temperature change (°C)</td> <td>3.0</td> <td>5.0</td> </tr> </tbody> </table> <p>*Perubahan data tertakluk kepada data PMP</p>	Set	I	II	Metal powder	Zink	X	Initial temperature of copper(II) sulphate solution (°C)	30.0	30.0	Highest temperature mixture (°C)	33.0	35.0	Temperature change (°C)	3.0	5.0	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	4
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(b)	(i)	<p>[Able to state one observation correctly]</p> <p>Temperature/thermometer reading increases//</p> <p>Paper cup becomes warm/ hot//X dissolves//</p> <p>Intensity of blue colour of copper(II) sulphate solution decreases//Blue colour of copper(II) sulphate solution turns colourless.</p> <p>Note: any one answer</p>	1	1														
	(ii)	<p>[Able to state inference based on the observation in 1(a)(i) correctly]</p> <p>Reaction is exothermic//Heat is released to the surrounding//</p> <p>X reacts with copper(II) sulphate//</p> <p>Displacement reaction occurs//</p> <p>Concentration of copper(II)/ Cu²⁺ ion decreases</p> <p>Note: Any one answer</p> <p>*Inference must be corresponding to the observation.</p>	1	1														

No.	Answer	Mark	Total mark
(c)	<p>[Able to state three variables correctly]</p> <p>(i) Manipulated variable: Type of metal // Zinc and metal X</p> <p>(ii) Responding variable: Highest temperature // Heat of displacement</p> <p>(iii) Fixed variable Concentration and volume of copper(II) sulphate solution// Mass of metal</p>	<p>1</p> <p>1</p> <p>1</p>	<p>3</p>
(d)	<p>[Able to state the hypothesis correctly]</p> <p>1. Correct MV and RV and 2. Contain direction</p> <p>The reaction between X and copper(II) sulphate solution/Set II produced higher heat of displacement of copper than the reaction between zinc and copper(II) sulphate solution/Set I//</p> <p>The reaction between X and copper(II) sulphate solution/Set II produced higher temperature than the reaction between zinc and copper(II) sulphate solution/Set I.</p> <p>*Accept vice versa</p>	<p>1</p>	<p>1</p>
(e)	<p>[Able to compare and explain temperature change in Set I and Set II correctly]</p> <p>P1. Temperature change for the reaction between X and copper(II) sulphate/Set II is higher compared to the temperature change for the reaction between zinc and copper(II) sulphate/Set I</p> <p>P2. Standard electrode potential value, E° of X is more negative than standard electrode potential value, E° of zinc //</p> <p>OR</p> <p>P1. X is more electropositive than zinc //</p> <p>P2. The reaction between X and copper(II) sulphate/Set II is higher compared to the temperature change for the reaction between zinc and copper(II) sulphate/Set I. More heat is released to the surrounding</p>	<p>1</p> <p>1</p>	<p>2</p>

No.	Answer	Mark	Total mark
(f)	[Able to state operational definition for the heat of displacement correctly] 1. What to do 2. What to observe Thermometer reading increases when 1 mole of copper is displaced when X / zinc is put/mixed into copper(II) sulphate solution.	1 1	1 1
(g)	[Able to write the ionic equation Set I correctly] $\text{Zn} + \text{Cu}^{2+} \rightarrow \text{Zn}^{2+} + \text{Cu}$	1	1
Total		15	

****END OF MARK SCHEME****