

# JAWAPAN KERTAS 3

## SET 1

| Soalan<br>Question                                                                                                          | Jawapan<br>Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Markah<br>Mark                                                             |                                                                       |                                                                                                                             |                                                                                 |      |      |    |      |      |                                        |
|-----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|------|------|----|------|------|----------------------------------------|
| (a)                                                                                                                         | <div>1. Label tajuk dengan unit yang betul<br/><i>Label heading with the correct unit</i></div> <div>2. Memindahkan semua data dengan betul<br/><i>Transfer all data correctly</i></div> <div>3. Menyatakan suhu dengan satu tempat perpuluhan<br/><i>State the temperature with one decimal place</i></div> <table><tr><th>Eksperimen<br/><i>Experiment</i></th><th>Suhu awal campuran (°C)<br/><i>Initial temperature of mixture (°C)</i></th><th>Suhu tertinggi campuran (°C)<br/><i>Highest temperature of mixture (°C)</i></th></tr><tr><td>I</td><td>28.0</td><td>34.5</td></tr><tr><td>II</td><td>28.0</td><td>31.5</td></tr></table> | Eksperimen<br><i>Experiment</i>                                            | Suhu awal campuran (°C)<br><i>Initial temperature of mixture (°C)</i> | Suhu tertinggi campuran (°C)<br><i>Highest temperature of mixture (°C)</i>                                                  | I                                                                               | 28.0 | 34.5 | II | 28.0 | 31.5 | <div>1</div> <div>1</div> <div>1</div> |
| Eksperimen<br><i>Experiment</i>                                                                                             | Suhu awal campuran (°C)<br><i>Initial temperature of mixture (°C)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Suhu tertinggi campuran (°C)<br><i>Highest temperature of mixture (°C)</i> |                                                                       |                                                                                                                             |                                                                                 |      |      |    |      |      |                                        |
| I                                                                                                                           | 28.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 34.5                                                                       |                                                                       |                                                                                                                             |                                                                                 |      |      |    |      |      |                                        |
| II                                                                                                                          | 28.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 31.5                                                                       |                                                                       |                                                                                                                             |                                                                                 |      |      |    |      |      |                                        |
| (b) (i)                                                                                                                     | Pemboleh ubah dimanipulasikan: Jenis asid<br><i>Manipulated variable: Types of acid</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1                                                                          |                                                                       |                                                                                                                             |                                                                                 |      |      |    |      |      |                                        |
| (ii)                                                                                                                        | Pemboleh ubah bergerak balas: Haba peneutralan<br><i>Responding variable: Heat of neutralisation</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1                                                                          |                                                                       |                                                                                                                             |                                                                                 |      |      |    |      |      |                                        |
| (iii)                                                                                                                       | Pemboleh ubah dimalarkan: Jenis alkali<br><i>constant variable: Type of alkali</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1                                                                          |                                                                       |                                                                                                                             |                                                                                 |      |      |    |      |      |                                        |
| (c)                                                                                                                         | Tindak balas antara asid kuat dengan alkali kuat menghasilkan haba peneutralan yang lebih tinggi daripada asid lemah<br><i>The reaction between a strong acid and a strong alkali produces a higher heat of neutralisation than a weak acid</i>                                                                                                                                                                                                                                                                                                                                                                                              | 1                                                                          |                                                                       |                                                                                                                             |                                                                                 |      |      |    |      |      |                                        |
| (d)                                                                                                                         | Bacaan termometer meningkat<br><i>Thermometer reading increases</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1                                                                          |                                                                       |                                                                                                                             |                                                                                 |      |      |    |      |      |                                        |
| (e)                                                                                                                         | Tindak balas eksotermik<br><i>Exothermic reaction</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1                                                                          |                                                                       |                                                                                                                             |                                                                                 |      |      |    |      |      |                                        |
| (f)                                                                                                                         | Bacaan termometer meningkat apabila asid dimasukkan ke dalam alkali untuk menghasilkan 1 mol air<br><i>Thermometer reading increases when acid is added into alkali to produce 1 mole of water</i>                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1                                                                          |                                                                       |                                                                                                                             |                                                                                 |      |      |    |      |      |                                        |
| (g)                                                                                                                         | Tenaga haba yang dibebaskan / <i>Heat energy released</i><br>= 50 × 4.2 × 6.5<br>= 1365 J<br>Bilangan mol air yang terhasil / <i>Number of moles of water produced</i><br>= 0.025 mol<br>Haba peneutralan / <i>Heat of neutralisation</i><br>= – 54600 J mol <sup>-1</sup>                                                                                                                                                                                                                                                                                                                                                                   | <div>1</div> <div>1</div> <div>1</div>                                     |                                                                       |                                                                                                                             |                                                                                 |      |      |    |      |      |                                        |
| (h)                                                                                                                         | Asid kuat menghasilkan perubahan suhu yang lebih tinggi, manakala asid lemah menghasilkan perubahan suhu yang lebih rendah<br><i>A strong acid produces a higher temperature change while weak acid produces a lower temperature change</i>                                                                                                                                                                                                                                                                                                                                                                                                  | 1                                                                          |                                                                       |                                                                                                                             |                                                                                 |      |      |    |      |      |                                        |
| (i)                                                                                                                         | <table><tr><th>Asid kuat<br/><i>Strong acid</i></th><th>Asid lemah<br/><i>Weak acid</i></th></tr><tr><td>Asid sulfurik<br/><i>Sulphuric acid</i><br/>Asid nitric<br/><i>Nitric acid</i><br/>Asid hidroklorik<br/><i>Hydrochloric acid</i></td><td>Asid fosforik<br/><i>Phosphoric acid</i><br/>Asid etanoik<br/><i>Ethanoic acid</i></td></tr></table>                                                                                                                                                                                                                                                                                       | Asid kuat<br><i>Strong acid</i>                                            | Asid lemah<br><i>Weak acid</i>                                        | Asid sulfurik<br><i>Sulphuric acid</i><br>Asid nitric<br><i>Nitric acid</i><br>Asid hidroklorik<br><i>Hydrochloric acid</i> | Asid fosforik<br><i>Phosphoric acid</i><br>Asid etanoik<br><i>Ethanoic acid</i> | 1    |      |    |      |      |                                        |
| Asid kuat<br><i>Strong acid</i>                                                                                             | Asid lemah<br><i>Weak acid</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                            |                                                                       |                                                                                                                             |                                                                                 |      |      |    |      |      |                                        |
| Asid sulfurik<br><i>Sulphuric acid</i><br>Asid nitric<br><i>Nitric acid</i><br>Asid hidroklorik<br><i>Hydrochloric acid</i> | Asid fosforik<br><i>Phosphoric acid</i><br>Asid etanoik<br><i>Ethanoic acid</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                            |                                                                       |                                                                                                                             |                                                                                 |      |      |    |      |      |                                        |
| JUMLAH / TOTAL                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 15                                                                         |                                                                       |                                                                                                                             |                                                                                 |      |      |    |      |      |                                        |

| Soalan<br>Question | Jawapan<br>Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Markah<br>Mark                                                                                              |                                                                                |                                                                                                             |                                                                                |                                                       |   |                               |      |      |      |    |                     |      |      |     |                            |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|-------------------------------------------------------|---|-------------------------------|------|------|------|----|---------------------|------|------|-----|----------------------------|
| (a)                | <table border="1"> <thead> <tr> <th>Set Set</th><th>Logam Metal</th><th>Suhu awal larutan kuprum(II) sulfat (°C)<br/><i>Initial temperature of copper(II) sulphate solution (°C)</i></th><th>Suhu tertinggi campuran (°C)<br/><i>Highest temperature of the mixture (°C)</i></th><th>Perubahan suhu (°C)<br/><i>Temperature change (°C)</i></th></tr> </thead> <tbody> <tr> <td>I</td><td>Magnesium<br/><i>Magnesium</i></td><td>28.0</td><td>50.0</td><td>22.0</td></tr> <tr> <td>II</td><td>Zink<br/><i>Zinc</i></td><td>28.0</td><td>36.0</td><td>8.0</td></tr> </tbody> </table> <p>P1 Suhu tertinggi campuran dalam Set I mesti lebih tinggi daripada Set II.<br/><i>Highest temperature of the mixture in Set I must be higher than Set II.</i></p> <p>P2 Suhu yang diukur tepat kepada satu tempat perpuluhan.<br/><i>Temperature is measured correct to one decimal point.</i></p> <p>P3 Perubahan suhu dihitung dengan betul.<br/><i>Temperature change is calculated correctly.</i></p> | Set Set                                                                                                     | Logam Metal                                                                    | Suhu awal larutan kuprum(II) sulfat (°C)<br><i>Initial temperature of copper(II) sulphate solution (°C)</i> | Suhu tertinggi campuran (°C)<br><i>Highest temperature of the mixture (°C)</i> | Perubahan suhu (°C)<br><i>Temperature change (°C)</i> | I | Magnesium<br><i>Magnesium</i> | 28.0 | 50.0 | 22.0 | II | Zink<br><i>Zinc</i> | 28.0 | 36.0 | 8.0 | <p>1</p> <p>1</p> <p>1</p> |
| Set Set            | Logam Metal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Suhu awal larutan kuprum(II) sulfat (°C)<br><i>Initial temperature of copper(II) sulphate solution (°C)</i> | Suhu tertinggi campuran (°C)<br><i>Highest temperature of the mixture (°C)</i> | Perubahan suhu (°C)<br><i>Temperature change (°C)</i>                                                       |                                                                                |                                                       |   |                               |      |      |      |    |                     |      |      |     |                            |
| I                  | Magnesium<br><i>Magnesium</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 28.0                                                                                                        | 50.0                                                                           | 22.0                                                                                                        |                                                                                |                                                       |   |                               |      |      |      |    |                     |      |      |     |                            |
| II                 | Zink<br><i>Zinc</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 28.0                                                                                                        | 36.0                                                                           | 8.0                                                                                                         |                                                                                |                                                       |   |                               |      |      |      |    |                     |      |      |     |                            |
| (b)                | <p>Larutan biru menjadi tak berwarna. //</p> <p><i>The blue solution becomes colourless. //</i></p> <p>Pepejal perang terbentuk. //</p> <p><i>Brown solid is formed. //</i></p> <p>Bacaan thermometer meningkat.</p> <p><i>Thermometer reading increases.</i></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <p>1</p> <p><b>Max: 1</b></p>                                                                               |                                                                                |                                                                                                             |                                                                                |                                                       |   |                               |      |      |      |    |                     |      |      |     |                            |
| (c)                | <p>Kepekatan Cu<sup>2+</sup> berkurang. / Cu<sup>2+</sup> membentuk Cu. //</p> <p><i>Concentration of Cu<sup>2+</sup> decreases. / Cu<sup>2+</sup> forms Cu. //</i></p> <p>Kuprum terbentuk. //</p> <p><i>Copper is formed. //</i></p> <p>Penyesaran kuprum oleh zink dan magnesium ialah tindak balas eksotermik.</p> <p><i>Displacement of copper by zinc and magnesium is an exothermic reaction.</i></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <p>1</p> <p><b>Max: 1</b></p>                                                                               |                                                                                |                                                                                                             |                                                                                |                                                       |   |                               |      |      |      |    |                     |      |      |     |                            |
| (d) (i)            | <p>Pemboleh ubah dimanipulasikan: Jenis logam // Magnesium dan zink</p> <p><i>Manipulated variable: Type of metal // Magnesium and zinc</i></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1                                                                                                           |                                                                                |                                                                                                             |                                                                                |                                                       |   |                               |      |      |      |    |                     |      |      |     |                            |
| (ii)               | <p>Pemboleh ubah bergerak balas: Perubahan suhu // Haba tindak balas // Haba penyesaran</p> <p><i>Responding variable: Temperature change // Heat of reaction // Heat of displacement</i></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1                                                                                                           |                                                                                |                                                                                                             |                                                                                |                                                       |   |                               |      |      |      |    |                     |      |      |     |                            |
| (iii)              | <p>Pemboleh ubah dimalarkan: Kepekatan dan isi padu larutan kuprum(II) sulfat</p> <p><i>Fixed variable: Concentration and volume of copper(II) sulphate solution</i></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1                                                                                                           |                                                                                |                                                                                                             |                                                                                |                                                       |   |                               |      |      |      |    |                     |      |      |     |                            |
| (e)                | <p><b>Set I</b></p> <p>Bilangan mol CuSO<sub>4</sub> / <i>Number of moles of CuSO<sub>4</sub></i></p> $= \frac{0.2 \times 50}{1\,000} = 0.01 \text{ mol}$ $Q = mc\theta$ $= 50 \times 4.2 \times 22$ $= 4620 \text{ J}$ $= 4.62 \text{ kJ}$ $\Delta H = \frac{4.62}{0.01} = -462 \text{ kJ mol}^{-1}$ <p><b>Set II</b></p> $Q = mc\theta$ $= 50 \times 4.2 \times 8$ $= 1680 \text{ J}$ $= 1.68 \text{ kJ}$ $\Delta H = \frac{1.68}{0.01} = -168 \text{ kJ mol}^{-1}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <p>1</p> <p>1</p> <p>1</p>                                                                                  |                                                                                |                                                                                                             |                                                                                |                                                       |   |                               |      |      |      |    |                     |      |      |     |                            |



| Soalan<br>Question | Jawapan<br>Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Markah<br>Mark |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| (f)                | Apabila logam yang lebih elektropositif ditambah ke dalam larutan garam, suhu campuran meningkat, maka haba dibebaskan.<br><i>When a more electropositive metal is added into salt solution, the temperature of the mixture increases, thus heat is released.</i>                                                                                                                                                                                                                                                                    | 1              |
| (g)                | P1 Perubahan suhu bagi tindak balas antara magnesium dengan kuprum(II) sulfat adalah lebih tinggi berbanding antara zink dengan kuprum(II) sulfat.<br><i>The temperature change for the reaction between magnesium with copper(II) sulphate solution is higher than between zinc with copper(II) sulphate solution.</i><br>P2 Magnesium lebih elektropositif daripada zink. // Zink kurang elektropositif daripada magnesium.<br><i>Magnesium is more electropositive than zinc. // Zinc is less electropositive than magnesium.</i> | 1<br><br>1     |
|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>15</b>      |