

Essay {Paper03}

[SPM11-02]

(a) How to construct an ionic equation for the formation of lead(II) iodide ?

(b) Manipulated variable : volume of lead(II) nitrate solution

Responding variable : height of yellow precipitate

Fixed variable : size of test tube // volume and concentration of potassium iodide

(c) As the volume of lead(II) nitrate solution used increases, the height of yellow precipitate increases until it achieves a constant height

(d) 0.5 mol dm⁻³ Lead(II) nitrate and 0.5 mol dm⁻³ potassium iodide solution

Test tube, test tube rack, burette, retort stand with clamp, ruler, glass rod and dropper

(e) Procedure for the experiment

1. 8 test tubes was labelled and put at the test tube racks

2. a burette is filled with 0.5 mol dm⁻³ potassium iodide solution. 5 cm³ of potassium iodide solution from burette was placed into 8 test tube

3. another burette was filled with 0.5 mol dm⁻³ lead(II) nitrate.

4. 1 cm³ of lead(II) nitrate solution from burette is added into first test tube, 2 cm³ for second test tube, and so on until 8 cm³ for the eight test tube.

5. the mixture in each test tube is stirred with a clean glass. A yellow precipitate is formed in each test tube.

6. the test tube left aside for about an hour

7. the height of precipitate in each test tube was measured by ruler and recorded.

(f)

Test tube	1	2	3	4	5	6	7	8
Volume of Pb(NO ₃) ₂ / cm ³								
Height of precipitate/ cm								

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[SBPmidyearF508-03]

(a)

Rubric	Score
<i>[Able to make a suitable statement of problem]</i> Suggested answer: How to differentiate between magnesium nitrate solution and calcium nitrate solution // How to differentiate between magnesium ion and calcium ion	3
<i>[Able to make a suitable aim]</i> Suggested answer: To differentiate the presence of magnesium ion and calcium ion by using aqueous ammonia solution.	2
<i>[Able to state an idea of statement of problem or aim]</i>	1
<i>No response given / wrong response</i>	0

(b)

Rubric	Score
<i>[Able to state the relationship between manipulated variable and responding variable correctly]</i> Suggested answer: If the addition of aqueous ammonia solution forms white precipitate which is insoluble in excess ammonia aqueous solution, then the solution tested is magnesium nitrate. // If aqueous ammonia solution is added and no change occur then the solution tested is calcium nitrate.	3
<i>[Able to state the relationship between manipulated variable and responding variable]</i>	2
<i>[Able to state an idea of the hypothesis]</i>	1
<i>No response given / wrong response</i>	0

(c)

Rubric	Score
<i>[Able to state all the three variables correctly]</i> Suggested answer: Manipulated variable : magnesium nitrate and calcium nitrate // Mg^{2+} and Ca^{2+} Responding variable: formation of white precipitate Controlled variable : aqueous ammonia solution	3
<i>[Able to state any two of the variables correctly]</i>	2
<i>[Able to state one of the variables correctly or state idea regarding variable]</i>	1
<i>No response given / wrong response</i>	0

(d)

Rubric	Score
<i>[Able to state the list of substances and apparatus correctly and completely]</i> Suggested answer: Test tube, dropper, test tube rack 0.5 mol dm ⁻³ magnesium nitrate solution, 0.5 mol dm ⁻³ calcium nitrate solution, aqueous ammonia solution.	3
<i>[Able to state the list of substances and apparatus correctly but not completely]</i> Suggested answer: Test tube 0.5 mol dm ⁻³ magnesium nitrate solution, 0.5 mol dm ⁻³ calcium nitrate solution, aqueous ammonia solution.	2
<i>[Able to state an idea about the list of substances and apparatus]</i> Suggested answer: Test tube magnesium nitrate, calcium nitrate	1
<i>No response given / wrong response</i>	0

(e)

Rubric	Score
<p><i>[Able to state a complete experimental procedure]</i></p> <p>Suggested answer:</p> <ol style="list-style-type: none"> 2 cm³ of solution A is poured into a test tube. A few drops of aqueous ammonia solution are added into the test tube using a dropper and the test tube is shaken well. If the precipitate is formed, aqueous ammonia solution is added continuously until no further change occurred / until excess The mixture is shaken well. The changes occur is recorded in a table. Steps 1 to 4 are repeated using solution B. 	3
<p><i>[Able to state a complete experimental procedure]</i></p> <p>1,2,3,4,5</p>	2
<p><i>[Able to state a complete experimental procedure]</i></p> <p>1,2,3,5</p>	1
<i>No response given / wrong response</i>	0

(f)

Rubric	Score								
<p><i>[Able to exhibit the tabulation of data correctly]</i></p> <table border="1" style="margin-left: 40px;"> <thead> <tr> <th rowspan="2">Reagent</th> <th colspan="2">Observation</th> </tr> <tr> <th>Test tube/Solution A</th> <th>Test tube/Solution B</th> </tr> </thead> <tbody> <tr> <td>Aqueous ammonia solution</td> <td></td> <td></td> </tr> </tbody> </table>	Reagent	Observation		Test tube/Solution A	Test tube/Solution B	Aqueous ammonia solution			3
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