

CHEMISTRY AS 90934

Collated Precipitation Reaction Questions

2018:1

You may use the solubility rules provided in the resource booklet.

Magnesium chloride solution and sodium hydroxide solution react to form a precipitate.

- (a) (i) Complete and balance the following ionic equation showing the formation of the precipitate. $\text{Mg}^{2+} + \text{OH}^- \rightarrow$
- (ii) What would be observed during this reaction? Link the observations to the species involved.
- (b) Three unlabelled solutions, A, B, and C, are known to be lead nitrate, magnesium nitrate, and barium nitrate.
- (i) Complete the following table by giving the expected observations and the formulae of any precipitates formed when solutions of sodium iodide, sodium sulfate, and sodium carbonate are added to A, B, and C. *You may use the colours of selected ions and solids provided in the resource booklet.*

Unknown solution		Sodium iodide	Sodium sulfate	Sodium carbonate
Lead nitrate	Expected observations			
	Formula of precipitate			
Magnesium nitrate	Expected observations			
	Formula of precipitate			
Barium nitrate	Expected observations			
	Formula of precipitate			

- (ii) Solutions of sodium iodide, sodium sulfate, and sodium carbonate available for use to determine the identity of A, B, and C.

Explain how A, B, and C could be identified using the available solutions.

In your answer, you should:

- describe a method that could be used to identify each of A, B, and C
- give the balanced ionic equation(s) for any precipitates formed with sodium sulfate.

2017:2

- (a) Zinc metal reacts with lead nitrate in a displacement reaction. Zinc chloride solution also reacts with lead nitrate; however, this is not a displacement reaction.

- (i) Complete the word equations below for these two reactions.

zinc + lead nitrate →

zinc chloride + lead nitrate →

- (ii) Explain why the reaction between zinc chloride and lead nitrate is not classified as a displacement reaction, but the reaction between zinc metal and lead nitrate is. In your answer, you should identify what type of reaction is occurring between zinc chloride and lead nitrate.

2017:3

- (a) (i) Which of the following substances are soluble in water? *You may use the solubility rules provided in the resource booklet.*

Substance	Soluble in water? Yes / No
Zinc carbonate	
Potassium hydroxide	
Barium chloride	

- (ii) For each of the pairs of solutions below, identify whether a precipitate will form when the solutions are mixed. Name any precipitates that form.

Solution being mixed	Precipitate forms? Yes/No	Name of precipitate
sodium carbonate and calcium chloride		
sodium hydroxide and potassium nitrate		
sodium sulfate and lead nitrate		

- (iii) Choose ONE of the pairs of solutions from the table above that forms a precipitate, and elaborate on the reaction occurring.

In your answer, you should:

- describe any observations that would be seen, and link them to the reactants and products involved
- explain why the reaction is classified as a precipitation reaction by referring to the ions in both solutions and the precipitate formed.

- (b) Three solutions containing negative ions / anions have been mislabelled. One of the solutions contains sulfate ions, one of them contains chloride ions, and one contains iodide ions. It is known that the solutions contain no other negative ions / anions. How could the solutions be tested to determine which solutions contain each of the three ions: sulfate, chloride, and iodide?

In your answer, you should:

- describe a method that could be carried out in a school laboratory, using barium nitrate and silver nitrate as test solutions
- identify any precipitates formed and link these to any observations that would be made
- explain how the results could be used to identify the solutions
- give balanced ionic equations for ALL precipitates formed.

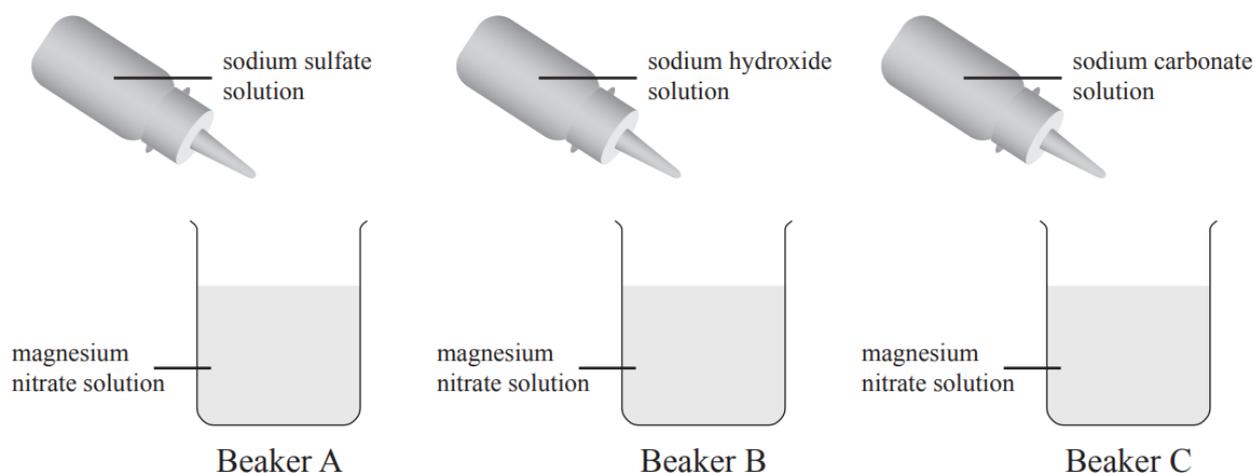
You may use the solubility rules provided in the resource booklet.

2016:

- (a) Name the precipitate that is formed when the following solutions are mixed together. *You may use the solubility rules provided in the resource booklet.*
- Zinc nitrate and sodium carbonate
 - Barium chloride and sodium sulfate
- (b) (i) Copper sulfate solution and sodium hydroxide solution react to form a precipitate. Complete the following equation showing the formation of the precipitate.
- $$\text{Cu}^{2+} + \text{OH}^{-} \rightarrow$$
- (ii) Why is this reaction classified as a precipitation reaction?
- (iii) Describe any observations that would be seen during this reaction, and link these to the reactants and products.
- (c) A solution is known to contain zinc ions OR lead ions. How could a piece of iron metal, and a solution of sodium chloride, each be used to decide the identity of the metal? In your answer, you should:
- for each test, write a method that could be carried out in a school laboratory
 - describe any observations and link them to the reactants and products involved
 - write balanced ionic equations for any reactions that occur.

2015:2

- (a) Three different solutions were added to separate beakers containing a solution of magnesium nitrate. Only two of the mixtures produced precipitates.



Complete the table below by identifying:

- whether a precipitate forms
 - the name of any precipitate that may have formed in the beakers.
- You may use the solubility rules provided in the resource booklet.*

	Precipitate forms? Yes/No	Name of precipitate
Beaker A		
Beaker B		
Beaker C		

- (b) (i) Iron(II) sulfate solution and sodium hydroxide solution react to form a precipitate. Complete the following ionic equation to show the formation of the precipitate.
- $$\text{Fe}^{2+} + \text{OH}^{-} \rightarrow$$
- (ii) Elaborate on the reaction occurring in (b)(i).
In your answer, you should:
- explain why the reaction is classified as a precipitation reaction by referring to the ions in both solutions and the precipitate formed
 - describe any observations that would be seen, and link them to the reactants and products involved.
- (c) A sample of water is required to be tested for the presence of calcium ions and silver ions. It is known that the sample of water does not contain any other positive ions/cations.

Explain how the sample of water could be tested to show whether or not it contains calcium ions, or silver ions, or both.

In your answer, you should:

- write a method that could be carried out in a school laboratory
- name any chemicals you would use
- identify any precipitates formed and link these to any observations that would be made
- explain how the results are used to determine which ions are present or absent.

You should use the solubility rules provided in the resource booklet.

Resource sheet – provided from 2018 onwards

Colours of selected ions and solids

Colourless ions	chloride, iodide, sulfate, hydroxide, carbonate, calcium, magnesium, zinc, lead, barium, silver
Blue ions	copper
Pale green ions	iron(II)
White solids	calcium sulfate, calcium hydroxide, calcium carbonate, magnesium hydroxide, magnesium carbonate, zinc carbonate, lead chloride, lead sulfate, lead carbonate, barium sulfate, barium hydroxide, barium carbonate, silver chloride
Green solid	iron(II) hydroxide, iron(II) carbonate
Blue solid	copper hydroxide
Yellow solid	lead iodide
Cream solid	silver iodide

Solubility rules

nitrates	All soluble
chlorides	All soluble except silver chloride, lead chloride
iodides	All soluble except silver iodide, lead iodide
sulfates	All soluble except barium sulfate, lead sulfate, calcium sulfate
hydroxides	All insoluble except potassium hydroxide, sodium hydroxide
carbonates	All insoluble except potassium carbonate, sodium carbonate