

07

This question is about salts.

Ammonium nitrate solution is produced when ammonia gas reacts with nitric acid.

07.1

Give the state symbol for ammonium nitrate solution.

[1 mark]

07.2

What is the formula of nitric acid?

[1 mark]

Tick (✓) **one** box.

HCl

HNO₃H₂SO₄NH₄OH

07.3

Ammonia gas dissolves in water to produce ammonia solution.

Ammonia solution contains hydroxide ions, OH⁻

A student adds universal indicator to solutions of nitric acid and ammonia.

What colour is observed in each solution?

[2 marks]

Colour in nitric acid

Colour in ammonia solution



0 7 . 4 The student gradually added nitric acid to ammonia solution.

Which row, **A**, **B**, **C** or **D**, shows the change in pH as the nitric acid is added until in excess?

[1 mark]

Tick (✓) **one** box.

	pH of ammonia solution at start	pH after addition of excess nitric acid	
A	10	7	<input type="checkbox"/>
B	2	10	<input type="checkbox"/>
C	7	1	<input type="checkbox"/>
D	10	2	<input type="checkbox"/>

0 7 . 5 Calculate the percentage by mass of oxygen in ammonium nitrate (NH_4NO_3).

Relative atomic masses (A_r): H = 1 N = 14 O = 16

Relative formula mass (M_r): $\text{NH}_4\text{NO}_3 = 80$

[3 marks]

Percentage by mass of oxygen = _____ %

Question 7 continues on the next page

Turn over ►



0 7 . 6

Describe a method to investigate how the temperature changes when different masses of ammonium nitrate are dissolved in water.

You do **not** need to write about safety precautions.

[6 marks]

14

END OF QUESTIONS



Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	(aq)	allow aq ignore aqueous ignore formulae	1	AO1 5.2.2.2
07.2	HNO ₃		1	AO1 5.1.1.1 5.4.2.2
07.3	red purple or blue	allow orange or yellow do not accept green allow shades of purple e.g. violet	1 1	AO1 5.4.2.4
07.4	D		1	AO3 5.4.2.4
07.5	3 × 16 or 48 $\frac{48}{80} (\times 100)$ 60 (%)	an answer of 60 (%) scores 3 marks an answer of 20 (%) scores 2 marks for: $\frac{16}{80} (\times 100) (1)$ = 20 (%) (1)	1 1 1	AO2 5.3.1.2

Question	Answers	Mark	AO/ Spec. Ref
07.6	Level 3: The design/plan would lead to the production of a valid outcome. All key steps are identified and logically sequenced.	5–6	AO3 AO2
	Level 2: The design/plan would not necessarily lead to a valid outcome. Most steps are identified, but the plan is not fully logically sequenced.	3–4	5.5.1.1
	Level 1: The design/plan would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	
	No relevant content	0	
	<p>Indicative content</p> <p>Steps</p> <ul style="list-style-type: none"> • use a suitable container e.g. test tube • use insulation • add water • measure the initial water temperature (with a thermometer) • add stated mass e.g. 1g or 1 spatula • stir (to dissolve the solid) • measure the final (allow lowest or highest) temperature of the solution • calculate the temperature difference or determine graphically • repeat with different masses • repeat with the same volume of water <p>to access level 3 there must be an indication of how the temperature change is determined using different masses dissolved in the same quantity of water</p>		
Total		14	