

(NPK fertilisers (industrial production, comparison with natural sources))

Q1. (2019)

World production of ammonia is now about 30 times greater than it was in 1950.

Suggest why the demand for ammonia has increased.

[2 marks]

Q2. (2021)

This question is about fertilisers.

Some fertilisers are described as NPK fertilisers because they contain three elements needed for healthy plant growth.

Which **two** compounds each contain **two** of these elements?

[2 marks]

Tick (✓) **two** boxes.

Ammonium nitrate

☐

Ammonium phosphate

☐

Calcium chloride

☐

Calcium phosphate

☐

Potassium chloride

☐

Potassium nitrate

☐

Q3. (2021)

Rocks containing calcium phosphate are treated with acid to produce soluble salts that can be used as fertilisers.

Name the soluble salts produced when calcium phosphate reacts with:

- nitric acid
- phosphoric acid.

[2 marks]

Nitric acid _____

Phosphoric acid _____

Q4. (2021)

Ammonium sulfate is a compound in fertilisers.

Ammonium sulfate can be made using an industrial process or in the laboratory.

In the industrial process, the following steps are used.

1. React streams of ammonia solution and sulfuric acid together.
2. Evaporate the water by passing the solution down a warm column.
3. Collect dry crystals continuously at the bottom of the column.

In the laboratory, the following steps are used.

1. React ammonia solution and sulfuric acid in a conical flask.
2. Evaporate water from the solution until crystals start to form.
3. Leave to cool and crystallise further.
4. Separate the crystals using filtration.
5. Dry the crystals between pieces of filter paper.

Evaluate the two methods for producing a large mass of ammonium sulfate.

[4 marks]

Q5. a). (2023)

This question is about fertilisers.

Compounds of nitrogen (N), phosphorus (P) and potassium (K) are used as fertilisers to improve agricultural productivity.

Table 4 shows information about three compounds, **A**, **B** and **C**, that can be used as fertilisers.

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Table 4

	Compound A	Compound B	Compound C
Name	potassium chloride	ammonium nitrate	diammonium hydrogen phosphate
Formula	KCl	NH ₄ NO ₃	(NH ₄) ₂ HPO ₄
Percentage (%) of N, P and K by mass	K: 52%	N: 35%	N: 21% P: 23%
Cost in £/kg	0.24	0.23	0.35

A scientist analysed the percentages of nitrogen, phosphorus and potassium in a soil.

The percentages of nitrogen and of potassium in the soil were lower than the percentages needed for high agricultural productivity.

There was sufficient phosphorus in the soil for high agricultural productivity.

Evaluate the use of the compounds in **Table 4** to improve the agricultural productivity of this soil.

[4 marks]

Q5. b). (2023)

How is potassium chloride (compound **A**) obtained from the Earth?

[1 mark]

Q5. c). (2023)

Name **one** other compound that could be used instead of potassium chloride (compound **A**) to give a similar improvement in agricultural productivity.

[1 mark]

Q5. d). (2023)

Nitric acid is needed to produce ammonium nitrate (compound **B**).

Name a compound needed to produce nitric acid.

[1 mark]

Q6. (2023)

Phosphate rock contains phosphorus compounds.

Plants absorb phosphorus from compounds dissolved in rainwater.

Suggest why phosphate rock **cannot** be used directly as a fertiliser.

[1 mark]

Q7. (2023)

Phosphate rock can be treated with different acids to produce salts useful as fertilisers.

Name the salts which are produced by treating phosphate rock with:

- sulfuric acid
- phosphoric acid.

[2 marks]

Sulfuric acid _____

Phosphoric acid _____

Q8. (2024)

Ammonia and nitric acid react to produce the salt, ammonium nitrate.

Ammonium ions and nitrate ions both contain nitrogen.

Suggest **one** use of ammonium nitrate.

[1 mark]
