

GCSE Chemistry

Worksheet: Production and uses of NPK fertilisers

TIME 35 min	TOTAL 32 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Production and uses of NPK fertilisers

NAME _____

CLASS _____

DATE _____

- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0 1

Phosphate rock is obtained by mining. It cannot be used directly as a fertiliser.

0 1 . 1

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

.....

.....

[1 mark]

0 1 . 2

Name the **two** products formed when phosphate rock is treated with nitric acid.

.....

.....

.....

.....

[2 marks]

0 1 . 3

Name the **two** salts formed when phosphate rock is treated with sulfuric acid.

.....

.....

.....

.....

[2 marks]

0 1 . 4

Name the salt formed when phosphate rock is treated with phosphoric acid.

.....

.....

.....

.....

[1 mark]

0 2

0 2 . 1

Explain why NPK fertiliser is described as a formulation, rather than a single compound.

.....

.....

.....

.....

[2 marks]

0 3

0 3 . 1

Name the **three** elements that NPK fertilisers provide.

.....

.....

[1 mark]

0 3 . 2

Why do farmers use fertilisers?

[1 mark]

0 3 . 3

Which substance is obtained by mining and is used as a source of potassium in fertilisers?

Tick (✓) **one** box.

Ammonium nitrate

☐

Nitric acid

☐

Phosphoric acid

☐

Potassium chloride

☐

[1 mark]

0 3 . 4

NPK fertilisers are formulations.
What does this mean?

[1 mark]

0 4

0 4 . 1

Which raw material provides phosphorus for fertiliser production, before being converted into a soluble form?

Tick (✓) **one** box.

Ammonia

☐

Nitric acid

☐

Phosphate rock

☐

Potassium chloride

☐

[1 mark]

0 4 . 2

N, P and K are chemical symbols for three elements.
Name these three elements.

.....

.....

.....

.....

.....

.....

[3 marks]

0 5

Urea, $\text{CO}(\text{NH}_2)_2$, is used as a fertiliser.

Relative atomic masses (A_r): C = 12 H = 1 N = 14 O = 16

0 5 . 1

Calculate the relative formula mass (M_r) of urea.

.....

.....

.....

$M_r =$

[1 mark]

0 5 . 2

Calculate the percentage by mass of nitrogen in urea.

.....

.....

.....

.....

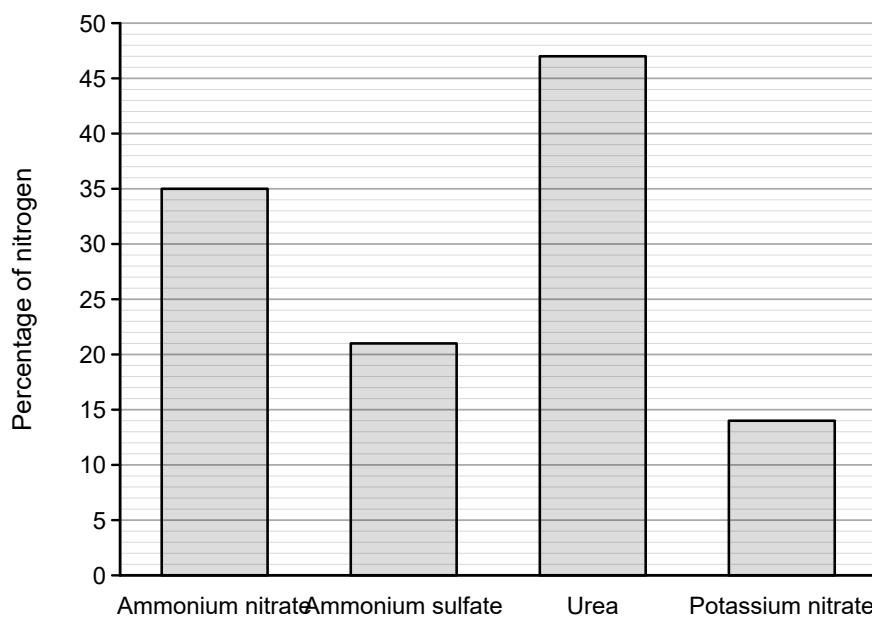
Percentage = %

[2 marks]

0 6

Figure 1 compares the percentage by mass of nitrogen in four common nitrogen fertilisers.

Figure 1



0 6 . 1

Use Figure 1 to identify which fertiliser supplies the most nitrogen per kg.

.....

.....

.....

[1 mark]

0 6 . 2

Use Figure 1 to calculate the mass of ammonium sulfate that contains the same mass of nitrogen as 10 kg of urea.

.....

.....

.....

.....

Mass = kg

[2 marks]

0 6 . 3

Suggest one advantage of using a fertiliser with a higher percentage of nitrogen.

.....

.....

[1 mark]

0 7

Potassium nitrate, KNO_3 , is used as a fertiliser because it supplies both nitrogen and potassium.

Relative atomic masses (A_r): N = 14 O = 16 K = 39

0 7 . 1

Calculate the relative formula mass of potassium nitrate.

.....

.....

.....

$M_r =$

[1 mark]

0 7 . 2

Calculate the percentage by mass of nitrogen in potassium nitrate.

.....

.....

.....

.....

Percentage = %

[2 marks]

0 8

A government wants to reduce the pollution of rivers by fertiliser washed off farmland, without significantly reducing crop yields.

0 8 . 1

Suggest **two** ways farmers could reduce the amount of fertiliser washed into rivers, while still supplying their crops with enough nutrients.

.....

.....

.....

.....

[2 marks]

0 9

A bag of fertiliser contains 50 kg of potassium sulfate, K_2SO_4 ($M_r = 174$).

Relative atomic masses (A_r): K = 39 O = 16 S = 32

0 9 . 1

Calculate the percentage by mass of potassium in potassium sulfate.

.....

.....

.....

.....

Percentage = %

[2 marks]

0 9 . 2

Calculate the mass of potassium in the bag.

.....

.....

.....

.....

Mass = kg

[2 marks]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Chemistry · Worksheet: Production and uses of NPK fertilisers · 32 marks

Question 1 (6 marks)

01.1 [1 mark]

- it is insoluble (in water), so plants cannot absorb the phosphorus (1)
-

01.2 [2 marks]

- phosphoric acid (1)
 - calcium nitrate (1)
-

01.3 [2 marks]

- calcium sulfate (1)
 - calcium phosphate (1)
-

01.4 [1 mark]

Answer: calcium phosphate

- calcium phosphate (1)
-
-

Question 2 (2 marks)

02.1 [2 marks]

- it is a mixture of different salts / compounds, providing nitrogen, phosphorus and potassium (1)
 - the components are mixed in carefully controlled proportions to give plants the nutrients they need (1)
-

Question 3 (4 marks)

03.1 [1 mark]

- nitrogen, phosphorus and potassium (all three needed) (1)

03.2 [1 mark]

- to improve agricultural productivity / to increase crop yields (1)

03.3 [1 mark]

Correct: Potassium chloride

03.4 [1 mark]

- they are mixtures of different salts containing the elements in appropriate percentages / designed as useful products (1)

Question 4 (4 marks)

04.1 [1 mark]

Correct: Phosphate rock

04.2 [3 marks]

- nitrogen (1)
- phosphorus (1)
- potassium (1)

Question 5 (3 marks)

05.1 [1 mark]

Answer: 60

- 60 (1)

05.2 [2 marks]

Answer: 46.7%

- $28 \div 60 \times 100$ (1)
- 46.7 (%) (1)

Notes: Allow ECF from the relative formula mass.

Question 6 (4 marks)

06.1 [1 mark]

Answer: urea

- urea (1)

06.2 [2 marks]

Answer: 22.4 kg

- mass of nitrogen in 10 kg of urea = $47 \div 100 \times 10 = 4.7$ (kg) (1)
- mass of ammonium sulfate = $4.7 \div 0.21 = 22.4$ (kg) (1)

Notes: Allow 22.38.

06.3 [1 mark]

- less mass of fertiliser needs to be transported, stored and applied to supply the same mass of nitrogen to the crop, which can reduce costs (1)

Question 7 (3 marks)

07.1 [1 mark]

Answer: 101

- 101 (1)

07.2 [2 marks]

Answer: 13.9%

- $14 \div 101 \times 100$ (1)
- 13.9 (%) (1)

Notes: Allow 13.86. Allow ECF from the relative formula mass.

Question 8 (2 marks)

08.1 [2 marks]

- apply fertiliser in smaller, more frequent doses matched to what the crop can currently absorb, rather than one large excess dose (1)
 - avoid applying fertiliser shortly before heavy rain is expected (allow: use soil testing / precision farming to apply only as much fertiliser as the soil needs, or use slow-release fertiliser formulations) (1)
-

Question 9 (4 marks)

09.1 [2 marks]

Answer: 44.8%

- $78 \div 174 \times 100$ (1)
- 44.8 (%) (1)

09.2 [2 marks]

Answer: 22.4 kg

- $44.8 \div 100 \times 50$ (1)
- 22.4 (kg) (1)

Notes: Allow ECF from the percentage.
