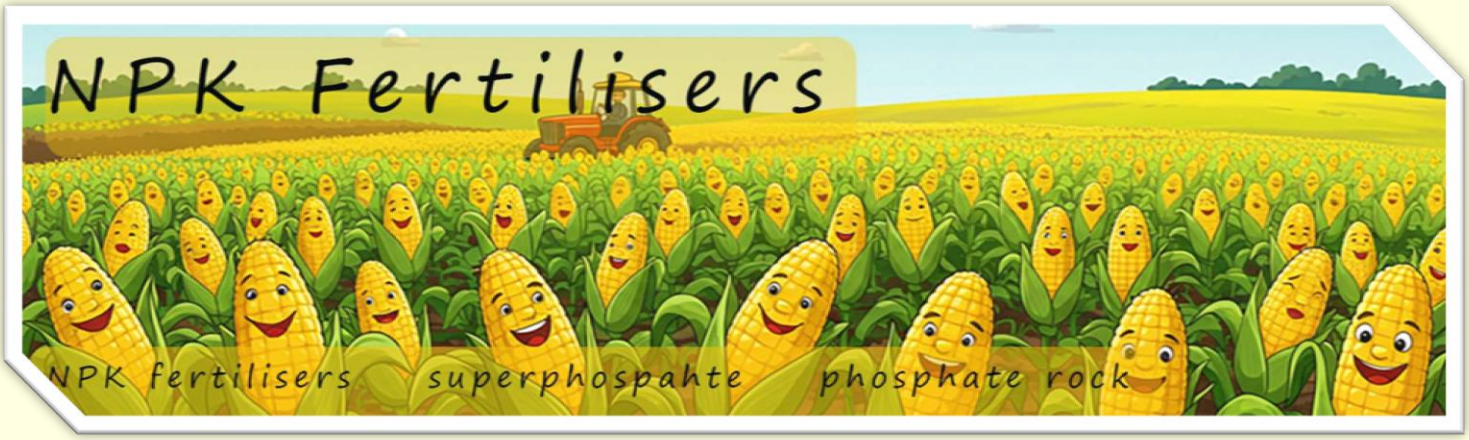


Answer the questions below then check your answers

1. Which three elements are most essential for plant growth in relatively large amounts?

a) Calcium, Magnesium, Sulfur

b) Nitrogen, Phosphorus, Potassium

c) Iron, Chlorine, Manganese

d) Zinc, Copper, Nickel

2. What is the role of nitrogen in plant growth?

3. True or False: Plants can directly absorb nitrogen from the atmosphere.

4. Match the element with its primary function in plant growth:

Essential mineral	What it does- its function
nitrogen	Overall plant vitality, stress and disease resistance
phosphorus	Protein production, stem and leaf growth (everything above the soil)
potassium	Root development (everything below the soil)

5. Fill in the Blank to complete the sentence below:

Leguminous plants have nodules on their roots containing bacteria that convert atmospheric nitrogen into _____.

6. Why do farmers add fertilisers to their fields?


Fertiliser being spread on a field before the crop is planted.

7. Explain why phosphate rock needs to be treated before it can be used as a fertiliser.

8. Describe the difference between the industrial production of superphosphate and a lab-scale process.

9. A farmer notices that their crops have weak stems and yellowing leaves. Which element is most likely deficient in the soil?

10. What does the N:P:K ratio on a fertiliser label represent?

11. Explain the advantages of crushing phosphate rock before reacting it with acid.

12. Why is it important for farmers to choose fertilisers with specific N:P:K ratios?

13. The production of sulfuric acid (used in making superphosphate) involves exothermic reactions. Explain how this heat can be used in the industrial process.

14. Describe the steps involved in the industrial production of superphosphate fertiliser, including the reasons for each step.

Answers

1. Which three elements are most essential for plant growth in relatively large amounts?

a) Calcium, Magnesium, Sulfur

b) Nitrogen, Phosphorus, Potassium

c) Iron, Chlorine, Manganese

d) Zinc, Copper, Nickel

Answer: b) Nitrogen, Phosphorus, Potassium

2. What is the role of nitrogen in plant growth?

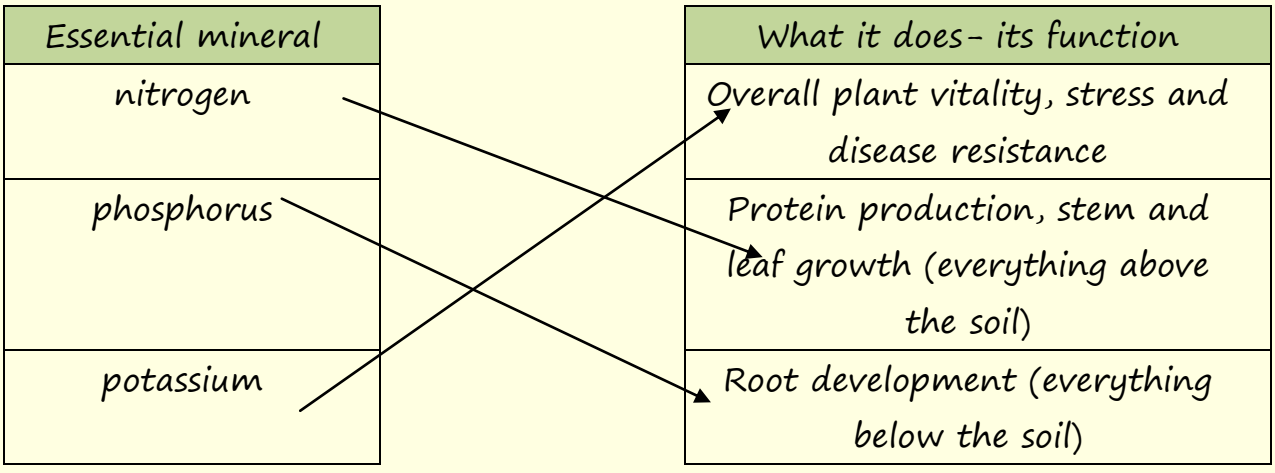
Answer: Nitrogen is essential for the manufacture of proteins within the plant, promoting the growth of healthy stems and leaves (everything above the soil).

True or False:

3. Plants can directly absorb nitrogen from the atmosphere.

Answer: False (Except for leguminous plants)

4. Match the element with its primary function in plant growth:



5. Fill in the Blank to complete the sentence below:

Leguminous plants have nodules on their roots containing bacteria that convert atmospheric nitrogen into _____.

Answer: Nitrates (NO_3^-)

6. Why do farmers add fertilisers to their fields?

Answer: Farmers add fertilisers to replenish essential minerals that are removed from the soil when crops are harvested. This ensures healthy growth and optimal yields for future crops.

7. Explain why phosphate rock needs to be treated before it can be used as a fertiliser.

Answer: Phosphate rock is insoluble, meaning plants cannot absorb the phosphorus directly. It needs to be converted into soluble compounds containing phosphate ions (PO_4^{3-}) through reactions with acids.

8. Describe the difference between the industrial production of superphosphate and a lab-scale process.

Answer: Industrial production is a continuous process operating 24/7, involving large-scale reactions, heat recovery, and quality control of raw materials. Lab processes are small-scale batch processes (one-off).

9. A farmer notices that their crops have weak stems and yellowing leaves. Which element is most likely deficient in the soil?

Answer: Nitrogen

10. What does the N:P:K ratio on a fertiliser label represent?

Answer: It represents the relative proportions of nitrogen (N), phosphorus (P), and potassium (K) in the fertiliser.

11. Explain the advantages of crushing phosphate rock before reacting it with acid.

Answer: Crushing the rock increases its surface area, which leads to a faster and more complete reaction with the acid, thus increasing the efficiency of the process.

12. Why is it important for farmers to choose fertilisers with specific N:P:K ratios?

Answer: Different crops have different nutrient requirements. Choosing the correct N:P:K ratio ensures the plants receive the optimal balance of nutrients for healthy growth and maximum yield, depending on the specific crop and the existing soil conditions.

13. The production of sulfuric acid (used in making superphosphate) involves exothermic reactions. Explain how this heat can be used in the industrial process.

Answer: The heat generated can be used to evaporate and dry the final fertiliser product, or to generate electricity which can be used elsewhere in the plant, increasing efficiency and reducing waste. This links to energy changes and industrial processes.

14. Describe the steps involved in the industrial production of superphosphate fertiliser, including the reasons for each step.

Answer:

Acid Production: Sulfuric acid is produced (e.g., by burning sulfur). This is exothermic, and the heat is recovered.

Rock Processing: Phosphate rock is tested, blended for consistent composition, and crushed to increase surface area for reaction.

Mixing and Reaction: Crushed rock is mixed with sulfuric acid, allowing the reaction to occur.

Waste Removal and Drying: Waste products are separated, and the fertiliser is dried using the recovered heat.

Granulation: The dried fertiliser is turned into granules (prills) for easier handling and application.