

17.2 FERTILIZERS

Chemical fertilisers

- Plants need water, carbon dioxide, sunlight and different nutrient elements like **N, P, K**, Ca, Mg, F, Zn, etc. for their growth.
- Naturally, plants get these nutrients from the soil.
- After cultivating the land for a long time, the soil becomes poor in these nutrients.
- So, these nutrients have to be supplied in the soil of the farms.
- In the traditional way, natural or organic fertilisers are supplied, which include dead and decaying vegetable or animal matter, wood and animal excreta.
- But the natural or organic fertilisers are not enough to fulfil the increasing demand for food production.
- Hence large amount of artificial or chemical fertilisers are being manufactured and used for the growth of crop production.
- Chemical fertilisers play a vital role in modern agriculture by enhancing soil fertility and addressing nutrient deficiencies quickly and efficiently.
- However, their overuse can lead to environmental issues like soil degradation, water pollution, and harm to beneficial organisms.
- Finding a balance between their usage and sustainable practices is crucial for long-term agricultural success.

Types of chemical fertilisers

Among the nutrients required by the plants N, P and K are essential. These play the following vital role in the plants.

- **Nitrogen:** rapid growth, increase yield, increase protein content and production of green colouring material chlorophyll (for photosynthesis)

- **Phosphorus:** stimulates early root formation and growth, maturity of crop, formation of seeds and resistance to frost, helps in energy transfer
- **Potassium:** development of healthy roots, vigour and resistance to diseases, takes part in carbohydrate formation, improves fruit quality and size, helps to remove excess nutrients, etc.

Hence, N, P and K are the major nutrients to be supplied as chemical fertilisers.

Based on chemical composition, the chemical fertilisers can be classified as:

1. Nitrogenous fertilisers: These mainly supply nitrogen. Some examples are listed below

Urea, $\text{NH}_2\text{-CO-NH}_2$

Ammonium nitrate, NH_4NO_3

Ammonium sulfate, $(\text{NH}_4)_2\text{SO}_4$

Calcium ammonium nitrate, CAN - $\text{CaCO}_3\cdot\text{NH}_4\text{NO}_3$

2. Phosphatic fertilisers

Diammonium phosphate (DAP), $(\text{NH}_4)_2\text{HPO}_4$

Monoammonium phosphate (MAP), $\text{NH}_4\text{H}_2\text{PO}_4$

Superphosphate $\text{CaH}_4(\text{PO}_4)_2$

Double superphosphate $\text{CaH}_2(\text{HPO}_4)_2$

Triple superphosphate $\text{Ca}(\text{HPO}_4)_2$

3. Potash fertilisers

Potassium chloride

Potassium sulphate

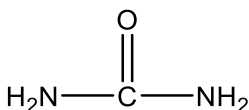
Potassium nitrate

Write the molecular formula of the above potash fertilisers.

Chemical fertilisers can also be classified into simple and mixed fertilisers.

- **Simple fertilisers** contain only one primary nutrient, e.g. urea, KCl, etc
- **Mixed fertilisers** contain two or more primary nutrients. E.g., Ammonium phosphate, potassium nitrate, etc.

Production of Urea



Aminomethanamide

Urea is manufactured by reacting ammonia and carbon dioxide at high temperature (about 200 °C) and pressure (150 atm) to form carbamate, which decomposes into Urea and carbon dioxide. Ammonia is generally obtained from Haber's process, and carbon dioxide is obtained by thermal decomposition of calcium carbonate.

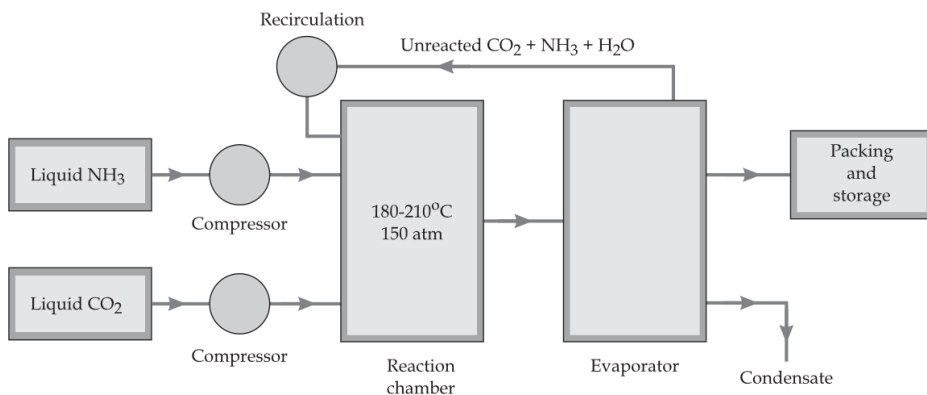
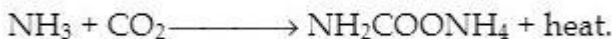


Figure: flow sheet diagram for the production of Urea

1. Which of the following elements are generally supplied to the crops in the form of chemical fertilisers?
 - a. K, Mg and P
 - b. K, N and P
 - c. Na, P and N
 - d. Mg, N and P
2. IUPAC name of urea is:
 - a. Diaminoketone
 - b. 1-aminoethanamide
 - c. 1-aminomethanamide
 - d. Aminoacetamide
3. An intermediate compound X is formed during the production of urea through *ammonia/carbon dioxide* technology. What is the molecular formula of X?
 - a. $\text{NH}_2\text{COONH}_2$
 - b. $\text{NH}_2\text{COONH}_4$
 - c. $\text{NH}_4\text{COONH}_2$
 - d. $\text{NH}_4\text{COONH}_4$
4. Nitrogenous fertiliser with the highest percentage of nitrogen is
 - a. Ammonium nitrate
 - b. Urea
 - b. Calcium cyanide
 - c. Ammonium sulphate
5. What is the nitrogen content of urea
 - a. 26%
 - c. 36%
 - b. 46%
 - d. 64%

*** This note is insufficient. It is to guide you. Study the prescribed textbooks too. ***