COMMON CHEMICAL INDUSTRIES OF PAKISTAN

1. **What are micro-nutrients?**

   Ans. The nutrients which are required in a very small amount for the growth of the plant are called micronutrients. These are generally required in quantities ranging from 6 gram to 200 gram per acre for healthy plant growth. It may be dangerous to add too much quantity because they are poisonous in larger quantities.

2. **What are macro-nutrients?**

   Ans. The nutrients which are required in a large amount for the growth of plants, are called macro-nutrients. These are generally required in quantities ranging from 5 Kg to 200 Kg per acre for healthy plant growth. These include Nitrogen, phosphorous, Potassium, Calcium, Magnesium, Sulphur, Carbon, Hydrogen and Oxygen.

3. **What are fertilizers?**

   Ans. The fertilizers are the substances added to the soil to make up the deficiency of essential elements like Nitrogen, Phosphorous, and Potassium (NPK) in order to enhance the natural fertility or replenish the chemical elements taken up from soil by the previous crop.

4. **What are the types of the fertilizers? Give examples.**

   Ans. There are three major types of fertilizers

   i) Nitrogenous Fertilizers
   Ammonium sulphate, Calcium ammonium sulphate, Basic calcium nitrate

   ii) Phosphatic Fertilizers
   Calcium super phosphate, Diammonium phosphate,

   iii) Potassium Fertilizers
   Potassium nitrate

5. **What is the role of nitrogen in plant growth?**

   Ans. i) Nitrogen is required during the early stage of plant growth for the development of stem and leaves.
   ii) It is the main constituent of protein, imparts green colour to leaves.
   iii) It enhances the yield and quality of plants.

6. **Why ammonium nitrate is not used as fertilizer in paddy rice?**

   Ans. Ammonium nitrate is not useful for paddy rice because the microbial bacteria in the flooded fields decompose it to nitrogen gas.

7. **What is the role of phosphorous in plant growth?**

Ans. i) Phosphorous is required to stimulate the early growth.

ii) It is required to accelerate the seed and fruit formation during the later stages of growth. iii) It is required to increase the resistance against diseases.

8. **What are the functions of potassium in plant growth?**

Ans. i) potassium is required for the formation of starch, sugar and fibrous material of plant.

ii) It is required to increase the resistance to diseases.

iii) It makes the plant strong by helping in healthy root development.

iv) It also help in ripening of seeds, fruits and cereals.

9. **What are calcareous materials give its functions in cement?**

Ans. The materials which are mainly composed of calcium carbonate (C_aCO_3) e.g. lime stone, marble, chalks and marine shell.

Function: Calcareous material helps in the formation of needles shaped crystals which get studded in the colloidal gel and impart strength to it.

10. **What are argillaceous materials, give its functions in cement?**

Ans. The material that provides acidic compon3ents to cement e.g. aluminates and silicates, is known as argillaceous material.

Function: Argillaceous material is used to fill the interstices that results in the hardening of cement.

11. **What is slurry?**

Ans. Definition: A suspension containing an appreciable quantity of a solid. e.g. The material obtained by making the mixture of finely ground lime stone and clay paste in a proportion of 75:25 which is homogenized by means of compressed air mixing arrangements is known as slurry.

12. **Which factors are responsible for the choice of dry or wet process?**

Ans. The manufacturing process of cement involves either by dry or wet process. The choice of dry or wet process depends on the following factors.

i) Physical condition of raw materials

ii) Local climatic conditions of factory

iii) The price of fuel

13. **Describe the origin of the name, Portland cement.**

Ans. Cement is a very important building material which was first introduced by an English Mason Joseph Aspadin. He found it when strongly heated mixture of lime stone and clay were mixed with water and allowed to stand, it hardened to a stone like mass which resembled

Portland Rock, a famous building stone of England, Since then the name of Portland Cement is given to the mixture of lime, silica, iron oxide, alumina, magnesia, sulphur dioxide and sodium oxide etc.

14. Describe the composition of a good Portland cement.

Ans. Average composition of Good Port Land Cement:

Sr.No	Compound	% age
1	Lime (CaO)	62
2	Silica (SiO_2)	22
3	Alumina (Al_2O_3)	7.50
4	Magnesia (MgO)	2.50
5	Iron oxide (Fe_2O_3)	2.50
6	Sulphur trioxide (SO_3)	1.50
7	Sodium Oxide (Na_2O)	1.00
8	Potassium oxide (K_2O)	1.00

15. Discuss digestion process in the manufacturing of paper.

Ans. Digestion: From wet silo the material is sent to digester to digest the material. The digestion process may be either batch or continuous. In our country batch process is mostly used the digester has the following characteristics.

i) It is the main unit of process
ii) It is made up of steel and wrought iron
iii) Its length is 10-meter
iv) Its diameter is 2 meters
v) It revolves at 2.5 RPM

Working

As the raw material enters into the digester

i) Steam is introduced from bottom
ii) Liquor containing sodium sulphite is injected simultaneously to cover the raw material. Sodium sulphite is buffered with sodium carbonate or sodium hydroxide to maintain the pH. 7-9
iii) Digester is closed carefully
iv) The temperature is maintained at 180^0C
v) It takes 45 mints to attain the desired temperature after which it gets switched off automatically and pressure is released

16. What is role of gypsum in cement industry?

Ans. The cement clinkers are then air-cooled. The required amount of gypsum (2.0%) is first ground to a fine powder and then mixed with clinkers. At this stage, finished cement is pumped pneumatically to storage silos from where it is draw for packing in paper bags or for dispatch in bulk containers.

17. Give reactions taking place in first 24 hours in setting of cement.

Ans. Reactions Taking Place in First 24 Hours

A short time after the cement is mixed with water tri-calcium aluminate absorbs water (hydration) and forms a colloidal gel of the composition, 3 Ca. Al2O3. 6H2O, (hydrated

tricalcium aluminate) This gel starts crystallizing slowly, reacts with gypsum (CaSO4). 2H2O) to from the crystals of calcium sulpho-aluminate (3Ca. Al_2O_3. 3$CaSO_4$. 2H_3O)

18. How di-ammonium hydrogen phosphate is prepared? Give its composition.

Ans. Manufacturing: Diamonium phosphate is prepared by continuous process under following conditions

i) Anhydrous ammonia
ii) Pure phosphoric acid
iii) 60-70^{0}C
iv) pH 5.8-6.0

Chemical reaction

The reaction is as follows $2NH_3$ (g) +H_3PO_4 (l) ⟶ $(NH_4)_2HPO_4$ + Heat

The given reaction is exothermic

The heat of reaction vaporizes water from the liquor and the crystals of Diammonium phosphate are taken out.

19. What are the four main non-woody raw materials used in the production of pulp and paper?

Ans. i) Wheat straw ii) Rice straw iii) Bagasse iv) Bamboo

20. Write down the main steps involved in manufacturing of urea?

Ans. Manufacturing of Urea:

The following steps are involved in the manufacture of urea.

i) Preparation of Hydrogen gas
ii) Preparation of Ammonia
iii) Preparation of Ammonium Carbonate
iv) Preparation of Urea/Dehydration of Ammonium Carbamate
v) Prilling

21. What are Argillaceous Material?

Ans. Argillaceous Material:

i) City ii) Shale iii) Slate iv) Blast furnace slag

These are all sources of acidic components i.e. Aluminates and silicates.

22. **Pulp formed by digestion is washed at pulp washing stage. Why is it essential?**

Ans. Pulp washing

The cooked material from the blow tank is washed thoroughly with water by using 80 mesh sieve to remove the following

i) Black liquor ……. Contaminate the pulp

ii) Lignin …… aromatic polymer and makes the paper brittle

iii) Coloured compounds

After washing the material is thickened and stored in high density storage towers.

Pulp contains residual lignin which makes the pulp coloured. Such pulp is not suitable for printing and writing papers. In order to get bright white pulp, the wood pulp is subjected to bleaching.

23. **What is a need of fertilizer??**

The basic need of fertilizer is that it should be stable in soil as well as in storage. i.e it should not be deliquescent or set to hard stony material with time. Above all it should be cheap to manufacture.

24. **What do you mean by prilling of urea?**

The moltem urea is sprayed at the prilling tower by means of prilling bucket where it is cooled by the air rising upward. Molten droplets solidify into the form of prills. Urea prills thus produced are either sent to bagging section or to the bulk storage.

25. **Name two woody and non woody raw material used in preparation of paper??**

Non Woody Raw materials	Woody Raw materials
Wheat straw Rice straw Bagasse Bamboo Rag Cotton silk	Poplar (Hard Wood) Eucalyptus (Hard Wood) Douglas (Soft Wood)

26. **Describe neutral sulphite semi chemical process of pulping of paper??**

This process uses sodium sulphite cooking liquor which is buffered with sodium carbonate or NaOH to neutralize the organic acid liberated from the raw material. The non woody raw material may be used in this process. The essential steps involve in this process are as follow:

i. Cutting of the raw material	ii. Dry cleaning
iii. Wet cleaning	iv. Screening
v. Digestion	vi. Blow tank
vii. Pulp washing	viii. Bleaching
ix. Paper making machine	x. Stock preparation plant

27. What are essential qualities of good fertilizer???

i) The nutrient elements present in it must be readily available to the plants.
ii) It must be fairly soluble in water so that it thoroughly mixes with the soil.
iii) It should not be injurious to plants.
iv) It should be cheap.
v) It must be stable so that it is available for the longer time to the growing plants.
vi) It should not alter the pH of soil.
vii) By rain or water, it should be converted into a form, which the plants can assimilate easily.

28. Define terms: Cement Paper

Cement: The material obtained by burning an intimate mixture of calcareous and argillaceous material at sufficiently high temperature to produce clinkers. These clinkers are then ground to fine powder.

Paper: It is defined in terms of its method of production, that is a sheet material made up of a network of natural cellulosic fibers which have been deposited from an aqueous suspension. The product obtained is a network if intertwining fibers.

29. What are lignin and clinkers?

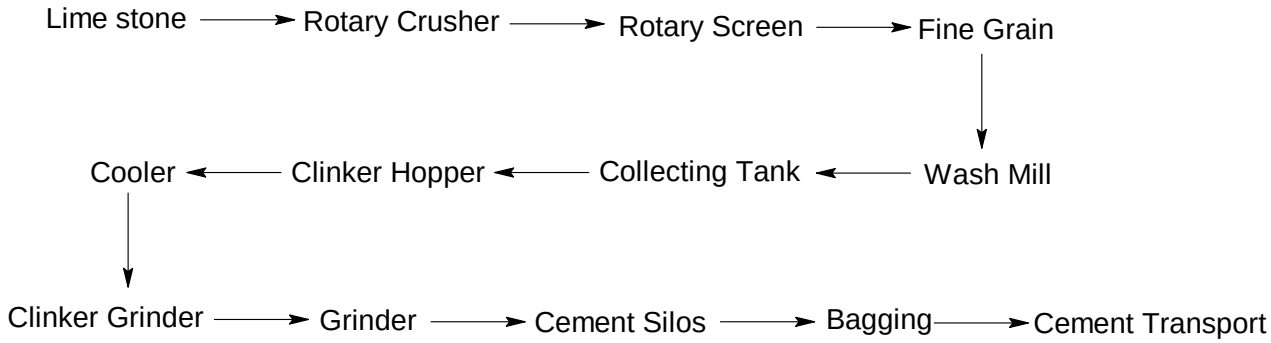
Lignin: lignin is an aromatic polymer and cause paper to become brittle.
The paper and pulp is washed with required amount of water to remove soluble lignin and colored compounds. It is then thickened finally stored in high density storage tower.

Clinker:

The resulting product obtained from the kiln is known as cement clinkers. This has the appearance of greenish black or grey coloured balls varying size from small nuts to peas.

30. Draw flow sheet diagram of urea?

Flow sheet Diagram:



31. What is phosphatic fertilizer? Give two names and formula of phosphatic fertilizer.

Phosphatic Fertilizer:

The fertilizer which provides phosphorous to the plants or soil is called phosphatic fertilizer. Various phosphatic fertilizers have different compositions.

Calcium super phosphate $Ca(H_2PO_4)_2$

Diammonium phosphate $(NH_4)_2HPO_4$

32. What do you mean by setting of cement?

The use of cement in construction of buildings is based on its property of setting to a hard mass when its paste with water is allowed to stand for some time. The chemical changes takes place in setting of cement.

33. What is clinker?

The resulting product obtained from the kiln is known as cement clinkers. This has the appearance of greenish black or grey coloured balls varying size from small nuts to peas.

34. Write major steps involved in synthesis of urea fertilizers.

Urea is produced by the reaction of liquid ammonia with gaseous carbon dioxide. Following steps are involved in the manufacturing of urea.

i) Preparation of hydrogen

ii) Preparation of ammonia

iii)Preparation ammonium carbamate

iv)Preparation of urea

v) Concentration of urea

vi)Prilling

35. What is paper? Name two methods for pulp preparation.

Paper: It is defined in terms of its method of production, that is a sheet material made up of a network of natural cellulosic fibers which have been deposited from an aqueous suspension. The product obtained is a network if intertwining fibers.

i) Kraft process (Alkaline)
ii) Sulphite process (Acidic)
iii) Neutral sulphite semi-chemical process (NSSC)

36. Just write five stages involved in the manufacturing of Portland cement.

i) Crushing and grinding
ii) Mixing of raw material
iii) Heating the slurry in a rotary kiln
iv) Clinker formation
v) Grinding the clinker with gypsum

37. Write names of any two pulping processes used in paper industry?

i) Kraft process (Alkaline)
ii) Sulphite process (Acidic)
iii) Neutral sulphite semi-chemical process (NSSC)

38. Write the importance of phosphorous for the plants?

Phosphorus is required for early growth, to accelerate the seed and fruit formation during later stage of growth. It also increases resistance to diseases. The various phosphatic fertilizers have different composition due to which they have different solubilities.

39. Briefly describe the Bleaching Process of Pulp.

Bleaching is done with chlorine dioxide or sodium hypochlorite and hydrogen peroxide. After washing, unbleached pulp is sent to the chlorinator where chlorine at 4-5 bar pressure is injected from chlorine tank. The chlorine reacts with unbleached pulp at about 45°C for 45-60 minutes to give the good results. The residual chlorine is neutralized with water which act as antichlor. The correct dosage is important and calculated amount of chlorine is needed to achieve the required brightness. After chlorination pulp is washed with hot water at 60°C and is then sent to the storage tank. Pulp is dried with hot air supply. After drying, pulp is ready for manufacturing of paper.