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30. Just name four factors affecting the activity of enzymes. (Grw 09)

Ans. Factors Affecting Activity of Enzymes

The factors which affect the activity of enzymes are:

- (i) Enzyme concentration.
- (ii) Temperature
- (iii) Effect of pH
- (iv) Radiations

31. What is the effect of these factors upon reactivity of enzymes?

- (a) Radiation (b) Enzyme concentration

Ans.

(a) Radiation

Generally enzymes are readily inactivated by exposure to ultraviolet light, beta rays, gamma rays and X-rays.

(b) Enzyme Concentration

The rate of an enzymatic reaction is directly proportional to the concentration of the substrate. The rate of reaction is also directly proportional to the square root of the concentration of enzyme. It means that the rate of reaction also increases with the increasing concentration of enzyme.

32. How many types of nucleic acids are present and what is their function? (Mtn 12)

Ans. Types of Nucleic Acids and their Functions

Nucleic acids are of two types:

- (i) Deoxyribonucleic acid (DNA)
- (ii) Ribonucleic acid (RNA)

Functions:

DNA carries the genetic information in the cell and RNA is involved in putting the genetic information to work in the cell.

33. Differentiate between DNA and RNA. (Rwp 10, Lhr 12)

Ans.

DNA	RNA
◦ DNA stands for Deoxyribonucleic acid	◦ RNA stands for Ribonucleic acid.
◦ The sugar used in the structure of DNA is 2-deoxyribose.	◦ The sugar used in the structure of RNA ribose.
◦ It contains nitrogenous bases i.e. Cytosine, thymine, adenine and guanine.	◦ It contains nitrogenous bases i.e. Cytosine, and uracil, adenine and guanine.
◦ It is double stranded.	◦ Usually, RNA is single stranded.
◦ It carries the genetic information in the cell.	◦ It is involved in putting the genetic information to work in the cell.

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## CHAPTER

15

## COMMON CHEMICAL INDUSTRIES IN PAKISTAN

### Solved Objective Exercise

Q.1 Fill in the blanks.

- (i) Fertilizers enhance the natural \_\_\_\_\_ of the soil.
- (ii) Micro-nutrients are required in quantity ranging from \_\_\_\_\_ per acre.
- (iii) Ammonia contains \_\_\_\_\_ % nitrogen.
- (iv) Manure is an \_\_\_\_\_ material used to fertilize land.
- (v) Cement was first introduced by an English mason \_\_\_\_\_.
- (vi) Phosphorus is required to stimulate \_\_\_\_\_ of plant.
- (vii) In Pakistan, bleaching of pulp is carried out with \_\_\_\_\_.
- (viii) Cement is generally manufactured by using \_\_\_\_\_ process.
- (ix) The use of cement in the construction of building is based on its property of \_\_\_\_\_ when its paste with water is allowed to stand for sometime.
- (x) Lignin is an \_\_\_\_\_ polymer and causes paper to become brittle.

Answer Key.

(i)	Fertility	(ii)	6-200 g
(iii)	82%	(iv)	organic
(v)	Joseph Aspdin	(vi)	Early growth
(vii)	Chlorine dioxide or Sodium hypochlorite and hydrogen peroxide	(viii)	Wet
(ix)	Setting	(x)	Aromatic

Q.2 Indicate true or false.

- (i) Potassium fertilizers are especially used for tobacco and corn.
- (ii) Ammonia is used in gaseous state while all other fertilizers are used in solid form.
- (iii) In wet process for the manufacture of cement, grinding of raw material is done in the presence of water.
- (iv) The total product of cement in Pakistan is 56,30,100 metric tons/annum.
- (v) In neutral sulphite semi-chemical process, sodium sulphite is used buffered with sodium carbonate.
- (vi) Lignin is an inorganic binder.
- (vii) Paper consumption in Pakistan is around 5kg per person per year.
- (viii) Urea contains 90% nitrogen.
- (ix) The temperature of the digester in paper industry should be around 160-180°C.
- (x) Potassium fertilizers increase the capability of plants to resist diseases.

## Answer Key.

(i)	True	(ii)	False	(iii)	True	(iv)	False	(v)	True
(vi)	False	(vii)	True	(viii)	False	(ix)	True	(x)	True

## Q.3 Multiple choice questions. Encircle the correct answer.

- (i) Which three elements are needed for the healthy growth of plants.  
(a) N,S,P (b) N,Ca,P (c) N,P,K (d) N,K,C
- (ii) Which woody raw material is used for the manufacture of paper pulp.  
(a) Cotton (b) Bagasse (c) Poplar (d) Rice straw
- (iii) The nitrogen present in some fertilizers helps plants.  
(a) To fight against diseases (b) To produce fat  
(c) To undergo photosynthesis (d) To produce protein
- (iv) Phosphorus helps in the growth of.  
(a) root (b) leave (c) stem (d) seed
- (v) Micro-nutrients are required in quantity ranging from.  
(a) 4-40g (b) 6-200g (c) 6-200kg (d) 4-40kg
- (vi) During the manufacturing process of cement the temperature of the decomposition zone goes up to  
(a) 600°C (b) 800°C (c) 1000°C (d) 1200°C
- (vii) The word paper is derived from the name of which reedy plant.  
(a) Rose (b) Sun flower (c) Papyrus (d) Water Hyacinth
- (viii) Which is not a calcareous material.  
(a) lime (b) clay (c) marble (d) marine shell
- (ix) How many zones through which the charge passes in a rotary kiln.  
(a) 4 (b) 3 (c) 2 (d) 5
- (x) Ammonium nitrate fertilizer is not used for which crop.  
(a) Cotton (b) Wheat (c) Sugar cane (d) Paddy rice

## Solved Exercise MCQ's

Q. No	Answer	Reason
(i)	(c) N, P, K	N = Nitrogen, P = Phosphorus, K = Potassium
(ii)	(c) Poplar	Cotton, bagasse and rice straw are non-woody raw materials.
(iii)	(d) To produce Protein	Nitrogen is main constituent of protein.
(iv)	(d) Seed	Phosphorus stimulates early growth and accelerates seed formation.
(v)	(d) 6 - 200g	Micro-nutrients are required in less amount.
(vi)	(b) 800°C	According to new text book in decomposition zone the temperature goes upto 900°C.
(vii)	(c) Papyrus	Papyrus grew along marshy delta of River Nile in Egypt.
(viii)	(b) Clay	Clay is argillaceous material.
(ix)	(a) 4	Each zone has a specific temperature.
(x)	(d) Paddy rice	Because microbial bacterial in flooded fields decompose ammonium nitrate to nitrogen.

## Previous Boards MCQ's

1. Which substance is added to the air cooled cement clinker? (D.G Khan 2008)  
(a) Clay (b) Gypsum (c) Alumina (d) Marble
2. The fertilizer, which contains 46 % N is (D.G Khan 2009)  
(a) Urea (b) Ammonia (c) Ammonium nitrate (d) None
3. Argillaceous material used for the manufacture of cement provides (D.G Khan 2010)  
(a) Basic components (b) Amphoteric components  
(c) Acidic components (d) Both acidic and basic components
4. The natural fertilizer is called (Rwp 2008)  
(a) Manure (b) Urea (c) Super phosphate (d) Ammonium sulphate
5. Which of the following elements is not a micro nutrient? (Rwp 2009)  
(a) Cu (b) Fe (c) Mg (d) Mo
6. Macronutrients are required for acre in quantity ranging from (Rwp 2010)  
(a) 2 - 200kg (b) 3 - 200 kg (c) 4 - 200kg (d) 5 - 200 kg
7. Ammonium nitrate fertilizer is not used for which crops? (Fsd 2009)  
(a) Cotton (b) Wheat (c) Sugercane (d) Paddy rice
8. The number of zones through which the charge passes in a rotary kiln during manufacture of cement are  
(a) 2 (b) 3 (c) 4 (d) 5 (Sgr 2009)
9. Phosphorus helps the growth of  
(a) Root (b) Leave (c) Stem (d) Seed (Sgr 2010)
10. Micronutrients are required in quantity are ranging from (Grw 2008)  
(a) 4 - 40g (b) 6 - 200g (c) 6 - 200kg (d) 10 - 200kg
11. Which woody raw material is used for the manufacture of paper pulp? (Grw 2009)  
(a) Cotton (b) Bagasse (c) Poplar (d) Rice straw
12. Which is not a calcareous material? (Grw 2010)  
(a) Lime (b) Clay (c) Zymase (d) Lipase
13. The three elements needed for the healthy growth of plants are  
(a) N, S, P (b) N, Ca, P (c) N, P, K (d) N, K, C (Fsd 12)(Lhr 2008)
14. The nitrogen present in fertilizers helps plants  
(a) To fight against diseases (b) To produce fat  
(c) To produce protein (d) To produce carbohydrates. (Lhr 2009)
15. Which non-woody raw material is used for making pulp and paper (Lhr 2011)  
(a) Fur (b) Corn straw (c) Eucalyptus (d) Poplar
16. The nitrogenous fertilizer easily taken up by plants is  
(a) Urea (b) Ammonium nitrate (c) Ammonia gas (d) Ammonia liquid (Lhr 12)
17. Percentage of nitrogen in urea is:  
(a) 76% (b) 56% (c) 46% (d) 86% (Lhr 12)
18. The word paper is derived from the name of which reedy plant:  
(a) Rose (b) Sun flower (c) Papyrus (d) Water Hyacinth

## Entry Test MCQ's

- Ammonium carbamate on dehydration gives  
(a)  $\text{NH}_3$  gas (b) Urea (c) Ammonium bicarbonate (d) Water
- Prilling of fertilizer increases its  
(a) Solubility (b) Spreading power (c) Stability (d) Absorption
- Which combination was first used as cement by Joseph Aspdin  
(a) clay and sand (b) lime stone and clay (c) limestone and sand (d) soap stone and clay
- The first paper was prepared by using Bark of  
(a) Mulberry tree (b) Pine apple (c) Bamboo (d) Raspberry tree
- Which of the three elements are largely needed for normal growth of crops  
(a) N,P,K (b) H,P,S (c) N,P,C (d) N,C,Mg
- Which of the following is not micronutrient  
(a) Fe (b) H (c) Cu (d) Mn
- The percentage of nitrogen in  $\text{NH}_3$  is  
(a) 82% (b) 16% (c) 46% (d) 33-33.5%
- Which of the following process is alkaline  
(a) Sulphite process (b) Neutral sulphite semi chemical process  
(c) Kraft process (d) None of these
- Which of the following makes paper brittle  
(a) Lignin (b) Aand particles (c) Dust particles (d) Lump of clay
- Which fertilizer is widely used in Pakistan  
(a)  $\text{Ca}(\text{H}_2\text{PO}_4)_2$  (b)  $(\text{NH}_2)_2\text{CO}$  (c)  $\text{KNO}_3$  (d)  $(\text{NH}_4)_2\text{HPO}_4$
- Which of the following fertilize contains 75% plant nutrients  
(a) Urea (b) Super phosphate (c) DAP (d)  $\text{NH}_4\text{NO}_3$
- Which of the following paper bleaching agents is largely used in Pakistan  
(a)  $\text{Cl}_2$  (b)  $\text{O}_2$  (c)  $\text{O}_3$  (d)  $\text{ClO}_2$
- Which of the following is not common domestic materials which are recycled  
(a) Paper (b) Plastics (c) Iron (d) Glass
- In cement, lime is provided by heating  
(a)  $\text{Ca}(\text{OH})_2$  (b)  $\text{CaSO}_4$  (c)  $\text{CaCO}_3$  (d) Clay
- Micro-nutrients are required in quantity ranging from  
(a) 4-40g (b) 6-200kg (c) 6-200g (d) 4-40kg

## Additional MCQ's

- $\text{CO}_2$  and liquid ammonia are mixed for the preparation of \_\_\_\_\_:  
(a) Anhydrous ammonia (b) Ammonium carbamate (c) Molten ammonia (d) None of these
- Ammonium nitrate ( $\text{NH}_4\text{NO}_3$ ) is prepared by the.....:  
(a) Acid base reaction (b) Neutralization reaction  
(c) Dehydration reaction (d) Hydration reaction

- Ammonium nitrate Contains .....:  
(a) 33-35 % Nitrogen (b) 33-37%  $\text{NH}_3$  (c) 33-37 % Nitrogen (d) All of these
- Ammonium nitrate is \_\_\_\_\_ in nature  
(a) Acidic (b) Basic (c) Hygroscopic (d) Neutral
- In formation of  $(\text{NH}_4)_2\text{HPO}_4$ , pH is maintained at:  
(a) 4-6 (b) 5.8-6.0 (c) 7 (d) 11
- Potassium fertilizers are especially used for:  
(a) Imparting green colour to leaves (b) Accelerate seed development  
(c) Tobacco & corn (d) All of these
- In wet process grinding is done in presence of.  
(a) Steam (b) Water (c) NaOH (d) All
- Hydrated tricalcium aluminate react with gypsum to form:  
(a) Tricalcium silicate (b) Aluminium hydroxide (c) Calcium hydroxide (d) Calcium sulpho-aluminate
- During setting of cement which compound form needle shaped crystals:  
(a) Aluminium hydroxide (b) Tricalcium aluminate  
(c) Calcium hydroxide (d) Tricalcium silicate
- In NSSC which compound is used as cooking liquor:  
(a) Sodium sulphite (b) Potassium sulphite (c) Sodium hypochlorite (d) Hydrogen peroxide
- pH in digester is maintained at:  
(a) 4-5 (b) 6-7 (c) 7-8 (d) 7-9
- Which one of the following is the macro-nutrient for plants:  
(a) Boron (b) Nitrogen & calcium (c) Calcium (d) Nitrogen
- The first step in stock preparation plant is:  
(a) Cutting of pulp (b) Beating of fibre  
(c) Dispersion of pulp (d) Addition of chemical additives
- From wet sheet of paper water is separated from fibre by:  
(a) Gravity (b) Suction (c) Pressing (d) All of the above
- The first part of Fourdrinier's machine is:  
(a) Flow spreader (b) Head box (c) Calender stock (d) Cutting part
- The dried paper has \_\_\_\_\_ moisture:  
(a) 0% (b) 2-4% (c) 4-6% (d) 6-8%
- What is the function of head box in paper making machine?  
(a) It reduces the thickness of paper (b) It dries the paper  
(c) It discharges the pulp at screen of fourdrinier table (d) Web structure is consolidated
- The pulp from blow tank is washed to remove:  
(a) Grey liquor (b) Black liquor (c) Excess suater (d) Extra gases
- The colour of pulp is due to:  
(a) Cellulose (b) Fibres (c) Pectin (d) Lignin
- \_\_\_\_\_ makes paper brittle:  
(a) Cellulose (b) Fibres (c) Pectin (d) Lignin
- Which substance is used to bleach the pulp :  
(a) Sodium sulphite (b) Sodium hypochlorite (c) Sodium chloride (d) Sodium hydroxide
- Which fertilizer has minimum percentage of nitrogen :  
(a) Ammonia (82%) (b) Potassium nitrate (c) Ammonium nitrate (d) Urea

23. Which one of the following fertilizers provide the nitrogen and phosphorous to plants:  
 (a) Urea (b) Calcium super phosphate  
 (c) Diammonium phosphate (d) Potassium nitrate
24. Which one of the following raw materials is not present in the cement:  
 (a) Limestone (b) Gypsum (c) Blast furnace slag (d) Red lead
25. Which of the following is required by the soil in large quantities?  
 (a) Nitrogen (b) Hydrogen (c) Both N and H (d) None of above

## ANSWERS TO MCQ'S

## Previous Board MCQ's

Q.No.	Answer	Reason
1.	(b) Gypsum	2% gypsum is added to prolong the time of setting.
2.	(a) Urea	$(\text{NH}_2)_2\text{CO}$ , % of N = $28/60 \times 100 = 46.67\%$
3.	(c) acidic components	Calcareous material provides basic components.
4.	(a) Manure	Manure is an organic material used to fertilize land.
5.	(c) Mg	N, P, K, Ca, Mg, S, C, H, O are macronutrients.
6.	(d) 5 – 200 kg	Macronutrients are required in high amount.
7.	(d) Paddyrice	Because microbial bacterial in flooded fields decompose ammonium nitrate to nitrogen.
8.	(c) 4	Each zone has a specific temperature.
9.	(d) seed	P stimulates early growth & accelerates seed formation.
10.	(b) 6 – 200g	Micronutrients are required in less amount.
11.	(b) Poplar	Cotton, bagasse and rice straw are non-woody.
12.	(b) Clay	Clay is not a calcareous material
13.	(c) N.P.K	N = Nitrogen, P = Phosphorus, K = Potassium
14.	(c) to produce protein	Nitrogen is an essential constituent of protein.
15.	(b) Corn straw	Fur, Eucalyptus and poplar are woody.
16.	(d) Ammonia liquid	Ammonia is used in liquid state and easily taken up by plants.
17.	(c) 46% urea = $(\text{NH}_2)_2\text{CO}$	% of N = $28/60 \times 100 = 46.67\%$
18.	(c) Papyrus	Papyrus grew abundantly along the marshy delta of River Nile in Egypt.

## Entry Test MCQ's

Q.No	Answer	Reason
1.	(b) Urea	$\text{NH}_2 - \overset{\text{O}}{\parallel} \text{C} - \text{O} - \text{NH}_4 \xrightarrow{\Delta} \text{NH}_2 - \overset{\text{O}}{\parallel} \text{C} - \text{NH}_2 + \text{H}_2\text{O}$
2.	(b) Spreading power	As it becomes easy to spread the fertilizer in form of prills.
3.	(b) limestone and clay	Joseph Aspdin was an English Mason.
4.	(a) Mulberry tree	First paper was prepared by Ts'ai Lun of China.
5.	(a) N, P, K	N = Nitrogen, P = Phosphorus, K = Potassium
6.	(b) H	Micro – nutrients are B, Cu, Fe, Mn, Zn, Mo, Cl.
7.	(a) 82%	% of N = $14/17 \times 100 = 82.35\%$
8.	(c) Kraft Process	Kraft process is principal method of chemical pulping.

9.	(a) Lignin	Lignin is an aromatic polymer.
10.	(b) $(\text{NH}_2)_2\text{CO}$	$(\text{NH}_2)_2\text{CO}$ is urea which is widely used in Pakistan because it is the most concentrated solid nitrogen fertilizer.
11.	(c) DAP	(DAP Diammonium Phosphate) contains 16% N and 48% $\text{P}_2\text{O}_5 = 75\%$ nutrients.
12.	(d) $\text{ClO}_2$	$\text{ClO}_2$ is chlorine dioxide
13.	(d) Glass	Glass is highly brittle and cannot be recycled.
14.	(c) $\text{CaCO}_3$	$\text{CaCO}_3 \xrightarrow{\Delta} \text{CaO} + \text{CO}_2$
15.	(c) 6 – 200g	Micro nutrients are required in less quantity.

## Additional MCQ's

Q.No	Answer	Reason
1.	(b) Ammonium carbonate	$\text{CO}_2(\text{g}) + 2\text{NH}_3(\text{g}) \longrightarrow \text{NH}_2 - \overset{\text{O}}{\parallel} \text{C} - \text{O} - \text{NH}_4$
2.	(b) Neutralization reaction	$\text{NH}_3(\text{g}) + \text{HNO}_3(\text{g}) \longrightarrow \text{NH}_4\text{NO}_3(\text{s})$ <p><math>\text{NH}_3</math> is base and <math>\text{HNO}_3</math> is an acid.</p>
3.	(a) 33 – 35% nitrogen	% age of N = $28/80 \times 100 = 35\%$
4.	(c) Hygroscopic	Ammonium nitrate is an important fertilizer.
5.	(b) 5.8 = 6.0	The reaction between $\text{NH}_3$ & $\text{H}_3\text{PO}_4$ is neutralization.
6.	(c) Tobacco and Corn	Potassium is necessary for both these crops.
7.	(b) Water	Grinding, in the presence of $\text{H}_2\text{O}$ is done in tube mills.
8.	(d) Calcium sulpho-aluminate	It is $3\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot 3\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
9.	(c) Calcium Hydroxide	These needle shaped crystals get-studded in colloidal gel and imparts strength to it.
10.	(a) Sodium sulphite	Sodium sulphite cooking liquor is buffered with NaOH.
11.	(d) 7 – 9	For this purpose sodium sulphite is buffered with NaOH or $\text{Na}_2\text{CO}_3$ .
12.	(b) Nitrogen and calcium	Boron is micronutrient.
13.	(c) Dispersion of pulp.	One of three important stages in stock preparation plant is the dispersion of the pulp as a slurry in water.
14.	(d) All of these	All of these are done in dryer section of paper making machine.
15.	(a) Flow spreader	It takes pulp and distribute it evenly across the machine.
16.	(d) 6 – 8%	The dried paper is wound in the form of a reel having final moisture of about 6 – 8 %.
17.	(c) It discharges the pulp at screen of fourdrinier table	Head box is pressurized where special suction devices work for the removal of water.
18.	(b) Black liquor	It should remove because it contaminates the pulp.
19.	(d) Lignin	Lignin is an aromatic polymer.
20.	(d) Lignin	Lignin is an aromatic polymer.
21.	(Sodium hypochlorite)	It is used to bleach pulp due to its oxidative nature.
22.	(b) Potassium nitrate	% of N = $14/101 \times 100 = 13.86\%$ which is less than others.
23.	(c) Diammonium phosphate	16% N and 48% $\text{P}_2\text{O}_5$ .
24.	(d) Red lead	Red lead has no connection with cement.
25.	(c) Both N and H	Macronutrients are N, P, K, Ca, Mg, H, C, O, S.

## Short Answers Questions

(Fsd 09, Mtn 12)

1. What are fertilizers? Why are they needed?

Ans. Fertilizers

"The substances which are added to the soil to make up the deficiency of essential elements like nitrogen, phosphorus and potassium (NPK) required for the proper growth of plants are called fertilizers."

Examples: Urea,  $\text{KNO}_3$ , manure,  $\text{NH}_3$ ,  $(\text{NH}_4)_2\text{HPO}_4$  etc.

Need of Fertilizers:

Fertilizers enhance the natural fertility of the soil or replenish the chemical elements taken up from soil by the previous crops.

(Lhr 12, Lhr 11)

2. Classify the elements essential for plant growth.

Ans. Classification of Elements Essential for Plant Growth

Plants need nutrients from the soil for a healthy growth. The elements essential for the plant growth can be classified into following two classes.

Micronutrients	Macronutrients
<ul style="list-style-type: none"> <li>The nutrients which are required in a very small amount for the growth of plants are called micro-nutrients.</li> <li>These include B, Cu, Fe, Mn, Zn, Mo and Chlorine</li> <li>These are generally required in quantities ranging from 6g to 200g per acre.</li> </ul>	<ul style="list-style-type: none"> <li>The nutrients which are required in a very large amount for the growth of plants are called macro-nutrients.</li> <li>These include N, P, K, Ca, Mg, S, C, H and O</li> <li>These are generally required in quantities ranging from 5kg to 200 kg per acre.</li> </ul>

(Fsd 08)

3. What are macro nutrients? Give their names.

Ans. Macro-nutrients

"The nutrients which are required in a very large amount for the growth of plants are called macro-nutrients."

- These includes N, P, K, Ca, Mg, S, C, H and O.
- These are generally required in quantities ranging from 5kg to 200 kg per acre.

(Rwp 09)

4. What are micro nutrients? Give its uses.

Ans. Micro-nutrients

"The nutrients which are required in a very small amount for the growth of plants are called micro-nutrients."

- These includes B, Cu, Fe, Mn, Zn, Mo and Chlorine.
- These are generally required in quantities ranging from 6g to 200g per acre.

(Lhr 12)

5. Write down any four characteristic features for a good fertilizer.

Ans. Features for a good fertilizer

The essential requisites of a good fertilizer are:

- It must be fairly soluble in water so that it thoroughly mixes with the soil.
- It should not be injurious to plant.
- It should be cheap.
- It should not alter the pH of the soil.

6. Write names and formulas of any two nitrogenous fertilizers.

(Fsd 10, Sgr 09)

Ans. Nitrogenous Fertilizers

- Ammonium sulphate  $(\text{NH}_4)_2\text{SO}_4$
- Urea  $(\text{NH}_2)_2\text{CO}$

7. Ammonia acts as fertilizer. Comment

(D.G Khan 10)

Ans. Ammonia  $(\text{NH}_3)$  as a Fertilizer

Ammonia is used in liquid state while all other nitrogen fertilizers are used in the solid form. Anhydrous ammonia has become an important fertilizer for direct application to soil. Ammonia contains 82% nitrogen and it is injected about 6 inches under the surface of the soil, to avoid it from seeping out.

8. Enlist steps involved in the manufacturing of urea.

(Lhr 12, Lhr 11)

Ans. Steps Involved in the manufacturing of urea

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

- |   |                             |
|---|-----------------------------|
| (i) Preparation of Hydrogen             | (ii) Preparation of Ammonia |
| (iii) Preparation of Ammonium Carbamate | (iv) Preparation of Urea    |
| (v) Concentration of Urea               | (vi) Prilling               |

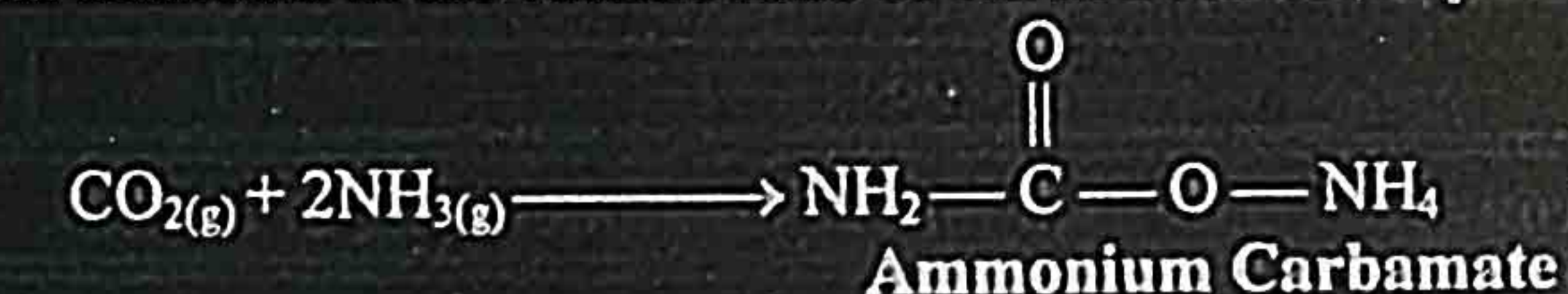
9. Write equation for preparation of:

- Ammonium carbamate from ammonia.
- Urea from ammonium carbamate.

Ans.

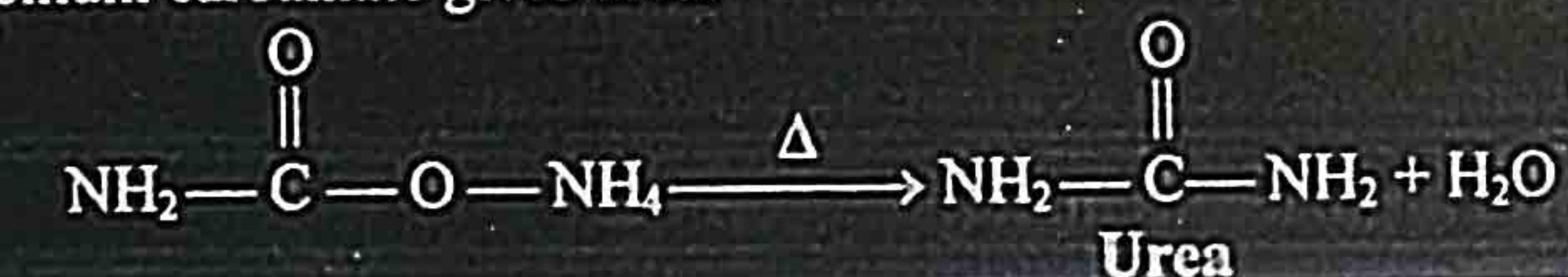
(a) Ammonium carbamate from ammonia

Gaseous  $\text{CO}_2$  is mixed with ammonia in the volume ratio of 1:2 in a reactor to produce ammonium carbamate.



(b) Urea from ammonium carbamate

Dehydration of ammonium carbamate gives urea.



10. Ammonium nitrate is a useful fertilizer for many crops except paddy rice, why?

(Grw 11)

Ans.

It is a useful fertilizer for many crops except paddy rice because the microbial bacteria in flooded fields decompose it to nitrogen gas.

11. How will you prepare diammonium phosphate from ammonia? Also indicate the percentage of  $\text{N}_2$  and  $\text{P}_2\text{O}_5$  present in this fertilizer.

(Lhr 09, 11, Grw 10)

Ans. Preparation of Diammonium Phosphate  $(\text{NH}_4)_2\text{HPO}_4$ 

Anhydrous ammonia gas is reacted with pure phosphoric acid to prepare diammonium phosphate by a continuous process at  $60 - 70^\circ\text{C}$  and pH 5.8 to 6.



It contains 16% nitrogen and 48%  $\text{P}_2\text{O}_5$ .

12. What is the role of phosphorus in plant growth? Give names of some phosphorus fertilizers?

(D.G Khan 09)

Ans. Role of Phosphorus in Plant Growth

- Phosphorus is required to stimulate early growth, to accelerate the seed and fruit formation during the later stages of growth.

- (ii) It also increases the resistance to diseases.

### Phosphatic fertilizers

The two most important water soluble fertilizers are

- (i) Super phosphate (calcium super phosphate)  $\text{Ca}(\text{H}_2\text{PO}_4)_2$   
 (ii) Triple phosphate (diammonium-phosphate)  $(\text{NH}_4)_2\text{HPO}_4$

13. What is the importance of potassium fertilizer?

(D.G Khan 08)

Ans. Importance of Potassium Fertilizers in plant growth

Potassium fertilizers such as  $\text{KNO}_3$  has following role in plant growth

- (i) Potassium is required for the formation of starch, sugar and the fibrous material of the plant.  
 (ii) They increase resistance to diseases and make the plants strong by helping in healthy root development.  
 (iii) They also help in ripening of seeds, fruits and cereals.  
 (iv) Potassium fertilizers are especially useful for tobacco, coffee, potato and corn.

14. What is the composition of lime, silica, alumina and magnesium oxide in a good cement?

(Mtn 12, Lhr 08)

Or Describe the composition of a good cement.

Ans. Composition of a Good Cement

Compound	% age
Lime ( $\text{CaO}$ )	62
Silica ( $\text{SiO}_2$ )	22
Alumina ( $\text{Al}_2\text{O}_3$ )	7.5
Magnesia ( $\text{MgO}$ )	2.5
Iron oxide ( $\text{Fe}_2\text{O}_3$ )	2.5
Sulphur trioxide ( $\text{SO}_3$ )	1.5
Sodium oxide ( $\text{Na}_2\text{O}$ )	1.0
Potassium oxide ( $\text{K}_2\text{O}$ )	1.0

15. Name four argillaceous materials used for the manufacturing of cement.

(Grw 11)

Ans. Argillaceous material

Following Argillaceous materials are used for the manufacturing of cement:

- (i) clay (ii) shale (iii) slate (iv) blast furnace slag  
 They provide acidic components such as aluminates and silicates.

16. What is the function of argillaceous materials in cement?

Ans. Function of Argillaceous material in Cement

Argillaceous material (clay, shale, slate, blast furnace slag) provides acidic components such as aluminates and silicates.

17. What do you know about decomposition zone of rotary kiln?

(Grw 09, Lhr 08)

Ans. Decomposition Zone (Moderate temperature zone)

In the rotary kiln, the charge passes through the different zones of temperature where different reactions take place. The charge takes 2 – 3 hours to complete the journey in the kiln.

In decomposition zone, the temperature goes upto  $900^\circ\text{C}$ . In this zone the limestone ( $\text{CaCO}_3$ ) decomposes into lime ( $\text{CaO}$ ) and  $\text{CO}_2$ .



18. What do you mean by setting of cement?

(Rwp 08)

Ans. Setting of Cement

"Cement paste when combines with water and allowed to stand for sometime then the resulting mass becomes hard and very resistant to pressure. This process is known as setting of cement."

The use of cement in the construction of building is based on its property of setting to a hard mass.

19. Describe the reactions taking place during setting of cement in first 24 hours.

(Sgr 09, Fsd 10, Grw 09)

Ans. Reactions Taking Place in First 24 Hours

A short time after the cement is mixed with water, tricalcium aluminate absorbs water (hydration) and forms a colloidal gel of the composition,  $3\text{Ca} \cdot \text{Al}_2\text{O}_3 \cdot 6\text{H}_2\text{O}$  (hydrated tri calcium aluminate).

This gel starts crystallizing slowly, reacts with gypsum ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ) to form the crystals of calcium sulpho-aluminate ( $3\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot 3\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ).

20. What reactions takes place in the setting of cement from one to seven days?

(Fsd 12)

Ans. Reactions Taking Place Between 1 to 7 Days

- Tri-calcium silicate ( $3\text{CaO} \cdot \text{SiO}_2$ ) and tricalcium aluminate ( $3\text{CaO} \cdot \text{Al}_2\text{O}_3$ ) get hydrolyzed to produce calcium hydroxide and aluminium hydroxide.
- The calcium hydroxide, thus formed, starts changing into needle-shaped crystals, which get studded in the colloidal gel and impart strength to it.
- Alumimin hydroxide, on the other hand, fills the interstices resulting in hardening the mass. The gel formed starts losing water partly by evaporation and sets to a hard mass.

21. Define paper. Give important raw material for the manufacture of paper.

(Fsd 12)

Ans. Paper

"A sheet material made up of a network of natural cellulosic fibres which have been deposited from an aqueous suspension is called paper." The product obtained is a network of interwinning (interlocking) fibres.

### Raw Material

The main raw materials used in the production of pulp and paper in Pakistan is of two types, that is non-woody and woody raw materials.

Non-Woody Raw Materials				Woody Raw Materials	
(i)	Wheat straw	(vi)	Cotton stalk	(i)	Poplar (hard wood)
(ii)	Rice straw	(vii)	Cotton linter	(ii)	Eucalyptus (hard wood)
(iii)	Bagasse	(viii)	Kahi grass	(iii)	Douglas fir (soft wood)
(iv)	Bamboo	(ix)	Grasses		
(v)	Rag				

22. What are the four non-woody raw materials used in the production of paper?

(Grw 09)

Ans. Non-Woody Raw Materials

- (i) Wheat straw (ii) Cotton stalk  
 (iii) Rice straw (ii) Rag

23. What are the principal methods of chemical pulping used for the production of paper? Which one is best and why?

Ans. Pulping processes

The following are three principal methods of chemical pulping and are used for the production of paper pulps.

- (i). Kraft process (Alkaline)  
 (ii). Sulphite process (Acidic)  
 (iii). Neutral Sulphite Semi Chemical process (NSSC)

### Best Method of Chemical Pulping

The neutral sulphite semi chemical process has come to occupy the dominant position because of the advantages in chemical recovery and pulp strength.