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**Unit - IV Anna University Two marks Questions and Answers****1. How do you remove iron and manganese from water? [NovDec2010]**

Iron and manganese from water can be removed by Physical process (Unit operations) and Chemical process (Unit Process)

**Physical process (Unit Operation)**

Aeration

**Chemical process (Unit Process)**

Chemical Oxidation using Chlorine dioxide, potassium permanganate and ozone  
Manganese Zeolite Filters

**2. Describe about the term water softening? [NovDec2010]**

Reduction or removal of hardness from water is known as water softening.  
Types of hardness are permanent and temporary hardness

**3. State the objectives of aeration process in water treatment? [AprMay2011]**

Objectives of aeration are to remove dissolved gases, such as carbon dioxide, hydrogen sulfide, and to oxidize dissolved metals iron and manganese. It can also be used to remove volatile organic chemicals (VOC).

**4. Mention any four methods of desalination process? [AprMay2011]**

- (i) Desalination by evaporation and distillation
- (ii) Electrodialysis
- (iii) Reverse osmosis
- (iv) Freezing process
- (v) Solar distillation method

**5. List the pollutants get removed in an aerator? [NovDec2011]**

Carbon dioxide, Hydrogen sulfide (rotten-egg odour), Methane (flammable), Iron (will stain clothes and fixtures), Manganese (black stains), Volatile organic chemicals, Various chemicals causing taste and odour

**6. Name the methods of defluoridation? [NovDec2011], [MayJun2014], [NovDec2014], [AprMay2015]**

- Prashanthi technique using adsorption by activated alumina
- Ion exchange adsorption method
- Nalgonda technique
- Reverse osmosis process

**7. List out the unit process applied to remove iron and manganese from water? [AprMay2012]****Chemical process (Unit Process)**

Chemical Oxidation using Chlorine dioxide, potassium permanganate and ozone  
Manganese Zeolite Filters

**8. What is reverse osmosis? [AprMay2012]**

The natural osmotic pressure is opposed by exerting an external pressure on the side containing the salt solution which forces pure water from the salt solution to move across the membrane towards the side containing water this process is called as reverse osmosis

**9. What is the maximum permissible limit of fluoride in drinking water? [NovDec2012]**

Acceptable limit of Fluoride in drinking water is 1mg/l

**10. How do you protect water treatment plant from corrosion? [NovDec2012]**

- Cathodic protection by making pipe line as cathode and separate scrap iron as anode using DC power supply
- Sacrificial Anodic protection by attaching zinc, aluminum and magnesium no need for power supply
- Control of internal corrosion by protective coatings and water treatment

**11. Mention the types of aerators used in water treatment? [MayJun2013]**

(i) Gravity aerators (water into the air), (ii) Spray aerators (water into the air), (iii) Diffusers (air into the water), and (iv) Mechanical aerators (air into the water)

**12. Any four effects of hardness in water? [MayJun2013]**

Hardness in water,

- Causes more consumption of soap in laundry work
- Affects dyeing of textiles
- Causes difficulties in paper, canning, ice and rayon industry
- Causes choking and clogging of pipes
- Causes scaling in boilers and heaters
- Makes food tasteless, tough or rubbery

**13. Write down the principle of desalination of water? [NovDec2013]**

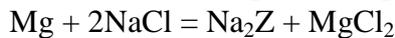
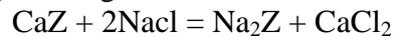
Desalination is the process of removing dissolved salts from water, thus producing fresh water from seawater or brackish water. Salts are present in water as hydrated  $\text{Na}^+$  cation and  $\text{Cl}^-$  anion. Removing hydrated salt ions from water through physical or chemical process is the principle of desalination.

Distillation:  $\text{Na}^+ (\text{aq}) + \text{Cl}^- (\text{aq}) + \text{heat} = \text{NaCl}(\text{solid}) + \text{H}_2\text{O}(\text{gas})$   
 $\text{H}_2\text{O}(\text{gas}) + \text{Condensation} = \text{H}_2\text{O}(\text{liquid})$

Freezing:  $\text{Na}^+ (\text{aq}) + \text{Cl}^- (\text{aq}) + \text{freezing} = \text{NaCl}(\text{concentrated solution}) + \text{H}_2\text{O}(\text{ice crystals})$   
 $\text{H}_2\text{O}(\text{ice crystals}) + \text{Heat} = \text{H}_2\text{O}(\text{liquid})$

**14. How do you regenerate softener? [NovDec2013], [MayJun2014]**

Water softeners can be regenerated by treating with 5-10% solution of sodium chloride

**15. Distinguish between physical adsorption and chemical adsorption? [NovDec2014]**

Physical Adsorption	Chemical Adsorption
The forces operating in these are weak vander Waal's forces	The forces operating in these cases are similar to those of a chemical bond.
Takes place at low temperature and decreases with increase in temperature	Takes place at high temperature
Heat of adsorption is low	Heat of adsorption is high
It forms multimolecular layer	It forms monomolecular layer

**16. What is meant by adsorption isotherm? [AprMay2015]**

The adsorption isotherm is an equation relating the amount of solute adsorbed onto the solid and the equilibrium concentration of the solute in solution at a given temperature.

$$q_e (\text{mg/g}) = \frac{C_0 - C_e}{C_{\text{solid}}}$$

$q_e$  = equilibrium concentration of a solute on the surface of an adsorbent

$C_e$  = concentration of the solute in the liquid