Unit - III Anna University Two marks Questions and Answers

1.Differentiate between unit operations and unit process in context of water treatment? (NOVDEC 2010), (NOVDEC 2012)

Unit operations	Unit process
Unit operations are primary treatment of water which uses physical forces to create the desirable changes during water treatment	Unit processes are secondary treatment of water which uses chemicals to get desirable changes during water treatment
Unit operations causes physical change to the water to be treated	Unit process causes chemical changes to the water treated
Unit operations are mixing, agitating, aeration, absorption, membrane separation, distillation, sedimentation and filtration	Unit processes are oxidation, nitrification, coagulation, chlorination and disinfection

2. What is the significance of velocity gradient in flash mixer? (NOVDEC 2010), (MAYJUN 2012), (MAYJUN 2014)

- Velocity gradient determines how much the water is agitated in the flash mixer
- Velocity gradient determines how much energy is used to operate the flash mixer
- Velocity gradient defines rate of change of velocity per unit distance normal to a section

3.State stokes equation for finding settling velocity of particles? (APRMAY 2011)

$v_s = \frac{g\, d^2}{18v} (G-1)$

v_s = velocity of particle settling
g = acceleration due to gravity
d = diameter of the particle
G = specific gravity of the particle
v = kinematic viscosity of particle

4.On what factors does the dose of coagulants depend? (APRMAY 2011)

Temperature, turbidity, colour, pH-value, alkalinity, nature of coagulant, intensity and duration of stirring during flash mixing and flocculation

5.Give the design criteria for flash mixer and state its use in water supply scheme? (NOVDEC 2011)

Design criteria:

Impeller speed is between 100 to 250 rpm
Detention time of 30 to 60 seconds is practised
Flash mixer units are circular or square tanks with height to diameter ratio of 1:1 to 3:1
Mean velocity gradient (G) is kept above 300 s^{-1} to 900 s^{-1}
Power requirements are from 1 to 3 watts per m^3/hr of flow
Ratio of impeller diameter to tank diameter is 0.2:1 to 0.4:1

Uses:

In Flash mixer coagulant is agitated vigorously by a paddle operated by a variable speed motor

6.What are the factors influencing the settling of a particle? (NOVDEC 2011), (MAYJUN 2015)

- The velocity of flow which carries the particle horizontally
- The viscosity of water in which the particle is travelling
- The size shape and specific gravity of the particle
- Temperature of water
- Short circuiting
- Scour velocity
- Flocculation of particles

7.Differentiate between sterilisation and disinfection? (MAYJUN 2012)

Sterilisation	Disinfection
Total destruction of disease-causing germs and other organisms.	Killing disease causing bacteria to obtain safe drinking water is known as disinfection
physical methods are used mostly to achieve sterilization	Chemical methods are mostly preferred to achieve disinfection
Types of sterilisations are Moist heat in autoclaves, Dry-heat in ovens, Gamma irradiation, Filtration, Plasma sterilization	Types of disinfections are treatment with chlorine, ozone, UV, and potassium permanganate

8.What are the advantages of chlorine as disinfectant? (NOVDEC 2012)

- Kills germs and disease causing bacteria effectively
- Cheap and easily available
- Can be stored for long periods
- Prevention of algal growths
- Taste and odor control

9.Define: Detention time and surface over flow rate for a sedimentation tank? (MAYJUN 2013)

Detention time is theoretical time taken by a particle of water to pass between entry and exit of the settling tank

$t_0 = \frac{\text{Volume of tank}}{\text{Rate of flow}}$

Rectangular tank $t_d = \frac{BLH}{Q}$

Circular tank $t_d = \frac{d^2(0.011d + 0.785H)}{Q}$ d = diameter of tank, H = depth at wall

Actual detention period should be twice as the theoretical detention period

Surface loading rate or surface over flow rate

The quantity of water passing per hour per unit horizontal area is known as the over flow rate or surface loading.

$\text{SOR or SLR} = \frac{Q}{A}$

10.What are the tests to be done to find the residual chlorine in water? (MAYJUN 2013)

Orthotolidine test
D.P.D test
Chlorotex test
Starch Iodide test

11.How to manage the residue in water treatment plant? (NOVDEC 2013)

Land filling, horticulture use, disposal to waste water treatment plant, deep well injection, regeneration of coagulants, incineration

12.List out advantages of rapid sand filter? (NOVDEC 2013)

- High filtration rate 3000 to 6000 litres/m^2/hr
- Occupies less area when compared to slow sand filter
- Less initial cost when compared to slow sand filter
- Flexible in operations to meet varying water demand

13.What is break point chlorination? (MAYJUN 2014), (NOVDEC 2014)
Chlorine when added to water reacts with ammonia to form chloramines. Addition of excess chlorine till all bacteria's are killed and organic matters are oxidised results in break point. Beyond break point chlorine appears as residual chlorine in water which is called as break point chlorination.
Residual chlorine limit is 0.2 to 0.3 mg/l

14.What is the significance of velocity gradient in flocculator design? (NOVDEC 2014)
- Velocity gradient determines how much the water is agitated in the flocculator
- Velocity gradient determines how much energy is used to operate the flocculator
- Velocity gradient defines rate of change of velocity per unit distance normal to a section

15.Enumerate the mechanism of disinfection process? (AprMay 2015)
Mechanism of disinfection may be chemical or physical which are tabulated below

Chemical agents	**Physical methods**
Alcohols Aldehydes Halogens Phenols Surfactants Heavy metals Dyes Oxidants	Boiling and pasteurization Ultraviolet radiation