EN8491 WATER SUPPLY ENGINEERING

CIVIL - FIFTH SEMESTER

REG. 2017

UNIT I SOURCES OF WATER

TOPIC 1.1 PUBLIC WATER SUPPLY SYSTEM - PLANNING, OBJECTIVES, DESIGN PERIOD, POPULATION FORECASTING;

1. The size of suspended solids lies in the range of _____
a) $10^{-3} – 10^{-6}$ mm
b) $10^{3} – 10^{6}$ mm
c) $10^{-1} – 10^{-3}$ mm
d) $10^{1} – 10^{3}$ mm

Answer: c
Explanation: Size of suspended solids – $10^{-1} – 10^{-3}$ mm, size of colloidal solids – $10^{-3} – 10^{-6}$ mm, size of dissolved solids < 10^{-6} mm.

2. Suspended solids are measured by which of the following?
a) Turbidity rod
b) Gravimetric test
c) Chromatography
d) Jackson's turbidity meter

Answer: b
Explanation: Turbidity rod and Jackson's turbidity meter is used to find turbidity whereas chromatography is used to detect odour. Hence b is the correct answer.

3. The maximum permissible limit for suspended solids is _____
a) 10 mg/l
b) 20 mg/l
c) 30 mg/l
d) 40 mg/l

Answer: c
Explanation: The maximum permissible limit for suspended solids is 30mg/l for testing waste water which is set by the Environmental Protection Agency (EPA).

4. Identify the correct relation between the following?
a) Dissolved solid = Total solid + Suspended solid
b) Dissolved solid = Total solid – Suspended solid
c) Total solid = Dissolved solid / Suspended solid
d) Dissolved solid = Suspended solid – Total solid

Answer: b
Explanation: Dissolved solid is the difference between total solid and suspended solid. Suspended solid is non-filterable solid whereas dissolved solid is filterable solid.

5. Which method is used to measure the color of water?
a) Gravimetric analysis
b) Chromatography
c) Tintometer method
d) Hydrometer analysis

Answer: c
Explanation: The colors in water are measured by Tintometer method. It is measured on Burgess scale or cobalt scale by Nessler's tube.

6. 1 TCU (True Color Unit) is equivalent to _____
a) The color produced by 1 g of platinum cobalt
b) The color produced by 1 mg of platinum cobalt
c) The color produced by 1 mg of platinum cobalt in 1L of distilled water
d) The color produced by 1 mg of platinum cobalt in 1mL of distilled water

Answer: c
Explanation: 1 TCU (True Color Unit) is equivalent to color produced by 1 mg of platinum cobalt in 1L of distilled water. The true color unit is also called a Hazen unit.

7. The range for threshold odour number is _____
a) 0-3
b) 1-5
c) 1-3
d) 0-5

Answer: c
Explanation: The maximum value of Threshold odour number is 3 and its range is 1-3. The threshold odour number is used to measure the intensity of taste and odour.

8. Threshold odour number testing is preferred in hot water.
a) True
b) False

Answer: b
Explanation: TON testing is preferred in cold water as in hot water due to increase in temperature, taste and odour can change.

9. One JTU is equivalent to turbidity produced by _____
a) 1mg of fine silica dissolved in 1L of distilled water
b) 1g of fine silica dissolved in 1L of distilled water
c) 1g of fine silica dissolved in 1ml of distilled water
d) 1mg of fine silica dissolved in 1ml of distilled water

Answer: a
Explanation: 1 JTU is equivalent to turbidity produced by 1mg of fine silica dissolved in 1L of distilled water. It is called as Jackson's turbidity unit and is based on the absorption principle.

10. If the PO value is 6, what does it imply?
a) No perceptible odour
b) Very faint odour
c) Very distinct odour
d) Extremely strong odour

Answer: d
Explanation: The PO value indicates the odour intensity. 6 is the maximum PO value and it indicates extremely strong odour.

11. The range of temperature of water that is required to do the temperature test is _____
a) 10-25^{0}C
b) 0-25^{0}C
c) 10-30^{0}C
d) 20-30^{0}C

Answer: a
Explanation: To do the temperature test of water, its temperature should be between 10^{0}C and 25^{0}C and the temperature higher than 25^{0}C is considered objectionable.

12. Which of the following statement is wrong regarding turbidity?
a) It is an extent to which light is absorbed by particles in the water
b) It is expressed in ppm
c) It depends on the fineness of particle

present in the water
d) Turbidity rod is a laboratory method to measure turbidity

Answer: d
Explanation: Turbidity rod is a field method not a laboratory method to measure turbidity.

13. The permissible limit of turbidity of domestic water is ____ ppm.
a) 5-10
b) 1-5
c) 10-50
d) 10-30

Answer: a
Explanation: According to WHO, the permissible limit for drinking water is 5NTU.

14. What is the full form of NTU in context with turbidity?
a) Number of transfer unit
b) Neurological turbidity unit
c) Nephelometric turbidity unit
d) Network terminal unit

Answer: c
Explanation: The value of turbidity measured by nephelometer is expressed in terms of NTU. Sometimes, it is referred as FTU or Formazin turbidity unit.

15. When depth of insertion of turbidity rod increases, the reading in the turbidity rod ___
a) Decreases
b) Increases
c) First decrease, then increase
d) Remains constant

Answer: a
Explanation: Turbidity rod is inserted inside the water and the reading at which needle becomes invisible gives the turbidity.

TOPIC 1.2 WATER DEMAND - SOURCES OF WATER AND THEIR CHARACTERISTICS

1. The average quantity of water (in lpcd) required for domestic purposes according to IS code is _____
a) 100
b) 120
c) 70
d) 135

Answer: d
Explanation: The average domestic water demand in India is 135 litres per capita per day. For developed countries, average domestic water demand is around 340 lpcd because they live a luxurious life.

2. The average consumption of water required in factories in lpcd is _____
a) 10-15
b) 20-30
c) 30-45
d) 70-80

Answer: c
Explanation: The average water consumption in factories is 30lpcd when no bathrooms are required and 45lpcd when bathrooms are required.

3. In which type of water demand, minimum average consumption of water takes place?
a) Domestic water demand
b) Industrial water demand
c) Institutional and commercial water demand
d) Fire demand

Answer: d
Explanation: The minimum average water consumption takes place in fire demand. It accounts to 1lpcd which is very less but this water is required in very less duration.

4. What is the minimum water pressure available at fire hydrants?
a) 80-100kN/m^2
b) 100-150kN/m^2
c) 40-60kN/m^2
d) 150-200kN/m^2

Answer: b
Explanation: The minimum water pressure available at fire hydrants is 100-150kN/m^2 i.e 10-15m of water head and it should be maintained for 4 to 5 hours.

5. Match list 1(calculation of fire demand) with list 2 (formulae) and select the correct answer using the codes given below.

List 1	List 2
A. Kuchling's Formula	1) Q = 3182√P
B. Freeman's Formula	2) Q = 1136[P/5 +10]
C. Buston's Formula	3) Q = 5663√P
D. Central Congested High Value City	4) Q = 4637√P[1-.01√P]

where Q = quantity of water, P = population in thousands

CODE

	A	B	C	D
a)	1	2	3	4
b)	2	3	4	1
c)	2	1	4	3
d)	1	2	4	3

Answer: a
Explanation: Kuchling's formula is used when the population of the city exceeds 50,000.
When the population of the city is less than 2 lakh, the above formula for central congested high value city is used.

6. What is the fire demand of the city of 1lakh population by Buston's formula?
a) 5663
b) 56630
c) 566300
d) 5663000

Answer: b
Explanation: By Buston's formula, Q = 5663√P where P in thousands. Here, P =100, Q = 5663√100 => Q = 56630.

7. Water lost in theft and waste contributes to how much % of total consumption?
a) 5
b) 10
c) 15
d) 20

Answer: c
Explanation: Water loss in thefts and wastes contributes to 15% of total consumption, which includes the water loss due to leakage or stolen due to illegal connection.

8. Which is the correct statement regarding per capita demand?
a) Daily water required by an individual
b) Water required for various purposes by a person
c) Water required by an individual in a year
d) Annual average amount of daily water required by one person

Answer: d
Explanation: The per capita demand is the annual average amount of daily water required by one person. It is denoted by q in litres per day per person.

9. What are the factors affecting per capita demand?
a) Size of city
b) Size of city, habit of people
c) Cost of water, quality of water, size of city
d) Cost of water, quality of water, size of city, habit of people

Answer: d
Explanation: Increase in cost of water, quality of water and size of the city will result in more consumption of water. Poor habits of people in the utilization of water will also cause greater consumption.

10. Which of the following statement is correct?
a) Rich class consumes less water
b) Intermittent water supplies leads to less water consumption

c) Loss of water is more if the pressure in the distribution system is less
d) Water consumption is less in flush system

Answer: b
Explanation: Rich class consumes more water, loss of water is more if the pressure in distribution system is more, water consumption is more in flush system and b option is the only correct statement.

11. If the annual average hourly demand of the city is 10000m3, what is the maximum hourly consumption?
a) 2700 m^3
b) 27000 m^3
c) 270000 m^3
d) 2700000 m^3

Answer: a
Explanation: Maximum hourly demand = 2.7 * annual average hourly demand
= 2.7 * 10000
= 27000m^3.

12. If in a city, the maximum daily draft is 25MLD, fire draft is 35MLD and maximum hourly draft is 40MLD, what is the coincident draft?
a) 60MLD
b) 40MLD
c) 25MLD
d) 35MLD

Answer: a
Explanation: Maximum daily draft +fire draft = 25 + 35 = 60MLD
Maximum hourly draft = 40MLD
Coincident draft is maximum of maximum draft draft + fire draft and maximum hourly draft =60MLD.

13. What is the design period for the water treatment unit?
a) 10 years
b) 15 years
c) 20 years
d) 30 years

Answer: b
Explanation: Water treatment unit is designed for 15 years and its design discharge is maximum daily demand.

14. What is the design discharge for intake structures?
a) Maximum daily demand
b) Maximum hourly demand
c) Maximum weekly demand
d) Average daily demand

Answer: a
Explanation: Intake structures and the pipe mains that carry water from intake structures to treatment plant are designed for maximum daily demand.

15. In which of the following units, design period is maximized?
a) Distribution system
b) Demand reservoir
c) Water treatment unit
d) Pipe mains

Answer: b
Explanation: Distribution system is designed for 30 years, the demand reservoir for 50 years, the water treatment unit for 15 years and the pipe mains for 30 years.

A	B	C	D
1	2	3	4
2	3	4	1
2	1	4	3
1	2	4	3

TOPIC 1.3 SURFACE AND GROUNDWATER - IMPOUNDING RESERVOIR

1. A dam reservoir which is not provided with gate controls on its spillway and other sluices is called _____
a) detention dam

b) storage reservoir
c) retarding basin
d) flood control reservoir

Answer: c
Explanation: Storage reservoir is the one having gates and valves installed at its spillway and at its sluice outlets. The retarding basin is the one with uncontrolled and ungated outlets. The cost of gate installation is saved and there are no gates hence, the possibility of human error and negligence in their operation is eliminated.

2. A hydel power project has been envisaged to serve the water supply and irrigation needs of the area at its inception stage. The dam reservoir so constructed is known as _____
a) multipurpose reservoir
b) single-purpose reservoir
c) distribution reservoir
d) retarding reservoir

Answer: a
Explanation: A reservoir planned and constructed to serve various purposes together is a multipurpose reservoir. It is designed to protect the downstream areas from floods, to conserve water, irrigation, industrial needs, hydroelectric purposes, etc. Bhakra dam and Nagarjuna Sagar dam are important multipurpose dams.

3. A dam reservoir catering to flood control, irrigation, and water supply basically designed for irrigation alone is a _____-
a) multipurpose reservoir
b) single-purpose reservoir
c) distribution reservoir
d) retarding basins

Answer: b
Explanation: A reservoir planned, designed and constructed for one purpose is called a single purpose reservoir whereas a reservoir planned and constructed to serve various purposes together is a multipurpose reservoir. A small storage reservoir constructed within a city water supply system is called distribution reservoir

4. Which reservoir is also known as Mitigation reservoir?
a) Conservation reservoir
b) Flood control reservoir
c) Multipurpose dam
d) Storage reservoir

Answer: b
Explanation: A flood control reservoir protects the downstream areas by storing a portion of the flood flows to minimize the flood peaks. The entire inflow entering the reservoir is discharged or gradually released to recover the capacity for the next flood. It is also called as a mitigation reservoir.

5. A reservoir having gates and valves installation at its spillway and at its sluice outlets _____
a) storage reservoir
b) retarding basin
c) both storage and retarding reservoir
d) distribution reservoir

Answer: a
Explanation: Storage reservoir is the one having gates and valves installed at its spillway and at its sluice outlets whereas retarding basin is the one with uncontrolled and ungated outlets. It provides more flexibility in operation and better control.

6. Which reservoir is helpful in permitting the pumps or the water treatment plants to work at a uniform rate?
a) Storage reservoir
b) Detention reservoir
c) Multipurpose reservoir
d) Distribution reservoir

Answer: d
Explanation: A small storage reservoir constructed within a city water supply system

is called a distribution reservoir. It stores water during hours of no demand or less demand and supply water from their storage during the critical time of maximum demand.

7. In which of the following reservoir the flood crest downstream can be better controlled and regulated properly?
a) Distribution reservoir
b) Multipurpose reservoir
c) Storage reservoir
d) Retarding reservoir

Answer: c
Explanation: Storage reservoirs are preferred on large rivers and require better control. It is provided with gated spillway and sluiceways for more flexibility of operation, better control and to increase the usefulness of the reservoir.

8. What are the types of flood control reservoirs?
a) Multipurpose reservoir and Single purpose reservoir
b) Storage reservoir and retarding reservoirs
c) Distribution reservoir and Storage reservoir
d) Distribution reservoir and multipurpose reservoir

Answer: b
Explanation: There are two basic types of flood-mitigation reservoirs i.e. storage reservoir and retarding reservoirs. Storage reservoir is the one having gates and valves installed at its spillway and at its sluice outlets whereas the retarding basin is the one with uncontrolled and ungated outlets.

9. As the reservoir elevation increases, the outflow discharge increases.
a) True
b) False

Answer: a
Explanation: When floods occur the reservoir gets filled and discharges through sluiceways and the water level goes on rising until the flood has subsided. The inflow becomes equal or less than the outflow. The water gets completely withdrawn until the stored water is completely discharged.

10. The maximum discharging capacity of a retarding reservoir should not be equal to the maximum safe carrying capacity of the channel downstream.
a) True
b) False

Answer: b
Explanation: Since the retarding reservoir is not always filled much of the land below the maximum reservoir level will be submerged only temporarily and occasionally. The automatic regulation of outflow depends upon the availability of water. The maximum discharging capacity should be equal to the maximum safe capacity of the channel d/s.

TOPIC 1.4 DEVELOPMENT AND SELECTION OF SOURCE - SOURCE WATER QUALITY

1. Which of the following can be identified as the objective of water supply scheme?
a) Chlorination of water
b) Treat water
c) Safe water supply
d) Ionization of water

Answer: c
Explanation: In general, the objective of water supply scheme includes safe water supply, sufficient quantity of water, supply of water to a convenient point with reasonable cost and encouraging personal and house hold cleanliness of the users.

2. Which of the following indicates the component of a water supply scheme?
a) Impure water
b) Chlorination of water
c) Sub surface water
d) Intake of the water

Answer: d
Explanation: The protected water supply scheme consists of four components. Those include the source of water from where it is being produced, intake of the water, treatment of the water and finally the distribution of the treated water.

3. Surface water can act as a source of water in water supply scheme.
a) True
b) False

Answer: a
Explanation: The source of water is classified as surface water and sub surface water. Generally in the water supply scheme surface water is having more priority than the sub surface water. The different sources of surface water include river, streams, lakes, canals etc.

4. While considering the design period, which must be given more priority?
a) Area of land
b) Population
c) Usage of water
d) Arrangement of pipes

Answer: b
Explanation: Design period is considered based on the population present in a particular area. While considering design period, population forecast methods has to be used for the determination of the upcoming population in that area. By doing this the design period can be estimated for a particular water tank construction.

5. The design period of storage reservoir can be given as _____
a) 50 yr
b) 20 yr
c) 30 yr
d) 10 yr

Answer: a
Explanation: Every water storage structure is having certain design periods based on the population present in that particular area. A storage reservoir is generally having a design period of 50 years.

6. Which of the following can be designated as an intake structure?
a) Culvert
b) River
c) Dam
d) Reservoir

Answer: d
Explanation: Intakes are the structures which can collect water from the surface sources and are used for the treatment plant. Reservoir intake, Lake Intake and canal intakes are some of the examples of an intake structure.

7. Which type of water is generally used in the treatment of water?
a) Chlorinated water
b) Treated water
c) Raw water
d) Sulphated water

Answer: c
Explanation: Water treatment plant generally uses raw water which is obtained from different sources containing various impurities. It is not recommended to be used directly without treatment and hence it is supplied to the treatment plant for treatment.

8. Which of the following does not act as a major factor that effects per capita demand?
a) Human activity
b) Industrial activities
c) Usage of water
d) Placement of pipe

Answer: b
Explanation: The factors effecting per capita demand include cost of water, climatic condition, pressure in the distributed system, industrial activities, commercial activities and economical status of the consumers.

9. The amount of water required for 1 percent per day is determined as _____
a) Daily demand
b) Monthly demand
c) Annual demand
d) Per capita demand

Answer: d
Explanation: Per capita demand can be defined as the amount of water required for 1 percent per day. It includes commercial, industrial, domestic, public uses and also in case of fire demand.

10. Which of the following can act as a type of variation in water demand?
a) Monthly variation
b) Annual variation
c) Crop variation
d) 10 year variation

Answer: a
Explanation: Variation in water demand is generally due to seasonal variation, monthly variation, daily and hourly variations. The demand for water in these variations is generally high and consumes more amount of water than daily consumption.

TOPIC 1.5 CHARACTERIZATION - SIGNIFICANCE - DRINKING WATER QUALITY STANDARDS.

1. The Clean Water Act (CWA) regulates _____
a) Discharge of pollutants into the waters of the United States
b) Discharge of pollutants into the waters of the United Kingdom
c) Discharge of pollutants into the air of the United States
d) Discharge of pollutants into the waters of India

Answer: a
Explanation: Under the CWA, EPA has implemented pollution control programs, such as setting wastewater standards for industry and water quality standards for all contaminants in surface waters.

2. Section _____ of CWA regulates discharges of hazardous substances.
a) 311(b)(2)(B)
b) 311(b)(2)(A)
c) 312(b)(2)(A)
d) 311(b)(1)(A)

Answer: b
Explanation: Section 311(b)(2)(A) of CWA regulates discharges of hazardous substances, which also includes formaldehyde. The list of designated hazardous substances is found at 40 CFR 116.4.

3. The CWA made it unlawful to discharge any pollutant from a point source into navigable waters, unless a permit was obtained.
a) True
b) False

Answer: a
Explanation: EPA's National Pollutant Discharge Elimination System (NPDES) permit program controls discharges. Industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters.

4. The Federal Water Pollution Control Act of 1948 was the first major U.S. law to address water pollution.
a) 1945
b) 1946
c) 1947
d) 1948

Answer: d
Explanation: The Federal Water Pollution Control Act of 1948 grew public awareness

and concern for controlling water pollution led to sweeping amendments in 1972.

5. The Federal Water Pollution Control Act of 1948 became CWA.
a) False
b) True

Answer: b
Explanation: The Federal Water Pollution Control Act of 1948 was the first key U.S. law to address water pollution, it was amended in 1972 and the law Clean Water Act (CWA).

6. The CWA reduced the amount of pollution from _____
a) Point sources
b) Non-point sources
c) Chemicals
d) Mining

Answer: a
Explanation: The Clean Water Act has been accredited with pointedly reducing the amount of pollution that enters the U.S. waterways from point sources, municipal and industrial discharges.

7. The discharge of regulated chemicals into surface waters is controlled by _____
a) SARA
b) CERCLA
c) NPDES
d) PDAC

Answer: c
Explanation: The discharge of regulated chemicals into surface waters is controlled by the National Pollutant Discharge Elimination System (NPDES) which entails contaminators to obtain federal permits for each chemical they discharge.

8. The maximum amount of pollution that each waterway could absorb is known as _____
a) TMDL
b) TSML
c) TDSML
d) TDS

Answer: a
Explanation: The TMDL establishes a target for total load of pollutant the water body can assimilate and allocates the load to point sources which are known as the waste load allocation and nonpoint sources known as the load allocation.

9. _____ requires EPA to establish regulations to protect human health from contaminants present in drinking water.
a) SAWD
b) SDWA
c) ASAW
d) SWSA

Answer: b
Explanation: The Safe Drinking Water Act (SDWA) permits EPA to develop national drinking water standards and safeguard agreement with these standards, and guides EPA to protect underground sources of drinking water through the regulation of underground injection of fluids to prevent pollution.

10. Who is responsible for the clean-up of oil spill?
a) HWS
b) APS
c) Oil Pollution Act
d) SARA

Answer: c
Explanation: The CWA and the Oil Pollution Act provide federal authority to prevent, respond to and clean up an oil spill or the threat of an oil spill.

11. Which section of CWA regulates land disposal of sludge?
a) Section 402
b) Section 403

c) Section 404
d) Section 405

Answer: d
Explanation: Section 405 of the CWA regulates the land application and the land disposal of sludge – the solid, semisolid or liquid untreated residue generated during the treatment of domestic sewage in a treatment facility.

12. Which CWA program controls water pollution by regulating point sources?
a) SPCC
b) PCC
c) NPDES
d) PDA

Answer: c
Explanation: The NPDES program controls water pollution by regulating point sources that discharge pollutants into the waters of the United States.

13. Which section of CWA is responsible for monitoring of wetlands?
a) Section 402
b) Section 403
c) Section 404
d) Section 405

Answer: c
Explanation: Section 404 of the CWA establishes a program to regulate the discharge of dredged or fill material into waters of the United States, including wetlands.

14. Which CWA program manages non-point source pollution?
a) NPSMP
b) NSPPP
c) NSGOP
d) NPSRA

Answer: a
Explanation: The CWA under Section 319 established the Nonpoint Point Source (NPS) Management Program to manage nonpoint sources of pollution.

15. When did CWA come into existence?
a) 1970
b) 1971
c) 1972
d) 1973

Answer: c
Explanation: CWA was enacted in 1948 and was called the Federal Water Pollution Control Act, but the Act was suggestively reorganized and expanded in 1972. Federal Water Pollution Control Act became the Clean Water Act with amendments in 1972.

UNIT II CONVEYANCE FROM THE SOURCE

TOPIC 2.1 WATER SUPPLY - INTAKE STRUCTURES - FUNCTIONS

1. Which of the following can be identified as the objective of water supply scheme?
a) Chlorination of water
b) Treat water
c) Safe water supply
d) Ionization of water

Answer: c
Explanation: In general, the objective of water supply scheme includes safe water supply, sufficient quantity of water, supply of water to a convenient point with reasonable cost and encouraging personal and house hold cleanliness of the users.

2. Which of the following indicates the component of a water supply scheme?
a) Impure water
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c) Sub surface water
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Answer: d
Explanation: The protected water supply scheme consists of four components. Those include the source of water from where it is being produced, intake of the water, treatment of the water and finally the distribution of the treated water.

3. Surface water can act as a source of water in water supply scheme.
a) True
b) False

Answer: a
Explanation: The source of water is classified as surface water and sub surface water. Generally in the water supply scheme surface water is having more priority than the sub surface water. The different sources of surface water include river, streams, lakes, canals etc.

4. While considering the design period, which must be given more priority?
a) Area of land
b) Population
c) Usage of water
d) Arrangement of pipes

Answer: b
Explanation: Design period is considered based on the population present in a particular area. While considering design period, population forecast methods has to be used for the determination of the upcoming population in that area. By doing this the design period can be estimated for a particular water tank construction.

5. The design period of storage reservoir can be given as _____
a) 50 yr
b) 20 yr
c) 30 yr
d) 10 yr

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Explanation: Every water storage structure is having certain design periods based on the population present in that particular area. A storage reservoir is generally having a design period of 50 years.

6. Which of the following can be designated as an intake structure?
a) Culvert
b) River
c) Dam
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Explanation: Intakes are the structures which can collect water from the surface sources and are used for the treatment plant. Reservoir intake, Lake Intake and canal intakes are some of the examples of an intake structure.

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Explanation: The factors effecting per capita demand include cost of water, climatic condition, pressure in the distributed system,

industrial activities, commercial activities and economical status of the consumers.

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Explanation: Per capita demand can be defined as the amount of water required for 1 percent per day. It includes commercial, industrial, domestic, public uses and also in case of fire demand.

10. Which of the following can act as a type of variation in water demand?
a) Monthly variation
b) Annual variation
c) Crop variation
d) 10 year variation

Answer: a
Explanation: Variation in water demand is generally due to seasonal variation, monthly variation, daily and hourly variations. The demand for water in these variations is generally high and consumes more amount of water than daily consumption.

TOPIC 2.2 PIPES AND CONDUITS FOR WATER - PIPE MATERIALS

1. What is the aim of pipes system in the dairy industry?
a) Facilitate product flow
b) Pasteurization
c) Fouling
d) Storage

Answer: a
Explanation: The product flows between the components of the plant in the pipe system. A dairy also has conduit systems for other media such as water, steam, cleaning solutions, coolant and compressed air.

2. Which material is used for pipes which are in contact with milk or product?
a) Stainless steel
b) Copper
c) Ceramic
d) Plastic

Answer: a
Explanation: All components in contact with the product are made of stainless steel. Stainless steel is easy to clean and non corrosive.

3. Which material is used for pipes which conduct water and air?
a) Stainless steel
b) Copper
c) Ceramic
d) Plastic

Answer: b
Explanation: Plastic is used for water and air lines. Plastic also provides transparency.

4. Which material is used for pipes which conduct waste?
a) Stainless steel
b) Copper
c) Ceramic
d) Plastic

Answer: c
Explanation: Various materials are used in the other systems, e.g. cast iron, steel, copper and aluminum. Plastic is used for water and air lines, and ceramic for drainage and sewage pipes.

5. Which grade of stainless steel is known as acid proof steel?
a) AISI 304
b) AISI 316
c) SIS 2333
d) SIS 2359

Answer: b
Explanation: For hygienic reasons, all product-wetted parts of dairy equipment are made of stainless steel. Two main grades are used, AISI 304 and AISI 316. The latter grade is often called acid proof steel.

6. Which of the following are installed in order to collect product samples hygienically for quality analysis?
a) Bends
b) Reducers
c) Sampling device
d) Tees

Answer: c
Explanation: Sampling devices need to be installed at strategic points in the plant to collect product samples for analysis. For quality control, such as determining the fat content of milk and the pH value of cultured products, the samples can be collected from a sampling cock.

7. Which among the following is not a permanent wielding connection?
a) Bends
b) Reducers
c) Sampling device
d) Tees

Answer: c
Explanation: Some examples of fittings for permanent welding are Tees, reducers and bends. This union allows disconnection without disturbing other pipe work. This type of joint is hence used to connect process equipment, instruments, etc. that need to be removed for cleaning, repair or replacement.

8. What are the reasons causing pressure drop in hydraulic systems?
i. Long length of pipe
ii. Friction
iii. Type of fluid
iv. Losses in valves and bends
a) i and iv
b) Only i
c) ii and iii
d) i, ii, iii and iv

Answer: d
Explanation: Pressure drop is the difference in the pressure of liquid entering the hydraulic system and pressure of liquid leaving the system. Long length of pipe, friction, fluid type and losses in valves and bends are all reasons behind pressure drop in hydraulic system.

9. Calculate area of a pipe if, flow rate is 20 l/min and flow velocity is 5 cm/s.
a) 66.66 cm^2
b) 60 cm^2
c) 62 cm^2
d) 64 cm^2

Answer: a
Explanation: Flow rate = 20 litre/min
= 200000 cm^3/60s
= 333.33 cm^3/s
Flow Rate = Velocity x Area
333.33cm3/s = 5cm/s x Area
Area = 333.33cm^3/s / 5 cm/s
= 66.66 cm^2.

10. Which formula is used to calculate head loss in valves?
a) K^2 (v/2 g)
b) K (v/2 g)
c) K (v^2/2 g)
d) K^3 (v^2/2 g)

Answer: c
Explanation: K (v^2/2 g) calculates head loss for Newtonian fluid. When fluid flows inside a pipeline, friction occurs between the moving fluid and the stationary pipe wall. The friction converts some of the fluid's hydraulic energy into thermal energy. The thermal energy cannot be converted back to hydraulic energy, so the fluid experiences a

drop in pressure. This conversion and loss of energy is known as head loss.

11. Which among the following is shut-off and change over valve?
a) Seat valve
b) Butterfly valve
c) Seat valve and butterfly valve
d) Bend

Answer: c
Explanation: There are many places in a piping system where it must be possible to stop the flow or divert it to another line. These functions are performed by valves. Seat valves, manually or pneumatically controlled, or butterfly valves, are used for this purpose.

12. To prevent the product flow in the wrong direction which of the following valve is used?
a) Seat valve
b) Butterfly valve
c) Seat valve and butterfly valve
d) Check valve

Answer: d
Explanation: A check valve is fitted when it is necessary to prevent the product from flowing in the wrong direction. The valve is kept open by the liquid flow in the correct direction. If the flow stops, the valve plug is forced against its seat by the spring. The valve then closes against reversal of the flow.

13. Which of the following valves is used to maintain pressure in the system?
a) Pressure relief valve
b) Check valve
c) Manual control valve with variable flow plug
d) Pneumatic control valve with variable-flow plug

Answer: a
Explanation: A pressure relief valve maintains the pressure in the system. If the pressure is low, the spring holds the plug against the seat. When the pressure has reached a certain value, the force on the plug overcomes the spring force and the valve opens.

14. The pipes will expand considerably when the product temperatures are high and during cleaning.
a) True
b) False

Answer: a
Explanation: Pipes must be firmly supported. On the other hand the pipes should not be so restrained that movement is prevented. The pipes will expand considerably when the product temperatures are high and during cleaning. The resulting increase in length and tensional forces in bends and equipment must be absorbed.

15. Valves with constant outlet pressure are used after which of the following machines?
a) Separator
b) Pasteurizer
c) Homogenizer
d) Filling machine

Answer: d
Explanation: Valves for constant inlet pressure are often used after separators and pasteurizers. Those for constant outlet pressure are used before filling machines.

TOPIC 2.3 HYDRAULICS OF FLOW IN PIPES - TRANSMISSION MAIN DESIGN

1. The liquid flowing through a series of pipes can take up_____
a) Pipes of different diameters
b) Pipes of the same diameters only.
c) Single pipe only
d) Short pipes only

Answer: a
Explanation: When pipes of different diameters are connected at its ends to form a pipe, this pipe so developed is called as pipes in series. They might not have to be of the same diameters. But, having the same diameters are better as it avoids the losses so developed.

2. What is the total loss developed in a series of pipes?
a) Sum of losses in each pipe only
b) Sum of local losses only
c) Sum of local losses plus the losses in each pipe
d) Zero

Answer: c
Explanation: When the pipes of different diameters are connected in series from end to end to form a pipe line. The total loss so developed is equal to the sum of local losses plus the losses in each pipe. The local losses are developed at the connection point.

3. The total head loss for the system is equal to_____
a) Pipe length
b) Pipe diameter
c) Width of the reservoir
d) Height difference of reservoirs

Answer: d
Explanation: Total head loss for a system is equal to the height difference of the reservoirs. Height difference is denoted by the letter 'H'. Total head loss can be equated by summing it up with all the local losses and the losses at each pipe.

4. Which among the following is not a loss that is developed in the pipe?
a) Entry
b) Exit
c) Connection between two pipes
d) Liquid velocity

Answer: d
Explanation: Liquid velocity in the pipe is the velocity with which the liquid travels through different cross sections of the pipe. It is a vector field which is used to describe the motion of a continuum. The length of flow velocity vector is equal to the flow speed.

5. Which among the following is the correct formula for head loss?
a) Z_1-Z_2
b) C
c) T_2-T_1
d) S_2-S_1

Answer: a
Explanation: Total head loss for a system is equal to the height difference of the reservoirs. Height difference is denoted by the letter 'H'. Total head loss can be equated by summing it up with all the local losses and the losses at each pipe. Here, the height difference between the reservoirs is Z_1-Z_2.

6. If the two reservoirs are kept at the same level, the head loss is _____
a) Z_1-Z_2
b) Zero
c) T_2-T_1
d) S_2-S_1

Answer: b
Explanation: Total head loss for a system is equal to the height difference of the reservoirs. Height difference is denoted by the letter 'H'. The height difference between the reservoirs is Z_1-Z_2. Since they are of the same level, Z_1=Z_2. Therefore, head loss is zero.

7. How do we determine the total discharge through parallel pipes?
a) Add them.
b) Subtract them
c) Multiply them
d) Divide them

Answer: a
Explanation: Total discharge in parallel pipes are determined by adding the discharges so developed in individual pipes. If Q_1 is the discharge through pipe 1 and Q_2 is the discharge through pipe 2. Then the total discharge through parallel pipes is equal to Q_1+Q_2.

8. The pipe diameter is _____
a) Directly proportional to fluid density
b) Directly proportional to mass flow rate
c) Inversely proportional to mass flow rate
d) Directly proportional to fluid velocity

Answer: b
Explanation: The pipe diameter is directly proportional to mass flow rate of fluid. Pipe diameter can be calculated if volumetric flow rate and velocity are known. 'D' is inversely proportional to its velocity.

9. Define Viscosity.
a) Resistance to flow of object
b) Resistance to flow of air
c) Resistance to flow of fluid
d) Resistance to flow of heat

Answer: c
Explanation: Viscosity is developed due to the relative motion between two surfaces of fluids at different velocities. It happens due to the shear stress developed on the surface of the fluid.

10. Coefficient of friction of a laminar flow is_____
a) $R_e/16$
b) $R_e/64$
c) $16/R_e$
d) $64/R_e$

Answer: c
Explanation: Coefficient of friction is defined as the value that shows relationship between force and the normal reaction. It is mainly used to find out an object's normal force and frictional force. Thus, it is equal to $16/R_e$.

TOPIC 2.4 LAYING, JOINTING AND TESTING OF PIPES - APPURTENANCES

1. What is the aim of pipes system in the dairy industry?
a) Facilitate product flow
b) Pasteurization
c) Fouling
d) Storage

Answer: a
Explanation: The product flows between the components of the plant in the pipe system. A dairy also has conduit systems for other media such as water, steam, cleaning solutions, coolant and compressed air.

2. Which material is used for pipes which are in contact with milk or product?
a) Stainless steel
b) Copper
c) Ceramic
d) Plastic

Answer: a
Explanation: All components in contact with the product are made of stainless steel. Stainless steel is easy to clean and non corrosive.

3. Which material is used for pipes which conduct water and air?
a) Stainless steel
b) Copper
c) Ceramic
d) Plastic

Answer: b
Explanation: Plastic is used for water and air lines. Plastic also provides transparency.

4. Which material is used for pipes which conduct waste?

a) Stainless steel
b) Copper
c) Ceramic
d) Plastic

Answer: c
Explanation: Various materials are used in the other systems, e.g. cast iron, steel, copper and aluminum. Plastic is used for water and air lines, and ceramic for drainage and sewage pipes.

5. Which grade of stainless steel is known as acid proof steel?
a) AISI 304
b) AISI 316
c) SIS 2333
d) SIS 2359

Answer: b
Explanation: For hygienic reasons, all product-wetted parts of dairy equipment are made of stainless steel. Two main grades are used, AISI 304 and AISI 316. The latter grade is often called acid proof steel.

6. Which of the following are installed in order to collect product samples hygienically for quality analysis?
a) Bends
b) Reducers
c) Sampling device
d) Tees

Answer: c
Explanation: Sampling devices need to be installed at strategic points in the plant to collect product samples for analysis. For quality control, such as determining the fat content of milk and the pH value of cultured products, the samples can be collected from a sampling cock.

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TOPIC 2.5 TYPES AND CAPACITY OF PUMPS

1. Which of the following is the correct classification of pumps?
a) Physical principle of operation
b) Mechanical principle of operation
c) Chemical principle of operation
d) Biological principle of operation

Answer: b
Explanation: The pumps are classified on the basis of the mechanical operation of the principle, type of power and type of service.

2. Displacement pump is classified on the basis of _____
a) Mechanical operation of principle
b) Type of power
c) Type of service
d) Efficiency

Answer: a
Explanation: Mechanical principle of operation is classified into displacement, centrifugal, air lift and miscellaneous pumps.

3. Which of the following pump is classified based on the type of service?
a) Displacement pump
b) Centrifugal pump
c) Deep well pump
d) Electric driven pump

Answer: c
Explanation: Pumps are of four types on the basis of type of service- low lift, high lift, deep well and booster pump.

4. Which of the following pump is based on the type of power?
a) Low lift pump
b) High lift pump
c) Air lift pump
d) Steam engine pump

Answer: d
Explanation: There are 3 types of pumps on the basis of type of power. They are – steam engine, diesel engine and electrically driven pump.

5. A booster pump is based on _____
a) Mechanical operation of principle
b) Type of power
c) Type of service
d) Efficiency

Answer: c
Explanation: Booster pump is classified on the basis of type of service. They are used for increasing gas pressure, transferring high pressure gas, scavenging and charging gas cylinders.

6. Consider the following statements.
i. Capacity of the pump
ii. Number of pump units
iii. Discharge condition
The selection of a particular type of pump depends on which of the following?
a) i, ii, iii
b) i only
c) ii, iii
d) i, iii

Answer: a
Explanation: The selection of a particular type of pump depends on the capacity of pump, number of pump units, suction and discharge condition, type of drive, initial and final cost, lift, flexibility of operations and floor space requirements.

7. The centrifugal pump has a _____ flow.
a) Variable

b) Uniform
c) Continuous
d) Constant

Answer: c
Explanation: The centrifugal pump has a continuous flow. It does not give a constant discharge under variable head.

8. The speed at which the centrifugal pump runs (in r.p.m) is _____
a) 200
b) 300
c) 500
d) 1200

Answer: c
Explanation: The speed at which the centrifugal pump runs lies in the range of 500 to 100 rates per minute (r.p.m). The direct connection of pump with driving machines is possible.

9. The maximum efficiency of a centrifugal pump is _____
a) 50%
b) 60%
c) 85%
d) 100%

Answer: c
Explanation: The efficiency of the centrifugal pump lies between 40% and 85%. It depends on the head and discharge of the pump.

10. Based on the type of casing, the centrifugal pump is divided into _____ types.
a) 2
b) 3
c) 4
d) 5

Answer: a
Explanation: Based on the type of casing, the centrifugal pump is divided into the volute pump and turbine pump.

TOPIC 2.6 SELECTION OF PUMPS AND PIPE MATERIALS

1. An apparatus for raising, driving or compressing fluids or gases is called _____
a) Piston
b) Pump
c) Compressor
d) Force drive

Answer: b
Explanation: A pump is a device used to transfer or force the liquid or gas against gravity. There are different types of pumps based on the requirements and the pumps are designed for different loads.

2. _____ pumps produce a head and a flow by increasing the velocity of the liquid with the help of the rotating vane impeller.
a) Displacement pumps
b) Positive pumps
c) Centrifugal pumps
d) Rotating pumps

Answer: c
Explanation: Centrifugal pumps produce a head and a flow by increasing the velocity of the liquid with the help of the rotating vane impeller. Centrifugal pumps include radial, axial and mixed flow units.

3. What are the pumps that operate by alternately filling a cavity and then displacing a given volume of liquid called?
a) Centrifugal pump
b) Rotating pump
c) Positive displacement pump
d) Roto-dynamic pump

Answer: c
Explanation: A positive displacement pump alternately fills a cavity and then displaces a given volume of liquid. For each cycle, this pump delivers a constant volume of liquid independent of discharge pressure or head.

4. The two types of pumps behave very differently regarding pressure head and flow rate.
a) True
b) False

Answer: a
Explanation: There are two types of basic pumps. One is the centrifugal pump and the other one is positive displacement pump. Centrifugal pump is also called as a roto-dynamic pump. These two pumps behave very differently with respect to flow rates and pressure head.

5. A steam pump is a type of centrifugal pump.
a) True
b) False

Answer: b
Explanation: There are different types of centrifugal pumps such as end suction pumps, in-line pumps, axial-flow pumps, regenerative pumps, etc. Steam pump is a type of positive displacement pump.

6. In a centrifugal pump, the flow is _____ when the viscosity is increased.
a) Reduced
b) Increased
c) Greater
d) Same

Answer: a
Explanation: In a centrifugal pump, the flow is reduced when the viscosity is increased. This is because the viscosity of any fluid restricts its capacity to flow easily. On thickening the solution or liquid, the flow is reduced.

7. What are the pumps with one or more impellers called?
a) ANSI process pumps
b) API process pumps
c) Centrifugal pumps
d) Positive displacement pumps

Answer: c
Explanation: The general name for pumps with one or more impellers is called centrifugal pumps. Many types and configurations of centrifugal pumps are used for different applications.

8. Why are booster pumps used?
a) Higher flow
b) Boost pressure
c) Chop solids
d) Maintain flow

Answer: b
Explanation: Booster pumps are used to further boost the pressure in a system. It may be in-line circulator, horizontal split case, or vertical turbine in a can type of pump. Chopper Pumps are designed to chop up solids and stringy material as it pumps.

9. Why are cryogenic pumps used?
a) Boost pressure
b) Handle low temperature liquids
c) Handle high temperature liquids
d) Pump small quantities of liquids

Answer: b
Explanation: Cryogenic pumps are used to handle very low temperature liquids. Booster pumps are used to further boost the pressure in a system. Drum pumps are used to pump out small quantities of liquid of out of drums and carboys.

10. End suction pumps are the common type of _____ pumps.
a) Drum pumps
b) Centrifugal pumps
c) Positive displacement pumps
d) Grinder pumps

Answer: b
Explanation: End suction pumps are the common type of centrifugal pump. It has a horizontal shaft with an overhung impeller. The flow goes in the end of the casing, and out the top.

11. Which pump among the ones mentioned below can be located above the suction reservoir without an external priming system?
a) Slurry pumps
b) Self-priming pumps
c) Submersible pumps
d) Trash pumps

Answer: b
Explanation: Self-Priming pumps are a type of centrifugal that can be located above the suction reservoir without an external priming system. It has an end suction configuration but an enlarged case to support priming.

12. Which type of pump is designed to handle rocks and other solids?
a) Trash pumps
b) Submersible pumps
c) Slurry pumps
d) Self-priming pumps

Answer: a
Explanation: Trash pumps are a type of submersible centrifugal pump designed to handle rocks and other solids while dewatering. It is used in dewatering construction sites, mines, and utility pits.

13. Which type of pump should be used in order to handle low viscosity fluids?
a) Centrifugal Pump
b) Displacement Pump
c) Submersible Pump
d) End Suction Pump

Answer: a
Explanation: Centrifugal pumps can pump liquids which are of low viscosity. It cannot handle liquids such as oil. The liquid that is pumped by centrifugal pumps should be free from air.

14. Which type of pump should be selected in order to pump the sewage from a septic tank to the water treatment system?
a) Vertical Sump Pump
b) Progressive Cavity Pump
c) Submersible Pump
d) Screw Pump

Answer: c
Explanation: Submersible pumps are used to handle liquids with solids. Also, these are non-clog pumps which are fully or partially submerged in the tanks. In cases where the pump is partially submerged the motor is above the water level and the motor is connected to the pump by an extended shaft.

15. In an activated sludge process which type of pump is used to recirculate the sludge?
a) Booster Pump
b) Centrifugal Pump
c) Vane Pump
d) Vertical Turbine Pump

Answer: b
Explanation: The activated sludge does not contain any solids. Also, it is not very viscous. Hence a centrifugal pump can be used for this application.

16. Which type of pump is used while handling the sludge disposal system?
a) Screw Pump
b) Multistage Pump
c) Self-priming Pump
d) Vertical Pump

Answer: a
Explanation: Screw Pumps utilize intermeshing screws driven by timing gears in order to move the viscous liquids. These pumps are used to pump thick liquids. Hence it is suitable to handle sludge.

UNIT III WATER TREATMENT

TOPIC 3.1 OBJECTIVES - UNIT OPERATIONS AND PROCESSES

- PRINCIPLES, FUNCTIONS, AND DESIGN OF WATER TREATMENT PLANT UNITS, AERATORS OF FLASH MIXERS, COAGULATION AND FLOCCULATION CLARIFLOCCUATOR-PLATE AND TUBE SETTLERS

1. In which unit operation, gases are released or absorbed in the water?
a) Gas transfer
b) Ion transfer
c) Solute stabilization
d) Solids Transfer

Answer: a
Explanation: In Gas transfer, gases are released or absorbed in water by exposing the water through aeration under normal, increased or reduced pressure.

2. How many types of aerators are commonly used in the treatment of water?
a) 2
b) 3
c) 4
d) 5

Answer: c
Explanation: There are 4 types of aerators namely Gravity aerators, Spray aerators, Diffusers and Mechanical aerators.

3. Which of the following process is used to remove the colloidal particles from water?
a) Chemical precipitation
b) Chemical coagulation
c) Ion exchange
d) Adsorption

Answer: b
Explanation: Chemical coagulation is used to remove colloidal particles by the use of coagulants which increase the particle size and they settle down.

3. Flocculation of iron from water by the addition of lime is an example of which of the following process?
a) Chemical precipitation
b) Chemical coagulation
c) Ion exchange
d) Adsorption

Answer: a
Explanation: Chemical precipitation removes the dissolved substance from water through ion transfer where precipitation of dissolved impurities takes place.

4. In which unit operation objectionable solutes are converted into unobjectionable forms without removal?
a) Gas transfer
b) Ion transfer
c) Solute stabilization
d) Solids Transfer

Answer: c
Explanation: In solute stabilization, water is stabilized by chlorination or liming so that objectionable solutes are converted into unobjectionable form.

5. In which form of solute stabilization, hydrogen sulfide in water is oxidized into sulfate?
a) Chlorination
b) Liming
c) Re-carbonation
d) Super-chlorination

Answer: a
Explanation: By the process of chlorination, water gets stabilized by the conversion of hydrogen sulfide into sulfate.

6. Which form of solute stabilization occurs when water passes through limestone?
a) Chlorination
b) Liming
c) Re-carbonation
d) Super-chlorination

Answer: b
Explanation: When water passes through limestone, carbon dioxide in excess get converted into soluble bicarbonate.

7. In which process, excess lime is converted into bicarbonate?
a) Chlorination
b) Liming
c) Re-carbonation
d) Super-chlorination

Answer: c
Explanation: By Re-carbonation of water softened by excess lime treatment, excess lime is converted into bicarbonate.

8. By which process, odour producing substances is oxidized?
a) Chlorination
b) Liming
c) Re-carbonation
d) Super-chlorination

Answer: d
Explanation: By addition of chlorine dioxide to water, odour producing substances are oxidized.

9. Solids are removed from the water by which of the following unit operation?
a) Inter facial contact
b) Solid stabilization
c) Ion transfer
d) Solids transfer

Answer: d
Explanation: During solids transfer, solids are removed from water by straining, sedimentation, flotation and filtration.

10. Dealkalization results in removal of all the ions from the water.
a) True
b) False

Answer: b
Explanation: Dealkalization results in removal of hydroxides, carbonates and bicarbonates of calcium, sodium and magnesium from water. Demineralization results in removal of all the ions from the water.

11. Organic contaminants are removed from the water by the process of _____
a) Water softening
b) Demineralization
c) Absorption
d) Adsorption

Answer: d
Explanation: Organic contaminants are removed from the water by the attraction and accumulation of one substance on the surface of another.

TOPIC 3.2 PULSATOR CLARIFIER - SAND FILTERS - DISINFECTION - RESIDUE MANAGEMENT - CONSTRUCTION, OPERATION AND MAINTENANCE ASPECTS.

1. _____ is an operation designed to force agitation in the fluid and induce coagulation.
a) Sedimentation
b) Flocculation
c) Disinfection
d) Aeration

Answer: b
Explanation: Flocculation is an agitating process in which destabilized particles are brought into contact to promote agglomeration.

2. The rate of change of velocity per unit distance normal to a section is called_____
a) Mean velocity
b) Average velocity
c) Mean velocity gradient
d) Velocity gradient

Answer: c
Explanation: Mean velocity gradient is given by $G = (P/uv)^{1/2}$ Where P = power dissipated, u = absolute viscosity, v = volume to which power is applied.

3. What is the dimension formula of mean velocity gradient?
a) 1/T
b) 1/T2
c) T
d) T2

Answer: a
Explanation: Mean velocity gradient is expressed in metre per second/m or Sec^{-1}, so it has dimension formula of 1/T.

4. What is the desirable value of mean velocity gradient in a flocculator?
a) 20-50sec^{-1}
b) 20-75sec^{-1}
c) 50-100sec^{-1}
d) 30-50sec^{-1}

Answer: b
Explanation: The desirable value of mean velocity gradient (G) in a flocculator is 20-75sec^{-1} and for 'Gt' is $2*10^4$ to $6*10^4$ where 'Gt' is the ratio of power induced rate of flow to displace mean induced rate of flow.

5. What is the normal value of the detention period adopted in a flocculator for design purpose?
a) 30min
b) 60min
c) 90min
d) 100min

Answer: a
Explanation: The detention period in a flocculator for design purpose should be in the range of 10-40min and its normal value should be 30min.

6. The design value of the velocity of flow in a flocculator is _____
a) 0.2-0.8m/s
b) 0.3-0.5m/s
c) 0.6-0.8m/s
d) 0.1-0.5m/s

Answer: a
Explanation:The normal value of the velocity of flow in a flocculator is 0.4m/s and its range is 0.2-0.8m/s.

7. What is the detention period of a clarifier used in the treatment of water?
a) 1hour
b) 2hours
c) 3hours
d) 4hours

Answer: c
Explanation: The detention period of a clarifier is lower than in the plain sedimentation tank and its range is 2.5 to 3 hours.

8. The pulsator clarifier is a type of _____
a) Horizontal flow sludge tank
b) Vertical flow sludge tank
c) Circular sludge tank
d) Plain sedimentation tank

Answer: b
Explanation: The pulsator clarifier is a vertical flow sludge tank in which pulse is generated at interval of 30Sec to give rapid flow for 5-10Sec resulting in the alternative rising up of the sludge blanket.

9. Which device solved the problem of unstable hydraulic conditions and operation of sludge removal equipment?
a) Centrifugal pump
b) Pulsator clarifier
c) Tube settler
d) Flocculator

Answer: c
Explanation: Tube settler solved the problem of unstable hydraulic conditions and operation of sludge removal equipment by providing laminar flow conditions for sedimentation.

10. In which device, the primary mixing is followed by a secondary reaction zone resulting in formation of sludge blanket?
a) Centrifugal pump
b) Flocculator
c) Tube settler
d) Solid contact clarifier

Answer: d
Explanation: In Solid contact clarifier, sludge blanket is formed where straining action occurs to remove some of the finer particles. The thickness of the blanket is 1m.

11. In which type of tube settler, tubes are slightly inclined in the direction of normal flow?
a) Solid contact clarifier
b) Steeply inclined tube settler
c) Vertical tube settler
d) Horizontal tube settler

Answer: d
Explanation: In Horizontal tube settler, the tubes are slightly inclined in the direction of normal flow and the sludge settled is drained by filter backwash.They are used in small plants.

UNIT IV ADVANCED WATER TREATMENT

TOPIC 4.1 WATER SOFTENING - DESALINATION- R.O. PLANT - DEMINERALIZATION - ADSORPTION

1. Ion exchange units are known as _____
a) Water hardeners
b) Water softeners
c) Water purifiers
d) Exchangers

Answer: b
Explanation: Ion exchange units that replace calcium and magnesium ions from water are known as water softeners. They may also remove varying amounts of other inorganic pollutants such as metals.

2. Water softener units work most efficiently with particulate water.
a) True
b) False

Answer: b
Explanation: Water softener units work most efficiently with particulate-free water. Ion exchange units that replace calcium and magnesium ions from water are known as water softeners.

3. Which of these have a negative electrical charge?
a) Calcium
b) Magnesium
c) Sodium
d) Chloride

Answer: d
Explanation: Calcium and magnesium ions are atoms having a positive electrical charge, as do sodium and potassium ions. Ions of the same charge can be exchanged.

4. The ions with opposite charge can be exchanged.
a) True
b) False

Answer: b
Explanation: Ions of the same charge can be exchanged. In the process, the water containing calcium and magnesium ions is

considered and substance containing sodium or potassium ions is used against it.

5. While designing the demineralisation plant what is considered as the weak acidic cation load?
a) Alkaline hardness
b) Alkaline hardness+ EMA
c) EMA
d) Silica

Answer: a
Explanation: The load for Weak acid cation is alkaline hardness alone. Alkalinity is expressed as phenolphthalein alkalinity. It is also expressed as methyl orange alkalinity.

6. While designing the demineralisation plant what is considered as the strong acidic cation load?
a) Alkaline hardness
b) Alkaline hardness + EMA
c) EMA
d) Silica

Answer: b
Explanation: The load for Weak acid cation is alkaline hardness alone. This is also equivalent to total anions. Total anions is equivalent to alkaline hardness + EMA.

7. While designing the demineralisation plant what is considered as the strong basic anion load?
a) Alkaline hardness
b) Alkaline hardness + EMA+CO_2
c) EMA+Silica
d) Silica+CO_2+ Alkalinity+EMA

Answer: d
Explanation: The load for strong basic anion is Silica+CO_2+ Alkalinity+EMA. This is in the case where there is no degasser.
In case there is a degasser then the CO_2 load is not considered.

8. While designing the demineralisation plant what is considered as the weak basic anion load?
a) Alkaline hardness
b) Alkaline hardness + EMA
c) EMA
d) Silica

Answer: c
Explanation: The load for weak basic anion is EMA alone. EMA constitutes of chlorides, sulphides, nitrates etc. It is the sum total of these ions.

9. When is strong basic anion not necessary?
a) Silica is nil
b) CO_2 is nil
c) Fluroine is nil
d) Sulphate is nil

Answer: a
Explanation: When silica is nil, there is no requirement of a strong basic anion. Degasser removes CO_2. A degasser tower is used in such cases.

10. When the hardness and alkalinity are around 30% what should be used?
a) SAC
b) WAC
c) WAC, SAC
d) WAC, SAC, WBA

Answer: c
Explanation: When the hardness and alkalinity are around 30%, then WAC and SAC should be used. WAC removes temporary hardness caused by alkalinity. SAC removes EMA and alkalinity.

11. In case along with silica, there is high content in sulphide and chloride what should be used?
a) WBA
b) WBA and SBA
c) SBA
d) SBA,WBA and WAC

Answer: b
Explanation: In case the sulphide and chloride are present then WBA should be used. SBA removes only silica and alkalinity. It doesn't remove EMA.

12. What is the preferred regenerant in case of cation exchanger?
a) HCl
b) H_2SO_4
c) H_2CO_3
d) HF

Answer: a
Explanation: The preffered regenerant in case of cation exchanger is HCl. Regeneration is a process necessary to regenerate the resin. In this way the resin can be reused for the next demineralization process.

13. What is the preferred regenerant in case of anion exchanger?
a) NaCl
b) NaOH
c) Na_2SO_4
d) Na_2CO_3

Answer: b
Explanation: The preffered regenerant in case of anion exchanger is NaOH. Regeneration is a process necessary to regenerate the resin. In this way the resin can be reused for the next demineralization process.

14. For obtaining Silica<5 ppm which of these should be utilized?
a) SBA followed by Mixed be
b) SBA
c) WBA SBA followed by mixed bed
d) Mixed bed

Answer: a
Explanation: A mixed bed is usually followed after a SBA to obtain silica level < 5 ppm. Mixed bed constitutes both an anion and cation exchanger. To obtain stringent level of silica mixed bed should be implemented.

TOPIC 4.2 ION EXCHANGE MEMBRANE SYSTEMS - RO REJECT MANAGEMENT - IRON AND MANGANESE REMOVAL - DEFLUORIDATION

1. In which year was the Ferrosand process patented?
a) 1960
b) 1965
c) 1970
d) 1975

Answer: b
Explanation: The manganese greensand process has been used in the United States since the 1950s. During the early years of its use, Hungerford & Terry, Inc. of Clayton, New Jersey, worked to improve the process and eventually developed the Ferrosand® CR Process, patented in 1965.

2. What is the permitted concentration of manganese in drinking water?
a) 30 g/l
b) 40 g/l
c) 50 g/l
d) 60 g/l

Answer: c
Explanation: The permitted concentration of manganese in drinking water is 50g/l. The manganese greensand process has been used in the United States since the 1950s.

3. What is the permitted concentration of iron in drinking water?
a) 100 g/l
b) 200 g/l
c) 300 g/l
d) 400 g/l

Answer: b
Explanation: The permitted concentration of iron in drinking water is 200g/l. The permitted concentration of manganese in drinking water is 50g/l. The permitted concentration of arsenic in drinking water is 10g/l.

4. What is the permitted concentration of arsenic in drinking water?
a) 10 g/l
b) 20 g/l
c) 30 g/l
d) 40 g/l

Answer: a
Explanation: The permitted concentration of arsenic in drinking water is 10g/l. The permitted concentration of iron in drinking water is 200g/l. The permitted concentration of manganese in drinking water is 50g/l.

5. What is the minimum time of aeration?
a) 20 minutes
b) 40 minutes
c) 60 minutes
d) 80 minutes

Answer: c
Explanation: The water is aerated for a period of no less than 60 minutes. If water flow is 50 m^3/h the aeration level is 100m^3/h of air and tank volume is 50m^3 of water.

6. What is the tank volume of aeration for water flow of 50m3/h?
a) 40 m^3
b) 50 m^3
c) 80 m^3
d) 100 m^3

Answer: b
Explanation: The water is aerated for a period of no less than 60 minutes. The tank volume of aeration for water flow of 50m^3/h is 50 m^3.

7. At what pH should the water be maintained?
a) 6.5
b) 7.5
c) 8.5
d) 9

Answer: b
Explanation: The pH of the water should be increased to a value over pH 7.5. The decrease in the value of pH leads to increase in the acidity of water.

8. The aeration system will decrease the redox potential of the water.
a) True
b) False

Answer: b
Explanation: The aeration system will increase the redox potential of the water. It is important to raise the potential to as high a value as possible. Certainly, it should be over 200mv.

9. What is the minimum required redox potential of water?
a) 100 mv
b) 200 mv
c) 300 mv
d) 400 mv

Answer: b
Explanation: The minimum required redox potential of water is 200 mv. Manganese oxidation requires a high oxidation potential.

10. Manganese oxidation requires a high oxidation potential.
a) True
b) False

Answer: a
Explanation: Manganese oxidation requires a high oxidation potential, in some cases if there is a high BOD or organic content in the water it may be required to add additional oxidizing agents such as hypochlorite,

chlorine dioxide, hydrogen peroxide or ozone.

11. What is the desirable bed depth for AFM filtration?
a) 1000 mm
b) 1200 mm
c) 1500 mm
d) 1800 mm

Answer: b
Explanation: The desirable bed depth of AFM filtration is 1200 mm. Maximum bed depth can be within 3000 mm and the bulk density is 1.25-1.

12. What is the maximum allowable flow for backwash?
a) 20 m/hr
b) 45 m/hr
c) 60 m/hr
d) 80 m/hr

Answer: c
Explanation: The maximum allowable water flow for backwash is 60 m/hr. The recommended water flow for backwash is 45 m/hr.

TOPIC 4.3 CONSTRUCTION AND OPERATION & MAINTENANCE ASPECTS - RECENT ADVANCES - MBR PROCESS

1. The fluoride concentration for prevention of dental caries is _____
a) 1mg/l
b) 2mg/l
c) 3mg/l
d) 4mg/l

Answer: a
Explanation: Dental caries occurs in children. It can be prevented when the concentration of fluoride in water is between 0.7 to 1.2mg/l.

2. In which process, the fluoride content of water is raised?
a) Chlorination
b) Fluoridation
c) Defluoridation
d) Flocculation

Answer: b
Explanation: When the fluoride content is low, it will cause dental caries. So the fluoride content of water is raised and the process is called fluoridation.

3. Which of the following is not used as a fluoride compound?
a) Sodium fluoride
b) Sodium silico fluoride
c) Hydrofluosilicic acid
d) Sodium fluro carbonate

Answer: d
Explanation: Sodium fluoride, sodium silico fluoride, hydrofluosilicic acid and sodium fluro carbonate are the fluoride compounds used for fluoridation.

4. Which of the following is the pure compound?
a) Sodium fluoride
b) Sodium silico fluoride
c) Hydrofluosilicic acid
d) Sodium fluro carbonate

Answer: a
Explanation: Sodium fluoride is the most purest compound having 95-98% purity due to which, they are commonly used for fluoridation.

5. As far as safer handling is considered, which of the following is used for fluoridation?
a) Sodium fluoride
b) Sodium silico fluoride

c) Hydrofluosilicic acid
d) Sodium fluro carbonate

Answer: c
Explanation: For safer handling, hydrofluosilicic acid is preferred as even if it is spilled on the skin, it can be removed easily by washing in cold water.

6. Fluorides in solution form are preferred over powdered form for fluoridation.
a) True
b) False

Answer: b
Explanation: Fluorides in powdered form like sodium fluoride or sodium fluosilicate are toxic and must be contained in air tight containers. Hence, they are not preferred.

7. What happens when water contains 8-20 ppm of fluoride concentration?
a) Blue baby disease
b) Crippling fluorosis
c) Dental fluorosis
d) Mottling of teeth

Answer: b
Explanation: Dental fluorosis is caused when fluoride concentration is above 3 ppm, whereas Crippling fluorosis is caused when the concentration of fluoride in water is between 8 and 20ppm.

8. The process of reducing the fluoride content from water is called _____
a) Chlorination
b) Fluoridation
c) Defluoridation
d) Flocculation

Answer: c
Explanation: When the fluoride content in water is high, it is essential to reduce the fluoride content to avoid health related problems and the process of reducing the fluoride content is called defluoridation.

9. Which of the following is not used for defluoridation?
a) Calcium phosphate
b) Copper sulfate
c) Alum
d) Bone charcoal

Answer: b
Explanation: Copper sulfate is used to remove taste, odor, color and control of algae growth and it is not used for fluoridation.

10. At which temperature, the bone is calcinated during defluoridation with calcium phosphate?
a) 100-200^{o}C
b) 200-300^{o}C
c) 400-600^{o}C
d) 500-800^{o}C

Answer: c
Explanation: During defluoridation by calcium phosphate, the bone is calcinated at 400-600^{o}C for 10 minutes followed by mineral acid treatment.

11. One cubic metre of bone can treat how much quantity of water containing 3.5 ppm of fluoride?
a) 10m^3
b) 100m^3
c) 1000m^3
d) 10000m^3

Answer: b
Explanation: Bone is used in the filter for removal of fluorides. One cubic metre of bone can treat 100m^3 water containing 3.5 ppm of fluoride.

12. Which material is used in contact filters for the removal of fluorides?
a) Calcium phosphate
b) Copper sulfate
c) Synthetic tri-calcium phosphate
d) Bone charcoal

Answer: c
Explanation: Synthetic tri-calcium phosphate is used in contact filters for the removal of fluorides. It is made from the milk of lime and phosphoric acid.

13. Which material is used for removing fluorides from hard water containing 3ppm of fluorides?
a) Lime
b) Copper sulfate
c) Synthetic tri-calcium phosphate
d) Bone charcoal

Answer: a
Explanation: Lime is suitable for removing fluorides from hard water containing less than 4ppm. Magnesium is also removed when this material is used for defluoridation.

14. Fluorex is a special mixture of _____
a) Di-calcium phosphate and carbon
b) Tri-calcium phosphate and hydroxyapatite
c) Di-calcium phosphate and phosphoric acid
d) Tri-calcium phosphate and carbon

Answer: b
Explanation: Fluorex is used for removing fluoride and it is a special mixture of tri-calcium phosphate and hydroxyapatite. It is used as a filter medium.

UNIT V WATER DISTRIBUTION AND SUPPLY

TOPIC 5.1 REQUIREMENTS OF WATER DISTRIBUTION - COMPONENTS - SELECTION OF PIPE MATERIAL - SERVICE RESERVOIRS FUNCTIONS - NETWORK DESIGN - ECONOMICS

1. Which of the following is not a component of plumbing water supply system?
a) Washbasin
b) Water supply and distribution pipes
c) Valves
d) Storage tanks

Answer: a
Explanation: The plumbing system consists of the entire system of piping fixtures which are used for the supply and drainage of water. The various components of plumbing water supply system are water supply and distribution pipes, valves, storage tanks, etc.

2. Which of the following is not a component of the plumbing drainage system?
a) Water closets
b) Taps
c) Vent pipes
d) Urinals

Answer: b
Explanation: The different components of the plumbing drainage system are water closets, vent pipes, urinals, septic tanks, soil waste pipes, traps, etc. Taps form the part of plumbing water supply system.

3. According to the Indian Standard recommendations, a water requirement of _____ per head per day is assumed for residential buildings.
a) 50 litres
b) 115 litres
c) 135 litres
d) 160 litres

Answer: c
Explanation: According to the Indian Standard recommendations, a water requirement of 135 litres per head per day is assumed for residential buildings. Out of this, 45 litres may be taken for flushing needs

while the rest 90 litres are taken for domestic purposes.

4. Light gauge copper tubes are used for general purpose work where the pressure is not more than 0.15 N/mm^2.
a) True
b) False

Answer: a
Explanation: Copper water service pipes are of two types. These are light gauge and heavy gauge. Light gauge copper tubes are used for general purpose work where the pressure is not more than 0.15 N/mm^2.

5. Which of the following is not true about lead pipes?
a) Lead pipes are highly resistant to corrosion
b) They have a low hydraulic coefficient of flow
c) Lead pipes are highly flexible
d) When lead goes into solution, it has a cumulative poisoning effect

Answer: b
Explanation: Lead pipes have many advantages. They have a high hydraulic coefficient of flow and are highly resistant to corrosion. Lead pipes are highly flexible. Still, it is not preferred because when the lead goes into solution, it has a cumulative poisoning effect.

6. Which of the following is not true about plastic pipes?
a) Plastic pipes are cheaper than the metal pipes
b) Plastic pipes are light in weight
c) Plastic pipes can be installed with ordinary tools
d) Plastic pipes are corrosive

Answer: d
Explanation: Plastic pipes are light in weight. Ordinary tools are used to install plastic pipes. Plastic pipes are non-corrosive and are cheaper than metal pipes.

7. The diameter of main service pipe may vary from _____
a) 2-15 mm
b) 12-40 mm
c) 50-75 mm
d) 60-80 mm

Answer: b
Explanation: The diameter of the main service pipe may vary from 12-40 mm. The materials which are commonly used for service pipes are copper, lead, galvanised iron and polythene.

8. _____ is used to measure flows to domestic buildings.
a) Rain gauge
b) Water tank
c) Drainpipe
d) Water meter

Answer: d
Explanation: Water meter is used to measure flows to domestic buildings. A water meter should be easy to maintain and repair and it should measure and register both large and small flows accurately.

9. _____ is used to measure the flow velocity across a cross-section with a known area.
a) Inferential meter
b) Anemometer
c) Speedometer
d) Barometer

Answer: a
Explanation: There are generally two types of meters used in water distribution systems. These are inferential meter and displacement meter. The inferential meter is used to measure the flow velocity across a cross-section with a known area.

10. Inferential meters can be used for both low and high flows.
a) True
b) False

Answer: b
Explanation: Inferential meters are used only for high flows. They are also known as velocity meters. For relatively low flows, displacement meters are used.

TOPIC 5.2 ANALYSIS OF DISTRIBUTION NETWORKS - COMPUTER APPLICATIONS - APPURTENANCES - LEAK DETECTION

1. The method of distribution of water is divided into how many types?
a) 1
b) 2
c) 3
d) 4

Answer: c
Explanation: The method of distribution of water is divided into 3 types and it includes gravity system, pumping system and combined gravity and pumping system.

2. In which of the following distribution system, the clean water flows entirely under gravity?
a) Gravity system
b) Pressure system
c) Combined gravity and pumping system
d) Pumping system

Answer: a
Explanation: The purified water in gravity system flow entirely under gravity. It is the most reliable and economical distribution system.

3. The pressure in the distribution mains does not depend on _____
a) Altitude to supply water
b) Fire fighting requirements
c) Availability of funds
d) Quality of water

Answer: d
Explanation: The pressure in the distribution mains depends on the height to which water is required to be supplied, fire fighting requirements, whether the supply is metered or not and availability of funds.

4. The pressure in distribution mains in a residential building up to three storeys is _____
a) $2kg/cm^2$
b) $5kg/cm^2$
c) $7kg/cm^2$
d) $10kg/cm^2$

Answer: a
Explanation: The pressure in distribution mains in a residential building up to three storeys is $2kg/cm^2$ and when it is between 3-6 storeys, the pressure is $3kg/cm^2$.

5. There is a 8 storey residential building in Lucknow. What is the pressure in the distribution mains?
a) $2kg/cm^2$
b) $5kg/cm^2$
c) $7kg/cm^2$
d) $10kg/cm^2$

Answer: b
Explanation: When the height of residential building is between 6 to 10 storey, the pressure in the distribution mains lies between 4 to $5.5kg/cm^2$.

6. The velocity of water in a 10 cm diameter pipe should be _____
a) 0.2m/Sec
b) 0.5m/Sec
c) 0.9m/Sec
d) 1.2m/Sec

Answer: c
Explanation: The velocity of water in a 10 cm diameter pipe should be 0.9m/Sec

Which is 1.2m/Sec when the diameter of pipe is 15cm.

7. In which system of water supply, water is available for 24 hours but uneconomically used?
a) Continuous supply
b) Fixed supply
c) Intermittent supply
d) Low supply

Answer: a
Explanation: In continuous water supply, water is wasted due to a continuous supply of water for 24 hours of the day or long duration of flow.

8. In which system of water supply, water is supplied only during fixed hours of the day?
a) Continuous supply
b) Fixed supply
c) Intermittent supply
d) Low supply

Answer: c
Explanation: In Intermittent supply, water is supplied to the consumer during fixed hours of the day and is adopted when sufficient pressure is not available or sufficient quantity of water is not available.

9. The velocity of water in the pipe is 1.8m/Sec. What is the diameter of pipe used?
a) 10cm
b) 15cm
c) 25cm
d) 40cm

Answer: d
Explanation: It is the maximum diameter of the pipe for which the velocity of water should not be less than 1.8m/Sec.

10. The hourly demand rate is constant throughout the day.
a) True
b) False

Answer: b
Explanation: The hourly demand rate is not constant throughout the day, it is more during morning and evening and less during other parts of the day.

11. According the mass curve method, the storage capacity is defined as _____
a) Maximum excess of supply / Maximum excess of demand
b) Maximum excess of supply * Maximum excess of demand
c) Maximum excess of supply – Maximum excess of demand
d) Maximum excess of supply + Maximum excess of demand

Answer: d
Explanation: A mass curve of demand is the cumulative demand curve, which is obtained by continuously adding the hourly demands and plotting it against time.

12. _____ causes hoop tension in pipe shell.
a) Internal water pressure
b) External water pressure
c) Water hammer
d) Longitudinal stress

Answer: a
Explanation: Internal water pressure causes hoop tension in pipe shell and its magnitude is given by f = pd/2t where p is the internal pressure of water, d is the diameter of the pipe and t is the thickness of pipe shell.

13. The water supply pipes are buried underground. The load on the buried pipe due to earth filling is given by _____
a) W = C*Y*B
b) W = C*Y/B
c) $W = C*Y*B^2$
d) W = C*Y2*B

Answer: c
Explanation: According to Marston, the load W on buried pipes due to earth filling is given

by $W = C*Y*B^2$ where, 'C' is the coefficient which depends on soil, 'Y' is the unit weight of back fill material and 'B' is the width of the trench.

14. Which of the following stress in pipe depends on temperature?
a) Internal water pressure
b) Stress due to foundation reaction
c) Longitudinal stress
d) Temperature stress

Answer: d
Explanation: Temperature stress is caused in pipes when they are laid above ground. When they are subjected to temperature variation, changes in the length of pipe takes place.

15. Pipe corrosion can be minimized by
_____
a) Removal of copper sulfate
b) Addition of calcium carbonate
c) Addition of carbon dioxide
d) Removal of dissolved oxygen

Answer: d
Explanation: Pipe corrosion can be minimized by pH adjustment, control of calcium carbonate, removal of dissolved oxygen, removal of carbon dioxide and by the addition of sodium silicate.

TOPIC 5.3 PRINCIPLES OF DESIGN OF WATER SUPPLY IN BUILDINGS - HOUSE SERVICE CONNECTION - FIXTURES AND FITTINGS, SYSTEMS OF PLUMBING AND TYPES OF PLUMBING.

1. How many types of pumps are present?
a) 1
b) 2
c) 3
d) 4

Answer: b
Explanation: Pumps are of two types. Submersible pumps and open type pumps. Submersible pumps require very less maintenance and are used inside water. Both types can be used for traditional as well as hydro-pneumatic system.

2. Submersible pumps require high maintenance.
a) True
b) False

Answer: b
Explanation: Submersible pumps require very less maintenance and are used inside water. Both types can be used for traditional as well as hydro-pneumatic system.

3. What is the minimum diameter of pipes used for drainage of waste water?
a) 50 mm
b) 75 mm
c) 100 mm
d) 105 mm

Answer: b
Explanation: Waste water is from showers, basins, kitchen sinks, washing machines and the like. This is also called grey water. Normally a minimum of 75 mm diameter pipes is used for drainage of waste water.

4. What is the wastewater from kitchen sinks called?
a) Grey water
b) Black water
c) Yellow water
d) Brown water

Answer: a
Explanation: Normally a minimum of 75 mm diameter pipes are used for drainage of waste water. Waste water is from showers, basins, kitchen sinks, washing machines and the like. This is also called grey water.

5. What is the water from urinals called?
a) Black water
b) Yellow water
c) Grey water
d) Brown water

Answer: a
Explanation: Soil water or sewage is from WCs and urinals. This is also called black water. Minimum of 100 mm diameter pipes are used for waste water. These can be of cast iron or of PVC.

6. What is the minimum diameter of the pipe used to collect black water?
a) 50 mm
b) 75 mm
c) 100 mm
d) 125 mm

Answer: c
Explanation: Soil water or sewage is from WCs and urinals. This is also called black water. Minimum of 100 mm diameter pipes are used for waste water.

7. What is the recommended slope ratio for soil water pipes?
a) 1:12
b) 1:20
c) 1:30
d) 1:40

Answer: d
Explanation: Soil water pipes should run at a steeper slope, such as 1:40, as they have solids. These can be of cast iron or of PVC. Minimum of 100 mm diameter pipes are used for waste water.

8. Grease should not be allowed to enter the normal drainage system.
a) True
b) False

Answer: a
Explanation: A grease trap should be used when draining waste from kitchens, grease should not be allowed to enter the normal drainage system. A grease trap is nothing but a small inspection chamber.

9. _____ is used to clean blockage in the line.
a) Lateral chamber
b) Main chamber
c) Inspection chamber
d) Sewer chamber

Answer: c
Explanation: Tone ware (ceramic) pipes are used when soil and waste water is to be transported in external soil. An inspection chamber is used to clean blockage in the line and change direction of pipes.

10. What is the shape of the septic tank?
a) Square
b) Rectangle
c) Circular
d) Oval

Answer: b
Explanation: A septic tank is a rectangular underground tank with compartments. It is always full of sewage that can be removed manually. The less water put into a septic tank, the better it will function.

11. What is the percentage of purification of septic tank effluent?
a) 30%
b) 50%
c) 70%
d) 90%

Answer: c
Explanation: The effluent that flows out of this, which is about 70% purified, is then put into a soak pit. A soak pit is a cylindrical tank with porous brick walls surrounded by a layer of gravel.

12. _____ should not be placed near water body.
a) Power generator

b) Soak pit
c) Pump stations
d) Houses

Answer: b
Explanation: A soak pit should not be placed near any occupied structure, water body or water supply pipe. The groundwater will enter and flood the pit through the porous walls. Hence, soak pit cannot be used where the water table is high.