PRACTICE QUESTIONS

for SSC-JE : CBT-2

Environmental Engineering

Civil Engineering

09 Environmental Engineering

Q.1 The per cepita demand of water is calculated in litres
(a) per person per year
(b) per person per month
(c) per person per day
(d) per person per week

Q.2 The multiplying factor, as applied to obtain the maximum daily water demand in relation to the average i.e. per capita daily demand is:
(a) 1.5 (b) 1.8
(c) 2.0 (d) 2.7

Q.3 Turbidity in water is the
(a) physical characteristics of water
(b) chemical characteristic of water
(c) physiochemical characteristics of water
(d) biological characteristics of water

Q.4 A water sample analysis data is given below:

Ion	Concentration (mg/l)	Atomic weight
Ca^{2+}	60	40
Mg^{2+}	30	24
HCO_3^-	400	61

The carbonate hardness (expressed as mg/l of $CaCO_3$) for the water sample is:
(a) 328 (b) 53
(c) 275 (d) 175

Q.5 The concentration of chloride ions in a water sample is estimated by titration with
(a) sodium thiosulphate reagent using ferroin as an indicator.
(b) Ferrous ammonium sulphate reagent using soluble starch as indicator
(c) Silver nitrate reagent using potassium chromate as an indicator
(d) silver nitrate reagent using potassium di-chromate as an indicator

Q.6 What is the equivalent calcium carbonate concentration of 110 mg/l of $CaCl_2$?
(a) 50 mg/l (b) 100 mg/l
(c) 117 mg/l (d) 58.5 mg/l

Q.7 One true colour unit is the colour produced by:
(a) one mg of formazin in one litre of distilled water
(b) one mg of silicon in one litre of distilled water
(c) one mg of ferric silicon in one litre of distilled water
(d) one mg of platinum as chloroplatinate ions in one litre of distilled water

Q.8 A water brone disease caused by protozoa
(a) cholera (b) paratyphoid
(c) histoplasmasis (d) amoebic dysentry

Q.9 Distribution layout in which the mains, sub-mains and branches are interconnected with each other is:
(a) Ring system (b) Grid iron system
(c) Radial system (d) Dead end system

Q.10 A sudden change in the slope of the hydraulic gradient line drawn for a straight section of a water pipe line indicates the
(a) change in ground slopes
(b) presence of water hammer
(c) accumulation of sediments
(d) leakage in pipeline

Q.11 The discharge per unit drawdown at the well is known as
(a) specific yield (b) specific storage
(c) specific retention (d) specific capacity

Q.12 The various treatment process in a water treatment plant are listed below:
1. Filtration 2. Chlorination
3. Sedimentation 4. Coagulation
5. Flocculation
The correct sequence of these processes in water treatment is:
(a) 1, 2, 3, 4, 5 (b) 4, 5, 3, 1, 2
(c) 2, 3, 1, 5, 4 (d) 1, 2, 5, 3, 4

Q.13 The coarse screens are normally kept inclined at about 45° – 60°, to the horizontal, so as to
(a) decrease the opening area to reduce the flow velocity
(b) decrease the opening area to increase the flow velocity
(c) increase the opening area to reduce the flow velocity
(d) increase the opening area to increase the flow velocity

Q.14 In which treatment unit is "schmutzdecke" formed?
(a) sedimentation tank
(b) rapid sand filter
(c) slow sand filter
(d) coagulation tank

Q.15 Nalgonda technique is used for
(a) deflouridation (b) chlorination
(c) ozonation (d) ionization

Q.16 The most commonly used adsorbent for water purification is:
(a) Ground nut husk carbon
(b) Activated carbon
(c) Coconut shell carbon
(d) Neem bark carbon

Q.17 Jar test is carried out to decide the dosage of
(a) coagulant (b) ozone
(c) chloride (d) lime

Q.18 While testing for COD of sewage, organic matter is oxidised by $K_2Cr_2O_7$ in the presence of
(a) HCl (b) H_2SO_4
(c) HNO_3 (d) $AgNO_3$

Q.19 In a BOD test, 5 m*l* of waste is added to 295 m*l* of aerated pure water. Initial dissolved oxygen content of the diluted sample is 8 mg/*l*. After 5 days of incubation at 20°C, the DO content of the sample is reduced to 5 mg/*l*. The BOD of the waste water is:
(a) 140 mg/*l* (b) 160 mg/*l*
(c) 190 mg/*l* (d) 180 mg/*l*

Q.20 The following zones are formed in a polluted river
1. Zone of clear water
2. Zone of active decomposition
3. Zone of recovery
4. Zone of degradation
The correct sequence in which these zones occur progressively downstream in a polluted river is:
(a) 4, 2, 1, 3 (b) 4, 2, 3, 1
(c) 2, 4, 3, 1 (d) 2, 4, 1, 3

Q.21 The sound pressure level for a jet plane on the ground with sound pressure of 2000m pa should be
(a) 60 dB (b) 70 dB
(c) 40 dB (d) 80 dB

Q.22 When are drop manholes provided in a sewerage system?
(a) There is change from gravity system to pressure system
(b) There is change in the elevation of the ground level
(c) There is change in the diameter of the sewer
(d) There is change in the direction of the sewer line

Q.23 Water seal in gully traps is usually from
(a) 50 mm to 75 mm
(b) 100 mm to 150 mm
(c) 10 mm to 20 mm
(d) 150 mm to 200 mm

Q.24 The important gaseous pollutants, contributing to acid rains, are:
(a) SO_x and NO_x (b) CO_2 and H_2S
(c) NO_x and O_3 (d) None of these

Q.25 EIA stands for:
(a) Energy impact assessment
(b) Ecological impact assessment
(c) Environmental impact assessment
(d) Emission impact assessment

Q.26 Leachate is a coloured liquid that comes out of
(a) septic tank
(b) sanitary landfill
(c) composite plants
(d) aerated lagoons

Q.27 The dominant micro-organism in an activated sludge process reactor are
(a) aerobic heterotrophs
(b) anaerobic hetetrotrophs
(c) autotrophs
(d) phototrophs

Q.28 Which of the following sewage treatment units has a parshall flume?
(a) Trickling filter (b) Oxidation ditch
(c) Grit Chamber (d) Aerated lagoon

Q.29 Eutrophication of water bodies is caused by the
(a) discharge of toxic substances
(b) excessive discharge of nutrients
(c) excessive discharge of suspended solids
(d) excessive discharge of chlorides

Q.30 Symbiosis, the beneficial association between algae and bacteria is used for treatment of waste water in the following unit?
(a) Activated sludge
(b) Rotating biological contractor
(c) Anaerobic digester
(d) Oxidation pond

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Answer Keys

1.	(c)	2.	(b)	3.	(a)	4.	(c)	5.	(c)	6.	(b)	7.	(d)
8.	(d)	9.	(b)	10.	(d)	11.	(d)	12.	(b)	13.	(c)	14.	(c)
15.	(a)	16.	(b)	17.	(a)	18.	(b)	19.	(d)	20.	(b)	21.	(c)
22.	(b)	23.	(a)	24.	(a)	25.	(c)	26.	(b)	27.	(a)	28.	(c)
29.	(b)	30.	(d)										

Detailed Solutions

1. (c)

Per Cepita demand: It is the average annual amount of daily water required by one person.

2. (b)

Maximum daily demand = 1.8 × Average daily demand

3. (a)

Physical water quality parameter.

- Suspended solid.
- Turbidity
- Colour
- Taste and odour.
- Temperature.

4. (c)

$$\text{TH (in mg/}l\text{ as CaCO}_3) = \frac{60}{20}\times 50 + \frac{30}{12}\times 50 = 275 \text{ mg/}l \text{ as CaCO}_3$$

$$\text{Alkalinity (in mg/}l\text{ as CaCO}_3) = \frac{400}{61}\times 50 = 327.86 \text{ mg/}l \text{ as CaCO}_3$$

$\therefore$ Carbonate hardness = minimum{TH, Alkalinity}

$= 275 \text{ mg/}l \text{ as CaCO}_3$

5. (c)

Chlorides are estimated by Mohr's method, in which raw water is titrated with standard $AgNO_3$ solution using K_2CrO_4 (potassium chromate as an indicator)

6. (b)

$$\text{Concentration (as CaCO}_3) = \frac{\text{Concentration of CaCl}_2}{\text{eq. wl. of CaCl}_2}\times \text{eq wt. of CaCO}_3$$

$$= \frac{110}{55}\times 50 = 100 \text{ mg/}l$$

7. (d)

Measurement of colour is done by colour matching technique (tintometer), and it is expressed in TCU (True colour unit) where, 1TCU is equal to colour produced by 1 mg per litre of platinum in the form of chloroplatinate ion.

8. (d)

Diseases caused by protozoal infection: Amoebic dysentry.

Diseases caused by bacterial infection: Cholera, paratyphoid.

9. (b)

Grid iron system: Also known as reticulation system, the mains, sub-mains and branches all are inter-connected with each other.

Note: This system is more suitable for well planned towns and cities.

10. (d)

By plotting the hydraulic gradient line, leakage of water from the underground water mains will be detected. In this method, the pressures at various points along a suspected pipeline are measured and the hydraulic gradient line is plotted. The appearance of any kink or change in the slope of the hydraulic gradient line will indicate the location of a leak in the pipe line.

11. (d)

Specific capacity of a well is defined as the well yield per unit of drawdown.

12. (b)

General process of treatment of water:

Screening → Aeration → Coagulation → Flocculation → Sedimentation → Filtration → Disinfection

13. (c)

The coarse screens are normally kept inclined at about 45° – 60° to the horizontal, so as to increase the opening area to reduce the flow velocity and thus making the screening more effective.

14. (c)

Schmutzdecke or dirt cover is a biological layer formed on the surface of a slow sand filter.

15. (a)

Ground water containing excess fluoride is treated by nalgonda technique.

16. (b)

Activated carbon is a specially treated carbon, which possesses the property of absorbing and attracting impurities such as liquids, gases and finely divided solids. Because of its excellent property of absorbing impurities, it is widely used for removing tastes and odours from public supplies.

17. (a)

Selection and optimum dosages of coagulants are determined experimentally by the jar test.

18. (b)

The COD test is used to measure the total organic matter (biodegradable as well as non-biodegradable) present in sewage. In order to perform this test, a known quantity of waste water is mixed with a known quantity of standard solution of potassium dichromate, and the mixture is heated. The organic matter is oxidised by $K_2Cr_2O_7$ (in the presence of H_2SO_4). The resulting solution of $K_2Cr_2O_7$ is titrated, and the oxygen used in oxidising the waste water is determined. This is called the chemical oxygen demand (C.O.D).

19. (d)

$$\text{BOD of waste water} = \text{DO consumed} \times \text{Dilution factor}$$

$$= (8-5)\times\frac{295+5}{5} = 180 \text{ mg/}l$$

20. (b)

A polluted stream undergoing self-purification can be divided into the sequence of following four zones:

Zone of degradation → zone of active decomposition

↓

Zone of clear water ← zone of recovery

21. (c)

Sound pressure level,

$$L_p = 20\log_{10}\left(\frac{p_{rms}}{p_{rmso}}\right)$$

$$p_{rms,\,o} = 20\ \mu\text{ Pa}$$

$$\therefore \quad L_p = 20\log_{10}\left(\frac{2000}{20}\right) = 40 \text{ dB}$$

22. (b)

- When the branch sewer enters a manhole by more than 0.5 to 0.6 m above the main sewer, the sewage is not allowed to fall directly, but brought into it through a down pipe.
- It the drop is only a few meters, the down pipe can be kept sloping (at 45° to the ground), and if drop is more, a vertical pipe is found to be economical.
- The manhole in which a vertical pipe is used is called a drop manhole, where as, the one using an inclined pipe is called a ramp.
- The drop manhole serve the following purposes.
  (i) It avoid a lot of earth work excavation
  (ii) The sewage trickling into the manhole from the directly placed branch sewer is likely to fall on persons working in the manhole. This is avoided in drop manholes.
- A plug is provided at the point where branch sewer, if taken straight, intersects the wall of the manhole. The length of the branch sewer between the vertical pipe and the plug is known as inspection arm and can be used for inspecting and cleaning the branch sewer after opening the plug.

23. (a)

Gully trap: A gully trap or a gully is often provided at the junction of a room or a roof drain and the other drain coming from bath, kitchen etc.

The water seal is usually 50 mm to 75 mm deep.

24. (a)

Acid rain results when gaseous emission of sulphur oxides (SO_x) and nitrogen oxide NO_x interact with water vapour and sunlight and are chemically converted to strong acidic compounds (H_2SO_4 and HNO_3).

25. (c)

EIA stands for environmental impact assessment.

26. (b)

Disposal of refuse by sanitary landfill:

In this method of refuse disposal, refuse is carried and dumped into low lying area (earmarked as landfill site).

During rainy season, when excess water seeping through the area, may come out of the dump, as a coloured liquid, called leachate.

28. (c)

Parshall flume is used in grit chamber of parabolic channels to both measure and control the flow through velocity in it.

29. (b)

Eutrophication is a natural process under which lakes gets infested with algae and silt up gradually to become shallower and more productive through the entry and cycling of nutrients like carbon, nitrogen and phosphorus.

30. (d)

- Stabilization ponds are open flow-through earthen basins, specifically designed and constructed to treat sewage and biodegradable industrial wastewaters.
- Such ponds provide comparatively long detention periods, extending from a few days to several days, during which time the wastes get stabilised by the action of natural forces.
- Stabilisation ponds may be classified as aerobic, facultative or anaerobic, depending upon the mechanism of purification.
- In a totally aerobic pond, the stabilisation of wastes is brought about by aerobic bacteria, which flourish in the presence of oxygen. The oxygen demand of such bacteria in such a pond is met by the combined action of algae and other microorganisms called algal photosynthesis or algal-symbiosis.
- In this symbiosis, the algae growing in the presence of sunlight, produce oxygen by the action of photosynthesis and this oxygen is utilised by the bacteria for oxidising the waste organic matter.

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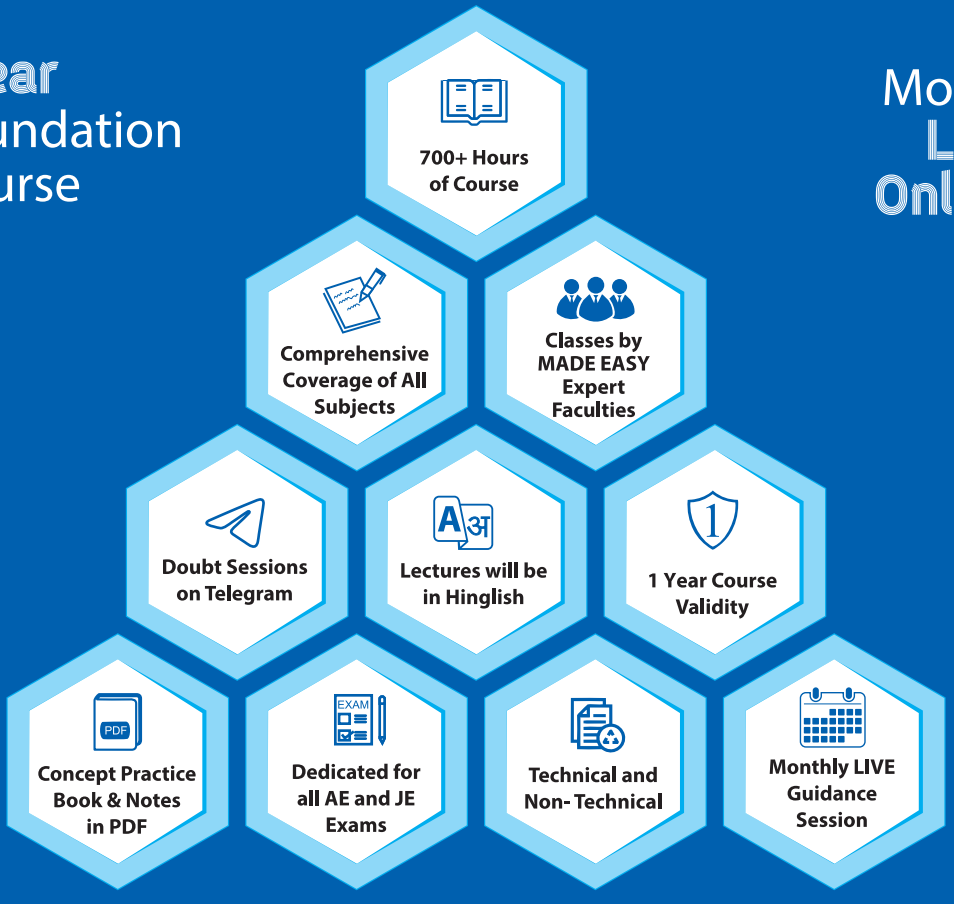

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