



CIVIL ENGINEERING



DDA JE 2022

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SSC JE PRE 2021

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START DATE

14th
JUNE 2022



DURATION

300
HOURS



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1
YEAR



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Coincident draft
 max { maximum + fire demand
daily demand
 = $1.8 \times Q_{avg}$
 maximum hr of
 maximum day = $2.7 \times \text{avg hr of maximum demand}$

Q : 1) Water distribution systems are sized to meet the:

A : Maximum hourly demand

B : Average hourly demand

C : Maximum daily demand and fire demand

D : Average daily demand and fire demand

③

Table 3.4 Institutional needs for potable water

No.	Institutions	Water Supply (litres)
1	Hospital including laundry and beds exceeding 100	450 per bed
2	Hospital including laundry and beds not exceeding 100	340 per bed
3	Lodging houses / hotels	180 per bed
4	Hostels	135 lpcd
5	Nurses homes and medical quarters	135 lpcd
6	Boarding schools/colleges	135 lpcd
7	Restaurants	70 per seat
8	Airports and Seaports, duty staff	70 lpcd
9	Airports and Seaports, alighting and boarding persons	15 lpcd
10	Train and Bus stations, duty staff	70 lpcd
11	Train and Bus stations, alighting and boarding persons	15 lpcd
12	Day schools/colleges	45 lpcd
13	Offices	45 lpcd
14	Factories, duty staff	45 lpcd
15	Cinema, concert halls and theatres	15 lpcd

full parking
45 l/c/day

$$50,000 \quad 3$$

$$50,000 - 2 \times 10^5 \quad 2.5$$

$$7 \times 10^5 \quad 2$$

Q : 2) The peak factor suggested by CPHEEO for computing carrying capacity in the design of sewars for the contributory population of 20,000 is

A : 2.00

B : 2.25

C : 2.50

D : 3.00



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Q : 3) Water supply projects, under normal circumstances may be planned for a design period of:

A : 10 years

B : 20 years

☒ C : 30 years

D : 50 years

20-30 years

C

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Distribution system, pump house, and pipe connections to several treatment units	30
Electric motors and pumps	15
Infiltration works	30
Storage reservoirs/dams	30
Water treatment units	15



50

15 years

1352/L/day

Q : 4) Match List-I with List-II and select the most appropriate answer using the codes given below the lists:

List-I (Bacteria)	List-II (Process)
A. Hourly peak demand is	1. <u>180% of average demand</u>
B. <u>Daily peak demand is</u>	2. 270% of average demand
C. Monthly peak demand is	3. 100% of average demand
D. Yearly peak demand is	4. 128% of average demand

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

Codes :

A : 1, 2, 4, 3

B : 4, 3, 2, 1

C : 1, 3, 2, 4

D : 1, 3, 2, 4

Leather
45KL

Q : 5) In which one of the following industries, the water requirement in kilo litres per unit of production is very high?

✓ A : Paper industry — 10mm

250-300KL B : Steel industry

1-2KL C : Sugar industry

D : Fertilizer industry

1-2KL

KL
200-400KL

400-1000KL

Q : 6) In which one of the following industries, the water requirement in kilo litres per unit of production is very high?

A : Paper industry

B : Steel industry

C : Sugar industry

D : Fertilizer industry



Q : 7) The trap efficiency of a reservoir depends on the

A : Capacity the reservoir

B : Inflow of the reservoir

C : Capacity inflow ratio

D : Capacity – outflow ratio

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Q : 8) Water may not contain much impurities if its source is:

A : Reservoirs ✓

B : Stream flowing in plains

C : Lake in lower regions

D : Spring along hill slopes

Suspended
impurities

dissolved
impurities

(D)

turbulence

dissolved
gases

atm
Fe²⁺ 1 min²⁺

Q : 9) If within a zone of saturation, an impervious deposit below a pervious deposit is found to support a body of saturated material, then this body of saturated material is known as-

A : Plowing well

B : Aquiclude

C : Artesian aquifer

D : Perched aquifer

Confined (Artesian)
aquifer form

Unconfined (dupita)
form

(W.T) (Known)



Q : 10) The measure of the amount to which light is absorbed or scattered by the suspended material in water is called:

A : Opacity

B : Turbidity

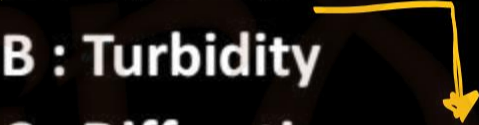
C : Diffraction

D : None of the above

permissible
limit:

5 to 25 mg/l

2012



Turbidity ^{turbidity}
rod

Jackson ^{725ppm}

NTU

(less than

1)

Scattering

absorption



Q : 11) As per IS 10500 : 1991, the desirable limit of dissolved solids in drinking water is:

A : 200 mg/l

B : 230 mg/l

C : 150 mg/l

D : 500 mg/l

B

2012

there is not alternate
source available
(Rejection)

Parameters	Permissible Limit	Cause for rejection
Total suspended solids	500	2000
Turbidity (NTU)	1	10
Colour (TCU)	5	25
Taste & odour (TON)	1	3
Total dissolved solid (mg)	500	2000
Alkalinity	200	600
pH	7 - 8.5	< 6.5 & > 9.2
Hardness (mg/L)	200	600
Chloride content (mg/L)	250	1000

5-25

No alternate source available.

WATER QUALITY PARAMETERS AND BIS STANDARDS FOR VARIOUS CHEMICAL AND BIOLOGICAL CONSTITUENTS

S.No.	Parameters	Drinking water IS 10500 : 2012	
		Permissible Limit	Maximum Limit
1	Odor	Agreeable	Agreeable
2	Taste	Agreeable	Agreeable
3	pH	6.5 to 8.5	No relaxation
4	TDS (mg/l)	500	2000
5	Hardness (as CaCO ₃) (mg/l)	200	600
6	Alkalinity (as CaCO ₃) (mg/l)	200	600
7	Nitrate (mg/l)	45	No relaxation
8	Sulfate (mg/l)	200	400
9	Fluoride (mg/l)	1	1.5
10	Chloride (mg/l)	250	1000
11	Turbidity (NTU)	5	10
12	Arsenic (mg/l)	0.01	0.05
13	Copper (mg/l)	0.05	1.5
14	Cadmium (mg/l)	0.003	No relaxation
15	Chromium (mg/l)	0.05	No relaxation
16	Lead (mg/l)	0.01	No relaxation
17	Iron (mg/l)	0.3	No relaxation
18	Zinc (mg/l)	5	15
19	Fecal Coliform (cfu)	0	0
20	E. Coli (cfu)	0	0

Q : 12) Dental cavities, a disease caused by drinking water due to

A : Excess fluorides

~~B : Absence of fluorides~~

C : Excess of nitrates

D : Presence of lead

Handwritten notes:
 1.5 mg/l2 (circled)
 Cause of Rejection
 discolorization
 Teeth.
 5 mg/l2 (underlined)
 Bone fluorosis.
 O.K.

Q : 13) Indian standard for acceptable limit of arsenic is

A : 0.01 mg/L

B : 0.05 mg/L

C : 0.005 mg/L

D : 0.001 mg/L

A 0.01 mg/L ?

A, B, C, D
toxic metal
Carcinogenic
↳ Cause Cancer

Surface water

Q : 14) In a water treatment plant, dissolved iron and manganese can be removed from the water by-

A : Aeration

B : Aeration and coagulation

C : Aeration and filtration

D : Aeration and sedimentation

Colours cause (Fe^{2+} , Mn^{2+})

$\downarrow \text{O}_2$
(Fe^{3+}) $\text{Mn}(\text{OH})_2$
ppt

weight

sedimentation

Subsurface water

Underground water



Q : 15) Identify the instrument which is not used to measure the turbidity of water sample

A : Nephlo turbidity meter

B : Jackson turbidity meter

C : Aries turbidity meter

D : Baylis turbidity meter

Q : 16) Jackson candle turbidimeter measures turbidity of a sample of water on the basic of

A : Scattering of light

B : ~~Absorption of light~~

C : Polarization of light

D : Concentration of colloids



Q : 17) Permanent hardness is removed by-

1. Lime soda process
2. Boiling
3. Demineralization process
4. Base exchange process

A : 1 only

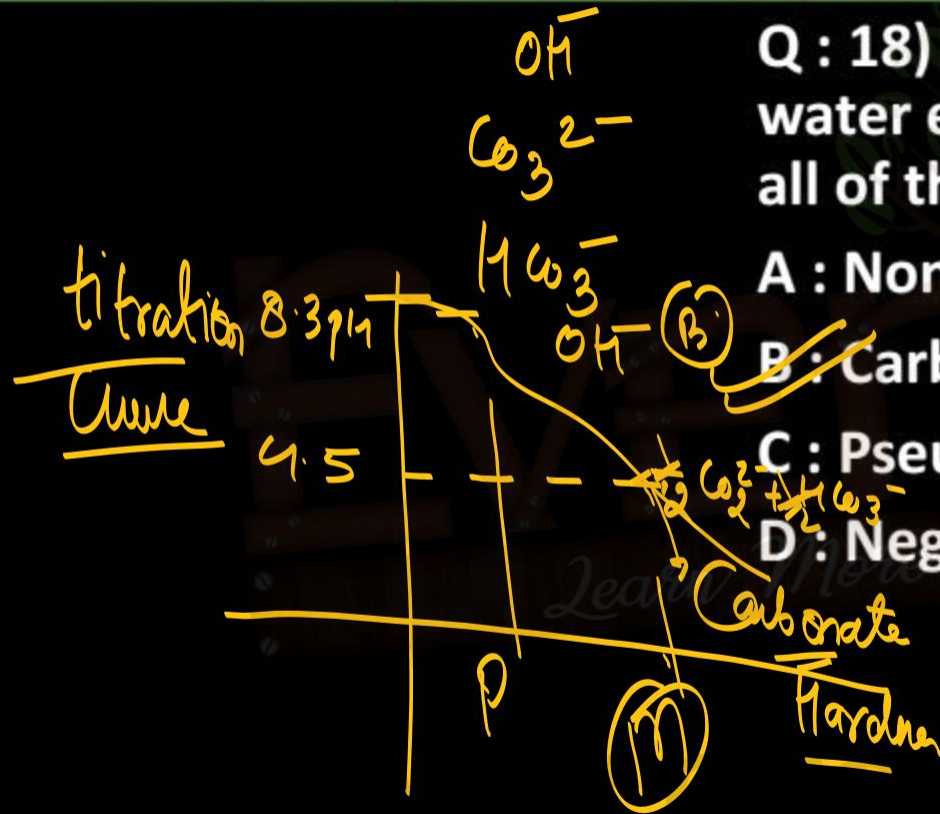
B : 2 only

D C : All of the above

~~D : 1, 3 and 4~~

Zero Hardness
(Ion exchange method)

Mg^{2+}, Ca^{2+}
Carbonate
Bicarbonates
Sulphate
Chloride
Temporary
Permanent Hardness



Q : 18) If the methyl orange alkalinity of water equals or exceeds total hardness, all of the hardness is:

A : Non carbonate hardness

~~B : Carbonate hardness~~

C : Pseudo hardness

D : Negative non-carbonate hardness

P | M

Fe^{2+} } 0.1mg/l

Mn^{2+} } 0.05mg/l

permissible
limit

Q.19) The commonly used indicator for measuring iron concentration in water is:

A: Sodium thiosulphate — dechlorination

B : Silver nitrate — chloride concentration

C : Eriochrome black T

D : 1, 10 phenanthraline

iron concentration

Nessler (Mercuric), EDTA

EDT — Red wine

Q : 20) The permissible limit of sulphate in the absence of alternate source (Provided that the magnesium does not exceed 30 mg/L) is : _____.

A

~~A : 600 mg/L~~

B : 200 mg/L

C : 250 mg/L

D : 400 mg/L

(Cause of Rejection)

Additional Information

The permissible limits of various compounds are as follows:

Parameters	Permissible Limit	Permissible limit in absence of alternate sources (Cause for rejection)
Total suspended solids	500	2000
Turbidity (NTU)	1	10
Colour (TCU)	5	25
Taste & odour (TON)	1	3
Total dissolved solids (mg)	500	2000

Q : 21) Match List-I with List-II and select the correct answer using the code given below the lists:

List-I (Impurity in drinking water)	List-II (Harm caused)
A. Excess of nitrates	1. Brackish water
B. Excess of fluorides	2. Goiter
C. Lack of iodides	3. Fragile bones
D. Excess of chlorides	4. Blue babies

NO_2^- (Nitrite)

partially decompose

0 mg/l

NO_3^-

Codes :

Ⓐ : 4, 2, 3, 1

Ⓑ : 4, 3, 2, 1

B : 1, 2, 3, 4

D : 1, 3, 2, 4

15 mg/l
methyoglobinemia

Q : 22) If the depletion of oxygen is found to be 5 ppm after incubating a 2.5% solution of sewage sample for 5 days at 20°C, BOD of the sewage is

A : 50 ppm

B : 100 ppm

C : 150 ppm

D : 200 ppm

①

$$\begin{aligned} \text{Biochemical Oxygen demand} &= \frac{(D_0 - D_t) \text{ dilution factor}}{5 \times \frac{100}{2.5}} \\ &= \frac{5 \times 100}{2.5} \\ &= 200 \text{ mg/l} \end{aligned}$$

Q : 23) The true relation between theoretical oxygen demand (TOD), Biochemical oxygen demand (BOD) and chemical oxygen demand (COD) is given by

Thox / Stoichiometrically Specific $C_6H_{12}O_6$

- A : TOD > BOD > COD
- B : TOD > COD > BOD
- C : BOD > COD > TOD
- D : COD > BOD > TOD

Bio + Non Bio (2.5 hrs)
Biodegradable (5 days 20°C)

Q : 24) The following zones are formed in a polluted river under the self-purification process.

A. Zone of clear water

B. Zone of active decomposition

C. Zone of recovery

D. Zone of pollution

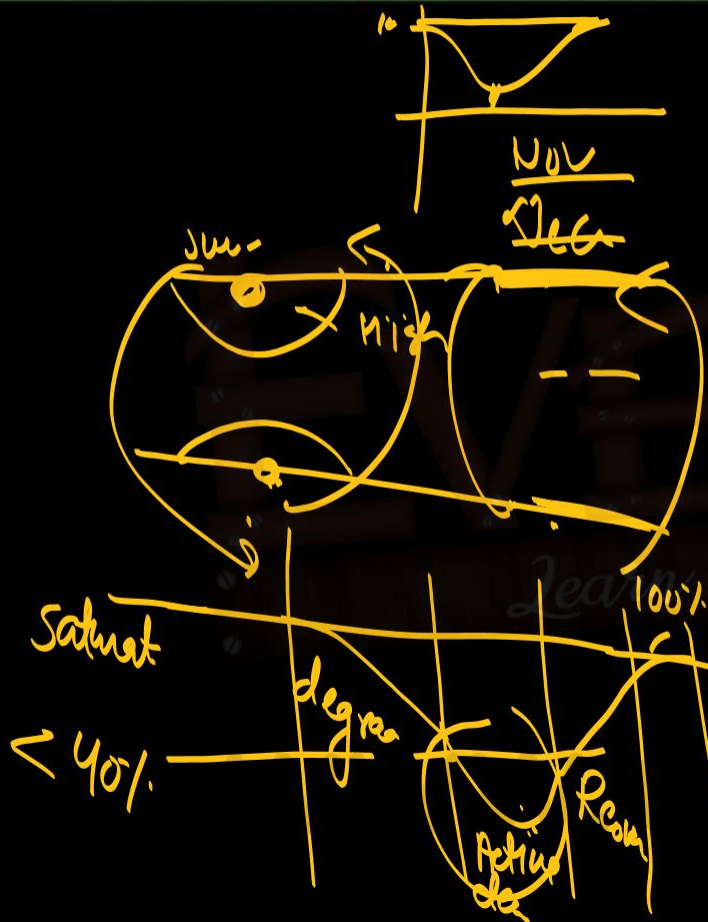
The correct sequence in which these zones occur progressively downstream in a polluted rivet is

A : 4, 2, 1, 3

C : 2, 4, 3, 1

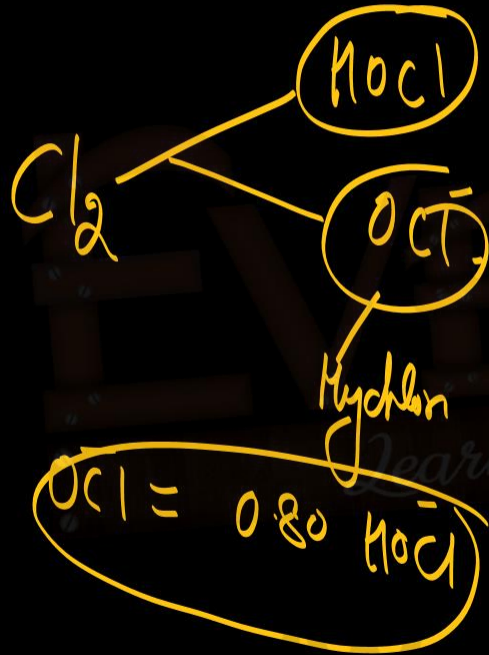
B : 4, 2, 3, 1

D : 2, 4, 1, 3



1 Sedimentation
2 Oxidation
3 Aeration
4 (4, 2, 3, 1)

(B)



Q : 25) Which of the following is NOT an advantage of chloramines-ammonia treatment of water? *weak disinfect*

A : It is less effective than chlorine alone

B : It prevents bad taste and odour

C : There is no danger of overdoes

D : Quantity of chlorine require is reduced especially if organic matter is present in large amounts

Q : 26) Match List-I (type of water source) with List-II (Treatment required) and select the correct answer using the codes given below the lists:

List-I (Type of water source)	List-II (Treatment required)
A. Surface water (river / canal)	1. Aeration, coagulation sedimentation and disinfection
B. Water of infiltration gallery	2. Disinfection
C. Lake / pond water	3. <u>CuSO₄ treatment</u> , coagulation, sedimentation, filtration and disinfection
D. Tube-well water	4. Coagulation, <u>flocculation</u> sedimentation, <u>filtration</u> and disinfection

~~Aeration~~ →

Codes :

A : 4, 1, 3, 2

C : 1, 4, 2, 3

B : 1, 4, 3, 2

D : 4, 1, 2, 3

(A)

Q : 27) Consider the following unit process commonly used in water treatment, Rapid mixing (RM), flocculation (F), Primary sedimentation (PS), secondary sedimentation (SS), chlorination ©, and rapid sand filtration (RSF). The order of these unit processes (First to last) in conventional water treatment plant is:

P.S + R.M → F + SS

A : PS → RSF → F → RM → SS → C

B : PS → F → RM → RSF → SS → C

C : PS → F → SS → RSF → RM → C

D : PS → RM → F → SS → RSF → C

R.S.F

Chlorination

Q : 28) In a water distribution network, which of the following ~~values~~ will work automatically?

(A)

~~A : Check valve~~

B : Butterfly valve

C : Scour valve

D : Sluice valve

Silt Removal

more than one direction

large conduits

Valve:

Regulation/ Non Return

Reflux
Regulate the flow in one direction

Q : 29) Self purification of running streams may be due to:

A : Sedimentation, oxidation and coagulation

B : Dilution, sedimentation and oxidation

C : Dilution, sedimentation and coagulation

D : Dilution, oxidation and coagulation

B

Anaerobic

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Qr
20

Q : 30) As per the Royal commission report on sewage disposal standards of purification required for waste water having dilution factor above 500 is:

A : Tertiary treatment required

B : Treatment such as sedimentation, screening and chemical precipitation is required

C : No treatment required

D : Plain sedimentation is required

Standard of Dilution

Table 3.15 Standards of Dilution Based on Royal Commission Report

Dilution factor	Standards of purification required
Above 500	No treatment is required. Raw sewage can be directly discharged into the volume of dilution water.
Between 300 to 500	Primary treatment such as plain sedimentation should be given to sewage, and the effluents should not contain suspended solids more than 150 ppm.
Between 150 to 300	Treatments such as sedimentation, screening and essentially chemical precipitation are required. The sewage effluent should not contain suspended solids more than 60 ppm.
Less than 150	Complete thorough treatment should be given to sewage. The sewage effluent should not contain suspended solids more than 30 ppm and 5 days B.O.D. at 18.3°C should not exceed 20 ppm.



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