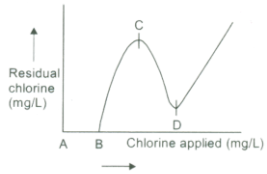
01. The effective size (ES) of sand and its uniformity coefficient (UC) are the usual specified parameters for sand filters. In slow sand filters, as compared to rapid sand filters,

(a) ES is less but UC is more
(b) ES is more but UC is less
(c) Both ES and UC are more
(d) Both ES and UC are less

02. For proper slow mixing in the flocculator of a water treatment plant, the temporal mean velocity gradient G needs to be of the order of

(a) 5 to $20S^{-1}$
(b) 20 to $80s^{-1}$
(c) 100 to $200S^{-1}$
(d) 250 to $350s^{-1}$

03.



If only ammonia was present in water, the only change in the above diagram would have been that the curve would

(a) Be a straight line
(b) Become parallel to Y-axis
(c) Become parallel to X-axis after 'D'
(d) Be passing through the origin

04. Match List-I (Water treatment units) with List-II (Detention time) and select the correct answer

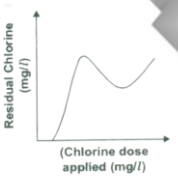
List – I	List – I
A. Rapid mixing unit	1. 11 hours
B. Flocculator	2. 10 seconds
C. Prpeller mixing unit	3. 30 seconds
D. Sedimentation tank	4. 30 minutes

Codes :
a. A – 3, B – 4, C – 2, D – 1
b. A – 4, B – 3, C – 1, D – 2
c. A – 4, B – 3, C – 2, D – 1
d. A – 3, B – 4, C – 1, D – 2

05. Air-binding in rapid sand filters is encountered when

(a) There is excessive negative head
(b) The water is subjected to prolonged aeration
(c) The raw water contains dissolved gases
(d) The filter bed comprises largely of coarse sand

06.



In the plot of residual chlorine versus chlorine dose applied shown in the above figure, the curve will not have any (0,0) point because
(a) of experimental error
(b) chlorine escapes into the atmosphere
(c) chlorine requires some contact time
(d) chlorine is consumed for disinfection

07. Consider the following statements: Some amount of chloride is allowed in drinking water because

1. It helps in killing bacteria
2. Small quantity of chloride adds to the taste
3. It is not injurious to human health
4. It is not economical to remove it completely

Which of these statements are correct?
(a) 1, 2 and 4 (b) 1, 2 and 3
(c) 2, 3 and 4 (d) 1, 3 and 4

08. The correct sequence of processes in a water treatment plant for rural water supply is

(a) Chlorination, aeration, sedimentation, rapid sand filter
(b) Coagulation, sedimentation, slow sand filter, chlorination
(c) Coagulation, flocculation, clarification, pressure filter
(d) Aeration, plain sedimentation, slow sand filter, chlorination

09. **Assertion (A):** Alum is the most commonly used coagulant in water treatment.
Reason (R): Alum is very effective in killing pathogens present in water.

10. A rural water supply scheme serves a population of 10,000 at the rate of 50 litres per capita per day. For the chlorine dose of 2 ppm, the required amount of bleaching powder with 20% available chlorine will be

(a) 0.5 kg
(b) 5 kg
(c) 10 kg
(d) 15 kg

11. The raw water entering an ideal horizontal settling tank contains following two types of particles:

Particle type	Settling velocity (m / l)	Concentration (mg /l)
I	3	200
II	1	300

When the surface overflow rate of the settling tank is $3m^3/m^2/h$, the concentration of the particles in the settled water will be
(a) 100 mg/l
(b) 200 mg/l
(c) 300 mg/l
(d) 400 mg/l

12. Which one of the following filters will produce water of higher bacteriological quality?

(a) Slow sand filter
(b) Rapid sand filter
(c) Pressure filter
(d) Dual media filter

13. Match List-I (Units in water treatment plant) with List-II (Impurities removed) and select the correct answer :

List – I	List – I
A. Aerator	1. Excess CO_2 and H_2S
B. Rapid sand filter	2. Settleable & colloidal matter
C. Slow sand filter	3. Suspended matter
D. Sedimentation tank (after coagulation and flocculation)	4. Suspended, colloidal & bacteriological matter

Codes :
a. A – 1, B – 3, C – 2, D – 4
b. A – 3, B – 1, C – 2, D – 4
c. A – 3, B – 1, C – 4, D – 2
d. A – 1, B – 3, C – 4, D – 2

14. Consider the following impurities:

1. CO_2 and H_2S
2. Finely-divided suspended matter
3. Disease causing bacteira
4. Excess alkalinity

The correct sequence of the removal of these impurities in a water treatment plant is
(a) 1, 2 3, 4
(b) 1, 4, 3, 2
(c) 1, 4, 2, 3
(d) 4, 1, 3, 2

15. Which of the following are the common problems associated with the operation of rapid sand-filter?

1. Air-binding
2. Cracking of sand beds
3. Bumping of filter beds
4. Mud balls

Select the correct answer using the codes given below:
(a) 1 and 2
(b) 2 and 3
(c) 2. 3 and 4
(d) 1. 2. 3 and 4

16. 'Air binding' may occur in

(a) Sewers
(b) Artesian well
(c) Aerator
(d) Filter

17. The purpose of re-carbonation after lime-soda process of water softening is the

(a) Removal of excess soda from water
(b) Removal of non-carbonate hardness
(c) Recovery of lime
(d) Conversion of precipitates to soluble form

18. Which of the following are removed by rapid sand filter from water?

1. Dissolved solids
2. Suspended solids
3. Bacteria
4. Helminths

Select the correct answer using the codes given below:
(a) 1 and 3
(b) 2 and 3
(c) 1 and 3
(d) 2. 3 and 4

19. **Which one of the following filters should be recommended for protected rural water supply project?**

(a) Pressure filter
(b) Slow sand filter
(c) Diatomaceous earth filter
(d) Rapid sand filter

20. **Consider the following statement: Aeration in water treatment helps in**

1. Killing pathogens
2. Correcting pH
3. Precipitating dissolved iron & manganese
4. Expelling excess CO_2 and H_2S
5. Expelling volatile oils

Which of the statements given above are correct?

(a) 2, 4 and 5 (b) 3, 4 and 5
(c) 1, 2, 3 and 5 (d) 1, 2, 3 and 4