01. EDTA titration method of hardness determination of water sample uses an indicator which combines with hardness- causing divalent cations and forms a coloured complex. The name of the indicator and the colour of the formed complex respectively are

(a) Ferroin and dark blue
(b) Ferroin and wine red
(c) Eriochrome Black T and dark blue
(d) Eriochrome Black T and wine red

02. One Nephelometry Turbidity Unit (NTU) is equal to the turbidity produced by

(a) 1 mg SiO_2 dissolved in 1l of distilled water with the test being run according to absorption principle
(b) 1 mg SiO_2 dissolved in 1l of distilled water with the test being run according to scattering principle
(c) 1 mg Formazin dissolved in 1l of distilled water with the test being run according to absorption principle
(d) 1 mg Formazin dissolved in 1l of distilled water with the test being run according to scattering principle

03. Which one of the following tests employs Ethylene Diamine Tetra Acetic Acid as a titrating agent?

(a) Chlorides
(b) Dissolved oxygen
(c) Hardness
(d) Residual chlorine

04. The total hardness value obtained from the complete analysis of a water sample was found to be 120 mg/l. If the value of carbonate hardness is 50 mg/l, the non-carbonate hardness and alkalinity are, respectively

(a) 170 mg/l and 70 mg/l
(b) 170 mg/l and 50 mg/l
(c) 70 mg/l and 50 mg/l
(d) 50 mg/l and 70 mg/l

05. The dissolved oxygen in a water sample is generally estimated by modified Winkler method. Accordingly, approximately 200 ml volume of dissolved-oxygen-fixed solution shall be titrated with

(a) Sodium thiosulphate reagent using soluble starch as an indicator
(b) Sodium thiosulphate reagent using ferrain as an indicator
(c) Ferrous ammonium sulphate reagent using soluble starch as an indicator
(d) Ferrous ammonium sulphate reagent using ferroin as an indicator

06. The following residual chlorine compounds are formed during chlorination of water:

1. NH_2Cl 2. $NHCl_2$
3. HOCl 4. OCl^-

The correct sequence of formation of these residual chlorine compounds is

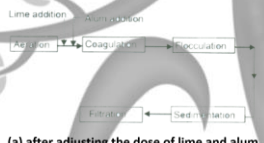
(a) 2, 1, 3, 4 (b) 1, 2, 4, 3
(c) 1, 2, 3, 4 (d) 2, 1, 4, 3

07. Match List-I (Type of water source) with List-II (Treatment to be given) and select the correct answer using the codes given below lists:

List – I	List – I
A. Surface water (river or canal)	1. Aeration, coagulation sedimentation and disinfection
B. Water from infiltration gallery	2. Disinfection
C. Lake/pond water	3. $CuSO_4$ treatment, coagulation, sediment- ation, filtration and disinfection
D. Tube well water	4. Coagulation, flocculation, sedimentation, filtration and disinfection

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

08. The flow chart of a water treatment plant is shown in the following figure. If it is proposed to defluoridate the water using Nalgonda treatment' then it should be done



(a) after adjusting the dose of lime and alum
(b) after sedimentation
(c) after filtration
(d) before aeration

09. Which of the following treatment reduce salinity of water?

1. Flash mixing and sedimentation
2. Electrodialysis
3. Reverse osmosis
4. Freezing
5. Filtration

Select the correct answer using the codes given below:

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

10. The cleaning of slow sand filter is done by

(a) reversing the direction of flow of water
(b) passing air through the filter
(c) passing a solution of alum and lime through the filter
(d) scraping off top layers of sand and admitting water

11. Match List-I (Name of impurity in water) with List-II (Removed by) and select the correct answer using the codes given below the lists:

List – I	List – I
A. Fluorides	1. Activated carbon
B. Manganese	2. Activated alumina
C. Taste and odour	3. Manganese zeolite

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

12. A river is the source of water for water supply to a town. Its water is very turbid and polluted. The correct sequence of steps for treating the river water would be

(a) Presedimentation → prechlorination → coagulation →sedimentation → filtration → post-chlorination
(b) Coagulation → sedimentation → post-chlorination
(c) Coagulation → filtration → sedimen-tation → post chlorination
(d) Sedimentation → post-chlorination

13. Uniformity coefficient of filter sand is given by

(a) $0_{50} / 0_5$

(b) $0_{50} / 0_{10}$

(c) $0_{60} / 0_5$

(d) $0_{60} / 0_{10}$

14. Zero hardness of water is achieved by

(a) Using lime soda process
(b) Excess lime treatment
(c) Ion exchange method
(d) Using excess alum dosage

15. Match List I with List II and select the correct answer:

List – I	List – I
A. Absence of fluorides	1. Methemoglobinaemia
B. Excess of lead	2. Goitre
C. Presence of excess nitrates	3. Dental caries
D. Absence of iodide	4. Anaemia

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

16. Which of the following treatment(s) will be indicated for a rural water supply from a deep groundwater source?

1. Sedimentation
2. Alum dosage.
3. Potassium permanganate dosing
4. Bleaching powder application.

Select the correct answer using the codes given below:

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

17. Match List-I (Impurites to be removed from sewage) with List-II (Treatment unit used) and select the correct answer.

List – I	List – II
A. Large floating matter	1. Trickling filter
B. Suspended inorganic matter	2. Primary clarifier
C. Suspended organic matter	3. Grit chamber
D. Dissolved organic matter	4. Screens

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

18. **Assertion (A):** In the case of dual media filter, the rate of filtration is more than that of rapid sand filter.
Reason (R): The direction of flow is from fine medium to coarse medium.

19. 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 flocculation
(d) Aeration and sedimentation

20. 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**