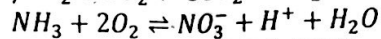
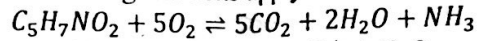


Time: 1 hour

NOTE: All answers should be written on answer sheet only. Nothing should be written on the question paper, calculator exchange is not allowed.

- Q. No. Marks
1. Brief the following [200 words each] 8
- (a) DO sag curve
 - (b) COD Vs BOD
 - (c) Scouring
 - (d) Basis for total coliform test

2. Bacterial cells have been represented by the chemical formula $C_5H_7NO_2$ compute the theoretical oxygen demand assuming the following reactions apply: 4



3. The BOD_5 of a waste is 220 mg/L and the ultimate BOD is 320.0 mg/L, what is the rate constant (base 10)? 2

4. If the water has a carbonate alkalinity of 120.0 mg/L as the ion and pH of 10.30, what is the bicarbonate alkalinity in mg/L as ion and as $CaCO_3$? 3

5. The following mineral analysis was reported for water sample taken from a well. 3

	mg/L as the ion		mg/L as the ion
Iron	0.2	Silica (SiO_2)	20.0
Manganese	0.0	Fluoride	0.35
Ammonium	0.5	Boron	0.1
Sodium	4.7	Nitrate	0.0
Potassium	0.9	Chloride	4.5
Calcium	67.2	Sulfate	29.0
Magnesium	40.0	Alkalinity	284.0 as $CaCO_3$
Barium	0.5	pH as recorded	7.6 units

Determine the total, carbonate and non-carbonate hardness in mg/L as $CaCO_3$.

6. (a) Draw the unit process required to treat the river water. The lab analysis showed that suspended solid concentration in raw water is 1250 mg/L, and water also contains large debris, wood logs and pathogens. What would be the type of settling occur in settling basins? 2+2

(b) If it is required to mix the ground water to dilute the river water what changes would you propose in water treatment process? Explain with neat diagram.

7. Brief the following: 6

- (a) Coagulation, name two coagulants and give one reaction to illustrate the process.
- (b) Disinfection, list the disinfectant and explain the chlorination through reactions
- (c) Break point chlorination with diagram