

Aim: Determine biological oxygen demand (BOD) of given sewage samples.

Introduction: The amount of oxygen, taken up by the microorganisms that decompose the organic waste matter in wastewater is known as biological oxygen demand or biochemical oxygen demand. Therefore it is used to measure the amount of certain type of organic water pollution BOD is calculated by keeping a sample of water containing a known amount of oxygen for five days at 20 °C. The oxygen content is measured again and BOD is calculated. A high BOD indicates the presence of a large number of microorganisms which indicates a high level of pollution in wastewater. Oxygen demand is associated with the biodegradation of the carbonaceous portion of wastes and oxidation of nitrogen compounds such as ammonia. The following equations simplify the process of biodegradation:

Organic matter + O₂ + microorganisms → CO₂ + H₂O + new microbial cells

Ammonia + O₂ + microorganisms → NO₃ + H₂O + new microbial cells

Requirements: Incubation bottle 300mL volume; Air compressor, 20°C incubator, OD measure reagents.

Procedure:

1. Prepare BOD dilutions. 5 mL sample in 300 mL BOD bottle, fill up with dilution water; 15 mL sample in 300 mL BOD bottle, fill up with dilution water; 20 mL sample in 300 mL BOD bottle, fill up with dilution water.
2. Take 300 mL sample in BOD bottle. Prepare two sets of this sample. Keep one set for DO analysis for day 0 (i.e., Sample0Day) and another sample in BOD incubator for 5 days at 20°C (Sample5Day).
3. Measure DO in different samples at t=0.
4. Incubate samples in 20°C for 5 days.
5. Come back in the lab after 5 days and record dissolved oxygen.
6. Record data in following manner.

Bottle no.	Wastewater sample (mL)	Initial DO (mg/L) (DO ₀)	DO at 5-day (mL) (DO ₅)
1			
2			
3			
4			

Calculations:

Calculate 5-day BOD value of the sample at 20°C:

$$t\text{-day BOD} = [\text{DO}_t - \text{DO}_0] / (P) \quad (1)$$

Where P = Dilution factor = 300mL / (sample volume in mL)

Observation table:

BOD Level in mg/liter	Water Quality
1 - 2	Very Good: There will not be much organic matter present in the water supply.
3 - 5	Fair: Moderately Clean
6 - 9	Poor: Somewhat Polluted - Usually indicates that organic matter present and microorganisms are decomposing that waste.
100 or more	Very Poor: Very Polluted - Contains organic matter.