Biochemical Oxygen Demand(BOD)

Biochemical Oxygen Demand (BOD) is a widely used parameter to evaluate organic pollution in water.
It measures the amount of dissolved oxygen (DO) required by micro organisms to decompose organic matter under aerobic conditions.
Higher BOD levels indicate greater organic contamination,often due to sewage, agricultural runoff, or industrial wastewater.

1. Significance of BOD

- Acts as an indicator of organic pollution load.
- Directly linked to dissolved oxygen depletion in water.
- Helps in designing and evaluating waste water treatment plants.
- Provides in sight into the self-purification capacity of rivers and lakes.
- Forms the basis for regulatory water quality standards.

2. Factors Affecting BOD

- Temperature: Higher temperatures increase microbial activity, raising BOD.
- Presence of organic matter: More organic waste increases oxygen demand.
- Microbial population: Higher microbial load accelerates decomposition.
- Toxicsubstances: Heavy metals or chemicals can inhibit microbial activity, reducing measured BOD.
- Light penetration: Affects photosynthetic oxygen production in water.

3. Measurement of BOD

- Standard method: BOD_5 test→Oxygen consumed over 5 days at20°C.
- Measured in mg/L of oxygen.
- Common approaches:
    - Winkler's titration method(classical).
    - DO probes in automated systems.

4. Standard BOD Levels inWater

- Unpolluted water: <2mg/L.

- Moderately polluted water: 2–8mg/L.
- Heavily polluted water: >10mg/L.
- Sewage/waste water: Can exceed 200mg/L.

5. Diagram: BOD Process in Water Body

Organic Waste Enters Water

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Microorganisms Decompose Waste

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Oxygen Consumption Increases

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Dissolved Oxygen Levels Decrease

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Stress on Aquatic Life → Fish Kills & Ecosystem Imbalance

6. Effects of High BOD

- Oxygen depletion leading to fish kills.
- Shift to anaerobic conditions,producing toxic gases like H_2S and CH_4.
- Reduced biodiversity in aquatic ecosystems.
- Deterioration of water quality for human use.

7. Control Measures

- Primary treatment: Screening and sedimentation of solids.
- Secondary treatment: Biological processes like activated sludge or trickling filters.
- Tertiary treatment: Advanced oxidation, disinfection, and nutrient removal.
- Reducing pollution at source: Proper sewage management and industrial effluent treatment.

8. Conclusion

BOD is a key parameter for assessing the extent of organic pollution in water bodies.
Its measurement provides critical insights in to oxygen depletion, ecosystem health,and wastewater management.
Maintaining BOD at safe levels is essential to ensure aquatic life survival, public health,and sustainable water use.