ScienceCube

Water Pollution and Dissolved Oxygen (DO)

1. **Understand and explain the water quality standards for river drinking water.**
2. **Measure and analyze water pollution levels using a DO sensor.**

Fundamental Concept

1. Dissolved Oxygen (DO)

The amount of oxygen dissolved in water is called dissolved oxygen. Without DO, river water will become putrid. If the DO is at least 2 mg/L, the water will not smell, and fish can live in water with a DO of 4 mg/L or more. The higher the DO value, the better the water quality.

2. DO by Water Quality Grade

Water Quality Grade	Usability	DO Standard (mg/L)	Indicator Species
Grade 1	Can be used for direct drinking or with simple purification	5.0-7.5 or more	Trout, Golden Mandarin Fish, Red-spotted Trout, Gudgeon, Crayfish, Stonefly, Mayfly

Grade 2	Can be used as household or industrial water after purification	5.0 or more	Goby, Sweetfish, Perch, Clam, Stonefly, Mayfly
Grade 3	Can be used as agricultural water or industrial water after purification	2.0 or more	Minnow, Creek Chub, Pond Snail, Leech, Water Bug, Dragonfly
Grade 4	Almost unusable as a water resource	2.0 or less	Carp, Catfish, Flatworm, Moth Fly, Soldier Fly

3. Importance of Dissolved Oxygen in the Environment

In liquid waste, dissolved oxygen is a factor determining whether biological changes occur due to aerobic or anaerobic microorganisms. These two types of microorganisms are universally present in nature, so it is crucial to maintain a state favorable to aerobic microorganisms (aerobic conditions). If not, anaerobic microorganisms will grow, leading to poor conditions. Therefore, measuring dissolved oxygen is vital for maintaining aerobic conditions in natural water and aerobic treatment processes for household and industrial wastewater.

Experiment

Materials Needed

Interface, Science# program, DO sensor, Calibration solutions (pH 4, 7, 10), Measurement solutions (aquarium water, rainwater, tap water, bottled water, seawater, river water, etc.), Beakers

Experimental Setup

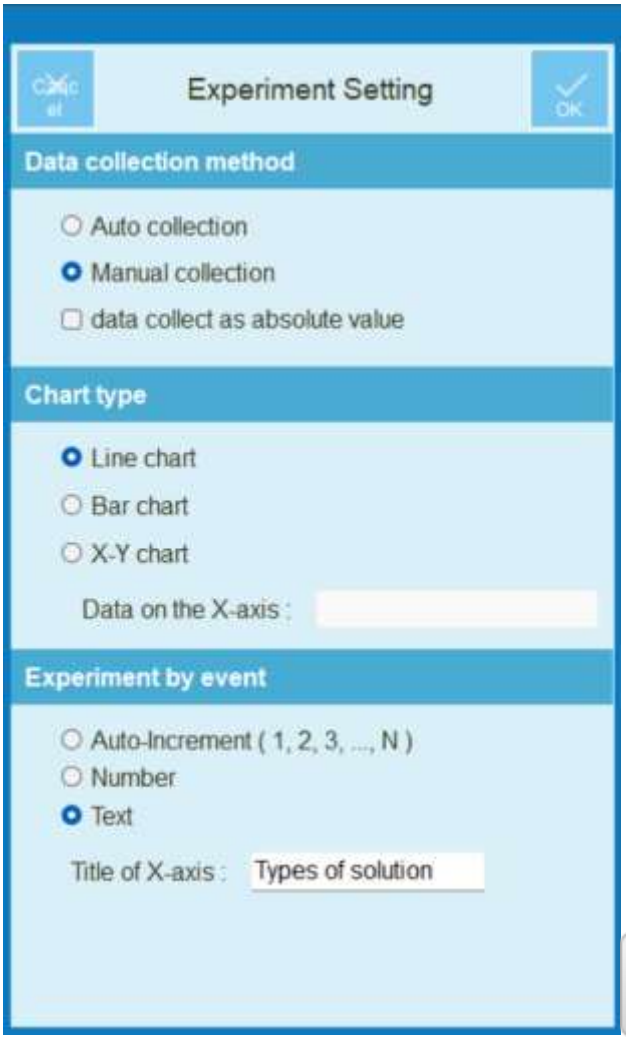
1. Open the DO sensor membrane cap, add 1 mL of Oxygen Probe Electrolyte solution, and close it

2. Immerse the DO sensor in distilled water and warm it up for 10 minutes.

Interface Setup

1. Run Science#..
2. Press the button.
3. To calibrate the DO sensor, immerse it in sodium sulfate (Na2SO4)..

4. Once the reading stabilizes, press the button to calibrate to 0 mg/L..
5. Clean the electrode with distilled water and expose the sensor to air.
6. Once the reading stabilizes, press the button to calibrate to 8.4 mg/L..
7. Press the button to set up the experimental environment as shown below or press the button for automatic setup.



Automatic Setup

Data Collection

1. Press the button to set it to bar graph.
2. Press the button to start data collection..

3. Place the DO sensor in the beaker containing the solution to be measured.
4. Once the value stabilizes, press the button  , and a text input window will appear to enter the type of solution measured.
5. Measure the DO of various solutions in the same way.
6. When the measurement is finished, press the button  to end data collection.

Data Analysis

Recording Data

1. Compare and graph the DO values for different solutions.

2. Record the DO values for each solution in the table below.

Type of Solution						
DO (mg/L)						

Data Application

1. Write down the DO values for each grade of water and complete the table below .

Grade	1st Grade	2nd Grade	3rd Grade	4th Grade	5th Grade
DO (mg/L)					

2. Write down the DO value for water that can be used as drinking water.

3. Name the solutions that cannot be used as drinking water from the experiment and explain why.