

BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI

Environmental Pollution Control (CHE F411)

Mid Semester Test

Maximum Marks - 20

Part - A (Closed Book)

1. In which years the Air Act and the Water Act were enacted in India? Mention two functions of the central pollution control board and two functions of the state pollution control board as per the Air Act. [3]
2. Concentration of nitrogen dioxide at a certain location was monitored as $160 \mu\text{g}/\text{m}^3$ at 25°C and 1 atm pressure. Express this concentration in parts per billion. [4]
3. Consider the following temperature readings: ground level, 25°C ; 400m, 23°C ; 800 m, 25°C ; 1000 m, 26°C . If a 70-m stack releases a plume with a temperature of 30°C , how high does the plume rise? [3]
4. Briefly explain the procedure of particulate matter sampling using tape sampler. [3]
5. mention the different source correction methods for controlling air pollution. [2]
6. Explain the different mechanisms by which particles are captured by a packed filter. [2]
7. What is biochemical oxygen demand? State the different processes which affect the dissolved oxygen content in water. [3]

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Part - B (Open Book)

1. A settling chamber is installed in a plant for removal of particulate matter. Determine the overall collection efficiency of the settling chamber under the following operating conditions assuming laminar flow: [10]

Chamber dimension: 11m (length) × 3 m (width) × 15 m (height);

Particle specific gravity: 2.7

Volumetric flow rate of contaminated air stream: 70m³/s

Flue gas temperature and pressure: 90⁰C and 1 atm

Avg Particle diameter (µm)	10	25	35	45	55	65	75	85	94
Inlet wt%	1.7	7.9	9.4	10.5	12.5	9.5	7	7.5	34

2. A power plant burns 20 tonnes/h of coal that contains 3% sulfur and discharges the combustion products through a stack 200 m high and 1.0 m inside diameter. A weather station anemometer located 10 m above the ground measures the wind speed at 3.0 m/s. Other pertinent informations are as follows:

Air temperature and pressure: 15⁰C and 1 bar

Stack gas velocity: 10 m/s; Stack gas temperature: 150⁰C

Atmospheric conditions are moderately stable.

Determine the ground level concentration of SO₂ in parts per million (PPM) at a distance 2 km downwind from the stack along the plume axis. [15]

3. A municipal wastewater treatment plant discharges 19000 m³/day of treated wastewater to a stream. The wastewater has a BOD₅ of 30 mg/l with a k₁ of 0.23 d⁻¹. The temperature of the wastewater is 27⁰C and the dissolved oxygen content is 2 mg/l. The stream just above the point of wastewater discharge flows at 0.65 m³/s, has a BOD₅ of 5 mg/l and a DO of 7.2 mg/l. After mixing the stream and wastewater flows at a velocity of 0.5 m/s and the reaeration constant is 0.45 d⁻¹.

What is the oxygen level of the stream after 2 days?

What is the critical DO content and at what distance downstream of the discharge point does it occur? [15]