CEL 140 Environmental Studies   MAJOR EXAM

No exchange of materials allowed.   Please DO NOT ASK ANY DOUBT

Exam Duration: 1 Hour 30 Minutes

1. A municipality supplies 15 MLD of water through a 45 cm dia., 3 km long pipe. Satisfactory disinfection is achieved by adding 35kg of chlorine/day at the head of the pipeline. In summer, the flow shall be increased to 20 MLD through the same pipe. How many kgs of chlorine will be required (to be added to the head of the pipeline) to achieve the same degree of disinfection in summer ?

(05 marks)

2. Draw the cross-sectional elevation of a conventional Rapid Sand Filter of a water treatment plant. Name all the parts. Explain its operation step by step.

(10 marks)

3. Estimate the terminal settling velocity of a discrete particle of size 1.01 mm. Water temperature = 20°C, Kinematic viscosity of water at 20°C = 1.01×10^{-2} cm²/sec, specific gravity of the particles = 2.64 g/cm³, g = 9.81 cm/sec²

(05 marks)

4. A small number of bacteria are inoculated into a fixed volume of cultural medium. Discuss the growth of the bacteria in this medium with respect to the availability of the substrate. Give a sketch showing the number of viable (living) bacteria in the medium.

(05 Marks)

5. Give Sketch (show details on the sketch) of the following: No explanations required.

(10 Marks)

a. A conventional Sewage Treatment Plant
b. Oxygen sag curve
c. A conventional Water Treatment Plant
d. A Clari-flocculator

[handwritten: Coagulation, Flocculation, same fee, same a & c]

6. A waste water treatment plant discharges 1.5 m³/sec of treated effluent having an ultimate BOD of 39.20 mg/lit into a river of flow 10.60 m³/sec. Just upstream of the discharge point, the river has an ultimate BOD of 3.80 mg/lit. The deoxygenation rate constant (k') is estimated to be 0.30 / day. Assume instantaneous complete mixing where the wastewater joins the river. Assuming a constant cross-section area for the river flow equal to 48.90 m², estimate the BOD of the river water at a point 2.34 km downstream from the wastewater mixing point.

(05 Marks)