1. A sample of wastewater has an ultimate BOD of 280mg/L and a 5-day BOD of 240mg/L. Calculate 20-day BOD of this sample.

   • Solution: $y_{20} = L_0 (1-e^{-k*20})$

   First calculate k using given data

   $y_5 = L_0 (1-e^{-k*5})$

   $240 = 280 (1-e^{-k*5})$

   $k = 0.39\ d^{-1}$

   Then 20-day BOD:

   $y_{20} = L_0 (1-e^{-k*20})$

   $280 (1-e^{-0.39*20}) = 279.9$ mg/L

2. A wastewater stream has a BOD of 4000 mg/L. Calculate the flowrate of BOD (in kg/hr) if the wastewater has a flowrate of 5000 m^3/hr.
   Assume, if necessary, the density of wastewater as 1.05 gm/cm^3

• **Solution:**

BOD Flowrate in kg/hr = (5000 m^3/hr) x (4000 mg/L) x
(1 kg/10^6mg) x(103 L/1 m^3) = 200 kg/hr.

3. Determine the 5-day BOD for a 15 ml sample that is diluted with dilution water to a total volume of 300 ml when the initial DO concentration is 8 mg/l and after 5 days, has been reduced to 2 mg/l.

$D_0 = 8$

$D_5 = 2$

$P = 15\ ml/300ml = 0.05$

$$BOD\ (mg/l) = \frac{8 - 2}{0\ 05} = 120$$

Time dependent BOD values

- $y_1 = L_0 (1-e^{-k*t1})$
- $y_2 = L_0 (1-e^{-k*t2})$
- $y_1/y_2 = (1-e^{-k*t1}) / (1-e^{-k*t2})$

If 2 different days of BODs are known, ***k*** value can be calculated. Then L_0 can be calculated….

Question: The BOD_5 of a wastewater is determined to be 150 mg/l at 20°C. The k value is known to be 0.23 per day. What would be the BOD_8 be if the test were run at 15°C?

a) Determine the ultimate BOD:

$$y_u = \frac{y_5}{1 - e^{-kt}}$$

$$y_u = \frac{150}{1 - e^{-0.23 \times 5}} = 220 mg/l$$

b) Correct the k value for 15^0C

$k_T = k_{20} \Theta^{T-20}$

$k_{15} = 0.23 (1.047^{15-20}) = 0.18\ d^{-1}$

c) Calculate y_8

$y_8 = 220 (1 - e^{0.18 \times 8}) = 168$ mg/L