Oxygen demand

Slide#23 solution)

Reaction stoichiometry:

$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$

MW of glucose = 180 g/mole

ThOD of 108.75 mg/L glucose

$$108.75\ mg\ glucose/L \times \frac{(6\times32)\ g\ O_2/mole\ glucose}{180\ g\ glucose/mole} = \mathbf{116\ mg\ O_2/L}$$

Modeling BOD

Slide#32 solution)

i) Ultimate BOD

$$BOD_t = L_0\left(1 - e^{-kt}\right)$$

$$L_0 = \frac{BOD_5}{1-e^{-5\ d\times k}} = \frac{120\ mg/L}{1-e^{-5\ d\times 0.115\ d^{-1}}} = 274\ mg/L$$

ii) BOD_3 at 15°C

$k_{15} = k_{20}\theta^{15-20}$, θ=*1.135 at 4-20°C*

$$k_{15} = 0.115\ day^{-1} \times 1.135^{15-20} = 0.0611\ day^{-1}$$

$$BOD_3 = 274\ mg/L \times \left(1 - e^{-0.0611\ day^{-1}\times 3\ day}\right) = 45.9\ mg/L$$