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Quality and Characteristics of Sewage Formulas

Calculators! Examples! Conversions!

List of 33 Quality and Characteristics of Sewage Formulas

Quality and Characteristics of Sewage

1) Time given Organic Matter Present at Start of BOD

Open Calculator

fx $$t = -\left(\frac{1}{K_D}\right) \cdot \log 10\left(\frac{L_t}{L_s}\right)$$

ex $$9.912351\text{d} = -\left(\frac{1}{0.23\text{d}^{-1}}\right) \cdot \log 10\left(\frac{0.21\text{mg/L}}{40\text{mg/L}}\right)$$

2) Total Amount of Organic Matter Oxidised

Open Calculator

fx $$l = L_s \cdot \left(1 - 10^{-K_D \cdot t}\right)$$

ex $$39.65954\text{mg/L} = 40\text{mg/L} \cdot \left(1 - 10^{-0.23\text{d}^{-1} \cdot 9\text{d}}\right)$$

Biodegradable Oxygen Demand BOD

3) BOD given Dilution Factor

Open Calculator

fx $$\text{BOD} = \text{DO} \cdot \left(\frac{3}{4}\right)$$

ex $$9.375\text{mg/L} = 12.5\text{mg/L} \cdot \left(\frac{3}{4}\right)$$

4) BOD in Sewage

Open Calculator

fx $$BOD = DO \cdot \left(\frac{V}{V_u} \right)$$

ex $$20.83333 mg/L = 12.5 mg/L \cdot \left(\frac{3.5 m^3}{2.1 m^3} \right)$$

5) BOD of Industry given Population Equivalent

Open Calculator

fx $$Q = 0.08 \cdot P$$

ex $$120 mg/L = 0.08 \cdot 1.5$$

Deoxygenation Constant

6) Deoxygenation Constant

Open Calculator

fx $$K_D = \frac{K}{2.3}$$

ex $$0.304348 d^{-1} = \frac{0.7 d^{-1}}{2.3}$$

7) De-oxygenation Constant

Open Calculator

fx $$K_D = 0.434 \cdot K$$

ex $$0.3038 d^{-1} = 0.434 \cdot 0.7 d^{-1}$$

8) Deoxygenation Constant at 20 degree Celsius

Open Calculator

$$K_{D(20)} = \frac{K_{D(T)}}{1.047^{T-20}}$$

$$0.237442\text{d}^{-1} = \frac{0.15\text{d}^{-1}}{1.047^{10K-20}}$$

9) Deoxygenation Constant at given Temperature

Open Calculator

$$K_{D(T)} = K_{D(20)} \cdot (1.047)^{T-20}$$

$$0.126346\text{d}^{-1} = 0.20\text{d}^{-1} \cdot (1.047)^{10K-20}$$

10) Deoxygenation Constant given Organic Matter Present at Start of BOD

Open Calculator

$$K_D = -\left(\frac{1}{t}\right) \cdot \log 10\left(\frac{L_t}{L_s}\right)$$

$$0.253316\text{d}^{-1} = -\left(\frac{1}{9\text{d}}\right) \cdot \log 10\left(\frac{0.21\text{mg/L}}{40\text{mg/L}}\right)$$

11) Deoxygenation Constant given Total Amount of Organic Matter Oxidised

Open Calculator

$$K_D = -\left(\frac{1}{t}\right) \cdot \log 10\left(1 - \left(\frac{Y_t}{L_s}\right)\right)$$

$$0.044216\text{d}^{-1} = -\left(\frac{1}{9\text{d}}\right) \cdot \log 10\left(1 - \left(\frac{24\text{mg/L}}{40\text{mg/L}}\right)\right)$$

DO Consumed

12) DO Consumed by Diluted Sample given BOD in Sewage

Open Calculator

fx $$DO = \left(BOD \cdot \frac{V_u}{V}\right)$$

ex $$12\text{mg/L} = \left(20\text{mg/L} \cdot \frac{2.1\text{m}^3}{3.5\text{m}^3}\right)$$

Organic Matter

13) Organic Matter Present at Start of BOD

Open Calculator

fx $$L = \frac{L_t}{10^{-K_D \cdot t}}$$

ex $$24.67285\text{mg/L} = \frac{0.21\text{mg/L}}{10^{-0.23\text{d}^{-1} \cdot 9\text{d}}}$$

14) Organic Matter Present at Start of BOD given Total Amount of Organic Matter Oxidised

Open Calculator

fx $$L = \frac{Y_t}{1 - 10^{-K_D \cdot t}}$$

ex $$24.20603\text{mg/L} = \frac{24\text{mg/L}}{1 - 10^{-0.23\text{d}^{-1} \cdot 9\text{d}}}$$

Oxygen Equivalent

15) Constant of Integration given Oxygen Equivalent

Open Calculator

fx $$c = \log(L_t, e) + (K \cdot t)$$

ex $$6.181914 = \log(0.21\text{mg/L}, e) + (0.7\text{d}^{-1} \cdot 9\text{d})$$

16) Oxygen Equivalent given Organic Matter Present at Start of BOD

Open Calculator

fx $$L_t = L_s \cdot 10^{-K_D \cdot t}$$

ex $$0.340455\text{mg/L} = 40\text{mg/L} \cdot 10^{-0.23\text{d}^{-1} \cdot 9\text{d}}$$

PH of Sewage

17) pH value of Sewage

Open Calculator

fx $$pH = -\log 10\left(H^{+}\right)$$

ex $$-4.39794 = -\log 10(25\text{mol/L})$$

Population Equivalent

18) Population Equivalent

Open Calculator

fx $$P = \frac{Q}{0.08}$$

ex $$1.4625 = \frac{117\text{mg/L}}{0.08}$$

19) Population Equivalent given standard BOD of Industrial Sewage

Open Calculator

$$P = \frac{Q}{D}$$

$$1.5 = \frac{117\text{mg/L}}{78\text{mg/L}}$$

Rate Constant

20) Rate Constant given Deoxygenation Constant

Open Calculator

$$K = 2.3 \cdot K_D$$

$$0.529\text{d}^{-1} = 2.3 \cdot 0.23\text{d}^{-1}$$

21) Rate Constant given De-oxygenation Constant

Open Calculator

$$K = \frac{K_D}{0.434}$$

$$0.529954\text{d}^{-1} = \frac{0.23\text{d}^{-1}}{0.434}$$

22) Rate Constant given Oxygen Equivalent

Open Calculator

$$K_h = \frac{c - \log(L_t, e)}{t}$$

$$9\text{E\^{}-6Hz} = \frac{6.9 - \log(0.21\text{mg/L}, e)}{9\text{d}}$$

Relative Stability

23) Period of Incubation given Relative Stability

Open Calculator

fx $$t = \frac{\ln\left(1 - \left(\frac{\%S}{100}\right)\right)}{\ln(0.794)}$$

ex $$16.95926\text{d} = \frac{\ln\left(1 - \left(\frac{98}{100}\right)\right)}{\ln(0.794)}$$

24) Period of Incubation given Relative Stability at 37 degree Celsius

Open Calculator

fx $$t = \frac{\ln\left(1 - \left(\frac{\%S}{100}\right)\right)}{\ln(0.630)}$$

ex $$8.466932\text{d} = \frac{\ln\left(1 - \left(\frac{98}{100}\right)\right)}{\ln(0.630)}$$

25) Relative Stability

Open Calculator

fx $$\%S = 100 \cdot \left(1 - (0.794)^{t}\right)$$

ex $$87.45749 = 100 \cdot \left(1 - (0.794)^{9\text{d}}\right)$$

26) Relative Stability at 37 Degree Celsius

$$\%S = 100 \cdot \left(1 - (0.63)^{t}\right)$$

Open Calculator

$$98.43662 = 100 \cdot \left(1 - (0.63)^{9d}\right)$$

Standard BOD

27) Standard BOD of Domestic Sewage given Standard BOD of Industrial Sewage

$$D = \frac{Q}{P}$$

Open Calculator

$$78\text{mg/L} = \frac{117\text{mg/L}}{1.5}$$

28) Standard BOD of Industrial Sewage

$$Q = D \cdot P$$

Open Calculator

$$117\text{mg/L} = 78\text{mg/L} \cdot 1.5$$

Threshold Odour Number

29) Threshold Odour Number

Open Calculator

fx $$T_o = V_s + \frac{V_D}{V_s}$$

ex $$12.4 = 2.2\text{m}^3 + \frac{22.44\text{m}^3}{2.2\text{m}^3}$$

30) Volume of Distilled Water given Threshold Odour Number

Open Calculator

fx $$V_D = (T_o - 1) \cdot V_s$$

ex $$22.44\text{m}^3 = (11.2 - 1) \cdot 2.2\text{m}^3$$

31) Volume of Sewage given Threshold Odour Number

Open Calculator

fx $$V_s = \frac{V_D}{T_o - 1}$$

ex $$2.2\text{m}^3 = \frac{22.44\text{m}^3}{11.2 - 1}$$

Volume of Sample

32) Volume of Diluted Sample given BOD in Sewage

Open Calculator

fx $$V = BOD \cdot \frac{V_u}{DO}$$

ex $$3.36m^3 = 20mg/L \cdot \frac{2.1m^3}{12.5mg/L}$$

33) Volume of Undiluted Sample given BOD in Sewage

Open Calculator

fx $$V_u = DO \cdot \frac{V}{BOD}$$

ex $$2.1875m^3 = 12.5mg/L \cdot \frac{3.5m^3}{20mg/L}$$

Variables Used

- **%S** Relative Stability
- **BOD** BOD *(Milligram per Liter)*
- **c** Integration Constant
- **D** BOD of Domestic Sewage *(Milligram per Liter)*
- **DO** DO Consumed *(Milligram per Liter)*
- H^+ Concentration of Hydrogen Ion *(Mole per Liter)*
- **K** Rate Constant in BOD *(1 Per Day)*
- K_D Deoxygenation Constant *(1 Per Day)*
- $K_{D(20)}$ Deoxygenation Constant at Temperature 20 *(1 Per Day)*
- $K_{D(T)}$ Deoxygenation Constant at Temperature T *(1 Per Day)*
- K_h Rate Constant *(Hertz)*
- **l** Organic Matter *(Milligram per Liter)*
- **L** Organic Matter at Start *(Milligram per Liter)*
- L_s Organic Matter at Start s *(Milligram per Liter)*
- L_t Oxygen Equivalent *(Milligram per Liter)*
- **P** Population Equivalent
- **pH** Negative Log of Hydronium Concentration
- **Q** BOD of Industrial Sewage *(Milligram per Liter)*
- **t** Time in Days *(Day)*
- **T** Temperature *(Kelvin)*
- T_o Threshold Odor Number
- **V** Volume of Diluted Sample *(Cubic Meter)*

- V_D Volume of Distilled Water *(Cubic Meter)*
- V_s Volume of Sewage *(Cubic Meter)*
- V_u Volume of Undiluted Sample *(Cubic Meter)*
- Y_t Organic Matter Oxidised *(Milligram per Liter)*

Constants, Functions, Measurements used

- Constant: **e**, 2.71828182845904523536028747135266249
  Napier's constant
- Function: **ln**, ln(Number)
  The natural logarithm, also known as the logarithm to the base e, is the inverse function of the natural exponential function.
- Function: **log**, log(Base, Number)
  Logarithmic function is an inverse function to exponentiation.
- Function: **log10**, log10(Number)
  The common logarithm, also known as the base-10 logarithm or the decimal logarithm, is a mathematical function that is the inverse of the exponential function.
- Measurement: **Time** in Day (d)
  Time Unit Conversion
- Measurement: **Temperature** in Kelvin (K)
  Temperature Unit Conversion
- Measurement: **Volume** in Cubic Meter (m^3)
  Volume Unit Conversion
- Measurement: **Frequency** in Hertz (Hz)
  Frequency Unit Conversion
- Measurement: **Molar Concentration** in Mole per Liter (mol/L)
  Molar Concentration Unit Conversion
- Measurement: **Density** in Milligram per Liter (mg/L)
  Density Unit Conversion
- Measurement: **First Order Reaction Rate Constant** in 1 Per Day (d^{-1})
  First Order Reaction Rate Constant Unit Conversion

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- Design of a Circular Settling Tank Formulas
- Design of a Plastic Media Trickling Filter Formulas
- Design of a Solid Bowl Centrifuge for Sludge Dewatering Formulas
- Design of an Aerated Grit Chamber Formulas
- Design of an Aerobic Digester Formulas
- Design of an Anaerobic Digester Formulas
- Design of Rapid Mix Basin and Flocculation Basin Formulas
- Design of Trickling Filter using NRC Equations Formulas
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