



Quality and Characteristics of Sewage Formulas

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List of 33 Quality and Characteristics of Sewage Formulas

Quality and Characteristics of Sewage 🗗

1) Time given Organic Matter Present at Start of BOD

$$\mathbf{f}\mathbf{x}igg|\mathbf{t} = -igg(rac{1}{\mathrm{K_D}}igg)\cdot \log 10igg(rac{\mathrm{L_t}}{\mathrm{L_s}}igg)igg|$$

Open Calculator 🗗

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

2) Total Amount of Organic Matter Oxidised

$$l = L_{
m s} \cdot \left(1 - 10^{-{
m K}_{
m D} \cdot {
m t}}
ight)$$

Open Calculator 🚰

 $ext{ex} \left[39.65954 ext{mg/L} + 40 ext{mg/L} \cdot \left(1 - 10^{-0.23 ext{d}^{-1} \cdot 9 ext{d}}
ight)
ight]$

Biodegradable Oxygen Demand BOD

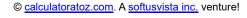
3) BOD given Dilution Factor

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

Open Calculator

$$oxed{ex} 9.375 \mathrm{mg/L} = 12.5 \mathrm{mg/L} \cdot \left(rac{3}{4}
ight)$$







Open Calculator

Open Calculator

Open Calculator

4) BOD in Sewage

 $\operatorname{BOD} = \operatorname{DO} \cdot \left(\frac{\operatorname{V}}{\operatorname{V}_{\scriptscriptstyle 11}} \right)$

fx $Q = 0.08 \cdot P$

Open Calculator 2

 $extbf{ex} \left[20.83333 ext{mg/L} + \left(rac{3.5 ext{m}^3}{2.1 ext{m}^3}
ight)
ight]$

5) BOD of Industry given Population Equivalent 💪

ex $120 \text{mg/L} = 0.08 \cdot 1.5$

Deoxygenation Constant

6) Deoxygenation Constant

fx $m K_D = rac{K}{2.3}$

ex $0.304348 ext{d}^{-_1}=rac{0.7 ext{d}^{-_1}}{2.3}$

7) De-oxygenation Constant 🛂

fx $m K_D = 0.434 \cdot K$

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

ex $0.3038 ext{d}^{-_1} = 0.434 \cdot 0.7 ext{d}^{-_1}$





8) Deoxygenation Constant at 20 degree Celsius 🗗

 $extbf{K} ext{K}_{ ext{D}(20)} = rac{ ext{K}_{ ext{D}(ext{T})}}{1.047^{ ext{T}-20}}$

Open Calculator 2

 $oxed{ex} 0.237442 \mathrm{d}^{-_1} = rac{0.15 \mathrm{d}^{-_1}}{1.047^{10\mathrm{K}-20}}$

9) Deoxygenation Constant at given Temperature 🗗

 $\left[\mathbf{K}
ight] ext{K}_{ ext{D(T)}} = ext{K}_{ ext{D(20)}} \cdot (1.047)^{ ext{T}-20}$

 $oxed{ex} 0.126346 \mathrm{d}^{_{-1}} = 0.20 \mathrm{d}^{_{-1}} \cdot \left(1.047
ight)^{10 \mathrm{K} - 20}$

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

 $\left| \mathbf{K}_{\mathrm{D}} = - \left(rac{1}{\mathrm{t}}
ight) \cdot \log 10 \left(rac{\mathrm{L_{t}}}{\mathrm{L_{s}}}
ight)
ight|$

Open Calculator

Open Calculator 2

11) Deoxygenation Constant given Total Amount of Organic Matter

Oxidised

$$extbf{K}_{
m D} = -igg(rac{1}{
m t}igg) \cdot \log 10igg(1-igg(rac{{
m Y}_{
m t}}{{
m L}_{
m s}}igg)igg)$$

 $= 0.253316 ext{d}^{-1} = -\left(rac{1}{9 ext{d}}
ight) \cdot \log 10 \left(rac{0.21 ext{mg/L}}{40 ext{mg/L}}
ight)$

Open Calculator

 $oxed{ex} \left[0.044216 \mathrm{d}^{-_1} = - \left(rac{1}{9 \mathrm{d}}
ight) \cdot \log 10 \left(1 - \left(rac{24 \mathrm{mg/L}}{40 \mathrm{mg/L}}
ight)
ight)$







DO Consumed

12) DO Consumed by Diluted Sample given BOD in Sewage

 $extbf{DO} = \left(ext{BOD} \cdot rac{ ext{V}_{ ext{u}}}{ ext{V}}
ight)$

Open Calculator 🚰

 $extbf{ex} 12 ext{mg/L} = \left(20 ext{mg/L} \cdot rac{2.1 ext{m}^{\scriptscriptstyle 3}}{3.5 ext{m}^{\scriptscriptstyle 3}}
ight)$

Organic Matter

13) Organic Matter Present at Start of BOD

 $\left| \mathbf{L} = rac{\mathbf{L}_{\mathrm{t}}}{10^{-\mathrm{K}_{\mathrm{D}} \cdot \mathrm{t}}}
ight|$

Open Calculator 🗗

 $extbf{ex} 24.67285 ext{mg/L} = rac{0.21 ext{mg/L}}{10^{-0.23 ext{d}^{-1} \cdot 9 ext{d}}}$

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

 $\mathbf{L} = rac{\mathrm{Y_t}}{1-10^{-\mathrm{K_D \cdot t}}}$

Open Calculator

 $m = 24.20603 mg/L = rac{24 mg/L}{1-10^{-0.23 d^{-1} \cdot 9 d}}$





Oxygen Equivalent

15) Constant of Integration given Oxygen Equivalent

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

Open Calculator

= 1.00 = 1.00

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

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

 $ext{ex} \left[0.340455 ext{mg/L} = 40 ext{mg/L} \cdot 10^{-0.23 ext{d}^{-1} \cdot 9 ext{d}}
ight]$

PH of Sewage G

17) pH value of Sewage

 $p H = -\log 10 \left(H^+\right)$

Open Calculator 🗗

Open Calculator

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

Population Equivalent 2

18) Population Equivalent

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

Open Calculator 🗗

 $oxed{ex} 1.4625 = rac{117 {
m mg/L}}{0.08}$



,



 $\mathbf{f} \mathbf{x} = rac{\mathbf{Q}}{\mathbf{D}}$

in Galculator C

Open Calculator 2

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

Rate Constant

20) Rate Constant given Deoxygenation Constant

fx $\mathrm{K} = 2.3 \cdot \mathrm{K_D}$

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

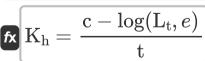
21) Rate Constant given De-oxygenation Constant

 $extbf{K} extbf{K} = rac{ ext{K}_{ ext{D}}}{0.434}$

Open Calculator

 $oxed{ex} 0.529954 \mathrm{d}^{ ext{--}1} = rac{0.23 \mathrm{d}^{ ext{--}1}}{0.434}$

22) Rate Constant given Oxygen Equivalent



Open Calculator

 $ext{ex} egin{array}{c} ext{9E^--6Hz} = rac{6.9 - \log(0.21 ext{mg/L}, e)}{ ext{od}} \end{array}$







Relative Stability

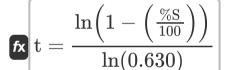
23) Period of Incubation given Relative Stability

 $\mathbf{t} = rac{\ln \left(1 - \left(rac{\%\mathrm{S}}{100}
ight)
ight)}{\ln(0.794)}$

Open Calculator 🗗

ex $16.95926 ext{d} = rac{\ln\left(1-\left(rac{98}{100}
ight)
ight)}{\ln(0.794)}$

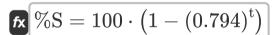
24) Period of Incubation given Relative Stability at 37 degree Celsius



Open Calculator 🗗

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

25) Relative Stability

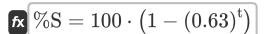


Open Calculator

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



26) Relative Stability at 37 Degree Celsius

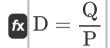


Open Calculator 🚰

 $\boxed{\textbf{ex}} \left[98.43662 = 100 \cdot \left(1 - \left(0.63 \right)^{9 \mathrm{d}} \right) \right]$

Standard BOD

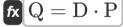
27) Standard BOD of Domestic Sewage given Standard BOD of Industrial Sewage



Open Calculator

 $extbf{ex} 78 ext{mg/L} = rac{117 ext{mg/L}}{1.5}$

28) Standard BOD of Industrial Sewage



Open Calculator 🚰

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



Threshold Odour Number 🗗

29) Threshold Odour Number

$$T_{
m o} = V_{
m s} + rac{V_{
m D}}{V_{
m s}}$$

Open Calculator

ex
$$12.4 = 2.2 \mathrm{m}^{_3} + rac{22.44 \mathrm{m}^{_3}}{2.2 \mathrm{m}^{_3}}$$

30) Volume of Distilled Water given Threshold Odour Number

fx
$$V_{\mathrm{D}} = (\mathrm{T_o} - 1) \cdot V_{\mathrm{s}}$$

Open Calculator

$$\mathbf{ex} \ 22.44 \mathrm{m}^{_3} = (11.2 - 1) \cdot 2.2 \mathrm{m}^{_3}$$

31) Volume of Sewage given Threshold Odour Number

$$oldsymbol{v}_{
m s} = rac{V_{
m D}}{T_{
m o}-1}$$

Open Calculator

$$= 2.2 \text{m}^{_3} = \frac{22.44 \text{m}^{_3}}{11.2 - 1}$$



Volume of Sample 🗗

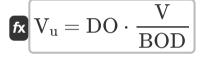
32) Volume of Diluted Sample given BOD in Sewage 🚰



Open Calculator

= $3.36 {
m m}^{_3} = 20 {
m mg/L} \cdot rac{2.1 {
m m}^{_3}}{12.5 {
m mg/L}}$

33) Volume of Undiluted Sample given BOD in Sewage



Open Calculator

 $ext{ex} \ 2.1875 ext{m}^{_3} = 12.5 ext{mg/L} \cdot rac{3.5 ext{m}^{_3}}{20 ext{mg/L}}$



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)
- I Organic Matter (Milligram per Liter)
- L Organic Matter at Start (Milligram per Liter)
- L_s Organic Matter at Start s (Milligram per Liter)
- Lt 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)
- To 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)
- Yt Organic Matter Oxidised (Milligram per Liter)





Constants, Functions, Measurements used

- Constant: e, 2.71828182845904523536028747135266249
 Napier's constant
- Function: In, In(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 (m³)
 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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 Disposing of the Sewage for Wastewater Disinfection Formulas [7
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- **Design of a Plastic Media** Trickling Filter Formulas
- Design of a Solid Bowl Centrifuge. Noise Pollution Formulas for Sludge Dewatering Formulas 🖸
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- Design of an Aerobic Digester Formulas
- Design of an Anaerobic Digester Formulas
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- **Design of Trickling Filter using** NRC Equations Formulas

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