Important Plasma Formulas PDF

Formulas
Examples
with Units

List of 11
Important Plasma Formulas

1) Apparent Tissue Volume given Plasma Volume and Apparent Volume Formula

Evaluate Formula

Formula

$$V_T = \left(V_d - V_P \right) \cdot \left(\frac{fu_t}{fu} \right)$$

Example with Units

$$2.8283\,\text{L} = \left(9\,\text{L} - 5\,\text{L} \right) \cdot \left(\frac{0.7}{0.99} \right)$$

2) Average Concentration of Plasma at Steady State Formula

Evaluate Formula

Formula

$$\bar{c}p_{ss} = \frac{D}{CL \cdot T}$$

Example with Units

$$0.3788\,\text{mol/L} = \frac{8\,\text{mol}}{0.48\,\text{L/s} \cdot 44\,\text{s}}$$

3) Average Plasma Concentration given Peak through Fluctuation Formula

Evaluate Formula

Formula

$$C_{av} = \frac{C_{max} - C_{min}}{\%PTF}$$

Example with Units

$$79.2741\,\text{mol/L} = \frac{60.9\,\text{mol/L} - 27.7\,\text{mol/L}}{0.4188}$$

4) Fractional Excretion of Sodium Formula

Evaluate Formula

Formula

$$FE_{Na} = \frac{Sodium_{urinary} \cdot Creatinine_{plasma}}{Sodium_{plasma} \cdot Creatinine_{urinary}} \cdot 100$$

Example with Units

$$0.2595 = \frac{0.010365\,\text{mol/L} \cdot 12\,\text{mol/L}}{3.55\,\text{mol/L} \cdot 13.5\,\text{mol/L}} \cdot 100$$

5) Initial Concentration for Intravenous Bolus Formula

Evaluate Formula

Formula

$$C_0 = \frac{D}{V_d}$$

Example with Units

$$0.8889\,\text{mol/L} = \frac{8\,\text{mol}}{9\,\text{L}}$$

6) Lowest Plasma Concentration Given Peak through Fluctuation Formula

Evaluate Formula

Formula

$$C_{min} = C_{max} - \left(C_{av} \cdot \%PTF \right)$$

Example with Units

$$52.524\,\text{mol/L} = 60.9\,\text{mol/L} - \left(20\,\text{mol/L} \cdot 0.4188 \right)$$

7) Peak Plasma Concentration Given Peak through Fluctuation Formula

Evaluate Formula

Formula

$$C_{max} = \left(\%PTF \cdot C_{av} \right) + C_{min}$$

Example with Units

$$36.076\,\text{mol/L} = \left(0.4188 \cdot 20\,\text{mol/L} \right) + 27.7\,\text{mol/L}$$

8) Peak through Fluctuation Formula

Evaluate Formula

Formula

$$\%PTF = \frac{C_{max} - C_{min}}{C_{av}}$$

Example with Units

$$1.66 = \frac{60.9\,\text{mol/L} - 27.7\,\text{mol/L}}{20\,\text{mol/L}}$$

9) Plasma Concentration of Constant Rate Infusion at Steady State Formula

Evaluate Formula

Formula

$$C_{Infusion} = \frac{k_{in}}{CL_r}$$

Example with Units

$$211538.4615\,\text{mol/L} = \frac{55\,\text{mol/s}}{15.6\,\text{mL/min}}$$

10) Plasma Volume of Drug given Apparent Volume Formula

Evaluate Formula

Formula

$$V_P = V_d - \left(V_T \cdot \left(\frac{fu}{fu_t} \right) \right)$$

Example with Units

$$4.05\,\text{L} = 9\,\text{L} - \left(3.5\,\text{L} \cdot \left(\frac{0.99}{0.7} \right) \right)$$

11) Renal Clearance using Rate of Reabsorption Formula

Evaluate Formula

Formula

$$CL_r = F_{rate} + \frac{S_{rate} - R_{rate}}{C_p}$$

Example with Units

$$13.9998\,\text{mL/min} = 14\,\text{mL/min} + \frac{10.4\,\text{mL/min} - 14.5\,\text{mL/min}}{17\,\text{mol/L}}$$

Variables used in list of Plasma Formulas above

- **%PTF** Peak Through Fluctuation
- C_0 Initial Plasma Concentration *(Mole per Liter)*
- C_{av} Average Plasma Concentration *(Mole per Liter)*
- $C_{Infusion}$ Plasma Concentration in Constant Rate Infusion *(Mole per Liter)*
- C_{max} Peak Plasma Concentration *(Mole per Liter)*
- C_{min} Lowest Plasma Concentration *(Mole per Liter)*
- C_p Plasma Concentration *(Mole per Liter)*
- **CL** Volume of Plasma Cleared *(Liter per Second)*
- CL_r Renal Clearance *(Milliliter per Minute)*
- $\overline{cp}_{ss}$ Average Concentration of Plasma at Steady State *(Mole per Liter)*
- $Creatinine_{plasma}$ Creatinine Concentration in Plasma *(Mole per Liter)*
- $Creatinine_{urinary}$ Creatinine Concentration in Urine *(Mole per Liter)*
- **D** Dose *(Mole)*
- F_{rate} Filtration Rate *(Milliliter per Minute)*
- FE_{Na} Fractional Excretion of Sodium
- **fu** Fraction Unbound in Plasma
- fu_t Fraction Unbound in Tissue
- k_{in} Rate of Infusion *(Mole per Second)*
- R_{rate} Reabsorption Rate of Drug *(Milliliter per Minute)*
- S_{rate} Secretion Rate of Drug *(Milliliter per Minute)*
- $Sodium_{plasma}$ Sodium Concentration in Plasma *(Mole per Liter)*
- $Sodium_{urinary}$ Urine Sodium Concentration *(Mole per Liter)*
- V_d Volume of Distribution *(Liter)*
- V_P Plasma Volume *(Liter)*

Constants, Functions, Measurements used in list of Plasma Formulas above

- Measurement: **Time** in Second (s)
  Time Unit Conversion
- Measurement: **Amount of Substance** in Mole (mol)
  Amount of Substance Unit Conversion
- Measurement: **Volume** in Liter (L)
  Volume Unit Conversion
- Measurement: **Volumetric Flow Rate** in Liter per Second (L/s), Milliliter per Minute (mL/min)
  Volumetric Flow Rate Unit Conversion
- Measurement: **Molar Flow Rate** in Mole per Second (mol/s)
  Molar Flow Rate Unit Conversion
- Measurement: **Molar Concentration** in Mole per Liter (mol/L)
  Molar Concentration Unit Conversion
- Measurement: **Glomerular Filtration Rate** in Milliliter per Minute (mL/min)
  Glomerular Filtration Rate Unit Conversion

- V_T Apparent Tissue Volume *(Liter)*
- **T** Dosing Interval *(Second)*

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