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Plasma Formulas

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List of 11 Plasma Formulas

Plasma

1) Apparent Tissue Volume given Plasma Volume and Apparent Volume

$$\text{fx } V_T = (V_d - V_P) \cdot \left(\frac{f_{u_t}}{f_u} \right)$$

[Open Calculator !\[\]\(a870788d6ed9b8fd294b7654a8c8526b_img.jpg\)](#)

$$\text{ex } 2.828283\text{L} = (9\text{L} - 5\text{L}) \cdot \left(\frac{0.7}{0.99} \right)$$

2) Average Concentration of Plasma at Steady State

$$\text{fx } \bar{c}_{P_{ss}} = \frac{D}{CL \cdot T}$$

[Open Calculator !\[\]\(c50c8b7b2cc2cf9ff925edec0ee94c0d_img.jpg\)](#)

$$\text{ex } 0.378788\text{mol/L} = \frac{8\text{mol}}{0.48\text{L/s} \cdot 44\text{s}}$$

3) Average Plasma Concentration given Peak through Fluctuation

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

[Open Calculator !\[\]\(f60b7a900783ac3fd531bfd9c111be6d_img.jpg\)](#)

$$\text{ex } 79.27412\text{mol/L} = \frac{60.9\text{mol/L} - 27.7\text{mol/L}}{0.4188}$$



4) Fractional Excretion of Sodium

fx

Open Calculator 

$$FE_{Na} = \frac{\text{Sodium}_{\text{urinary}} \cdot \text{Creatinine}_{\text{plasma}}}{\text{Sodium}_{\text{plasma}} \cdot \text{Creatinine}_{\text{urinary}}} \cdot 100$$

ex $0.259531 = \frac{0.010365\text{mol/L} \cdot 12\text{mol/L}}{3.55\text{mol/L} \cdot 13.5\text{mol/L}} \cdot 100$

5) Initial Concentration for Intravenous Bolus

fx

Open Calculator 

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

ex $0.888889\text{mol/L} = \frac{8\text{mol}}{9\text{L}}$

6) Lowest Plasma Concentration Given Peak through Fluctuation

fx $C_{\min} = C_{\max} - (C_{\text{av}} \cdot \%PTF)$

Open Calculator 

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

7) Peak Plasma Concentration Given Peak through Fluctuation

fx $C_{\max} = (\%PTF \cdot C_{\text{av}}) + C_{\min}$

Open Calculator 

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



8) Peak through Fluctuation 

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

Open Calculator 


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

9) Plasma Concentration of Constant Rate Infusion at Steady State 

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

Open Calculator 

$$\text{ex } 211538.5\text{mol/L} = \frac{55\text{mol/s}}{15.6\text{mL/min}}$$

10) Plasma Volume of Drug given Apparent Volume 

$$\text{fx } V_P = V_d - \left(V_T \cdot \left(\frac{f_u}{f_{u_t}} \right) \right)$$

Open Calculator 

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

11) Renal Clearance using Rate of Reabsorption 

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

Open Calculator 

$$\text{ex } 13.99976\text{mL/min} = 14\text{mL/min} + \frac{10.4\text{mL/min} - 14.5\text{mL/min}}{17\text{mol/L}}$$



Variables Used








- **%PTF** Peak Through Fluctuation
- **C₀** 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)
- **C̄_{p_{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)
- **V_T** Apparent Tissue Volume (Liter)
- **T** Dosing Interval (Second)



Constants, Functions, Measurements used

- **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 



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