GPAT 2026: Biopharmaceutics & Pharmacokinetics Practice Questions with Solutions

1. A drug is administered as a 500 mg IV bolus dose. If the initial plasma concentration (C_0) is found to be 10 mg/L, calculate the apparent volume of distribution (V_{d}).

A. 50 L
B. 0.02 L
C. 5 L
D. 5000 L

Answer: A) 50 L

Expert Tip: Recall the fundamental relationship between dose, concentration, and volume.

2. A drug follows first-order kinetics with an elimination rate constant (k_e) of $0.0693 hr^{-1}$. What is the half-life ($t_{1/2}$) of this drug?

A. 10 hours
B. 6.93 hours
C. 100 hours
D. 1 hour

Answer: A) 10 hours

Expert Tip: Use the standard constant for natural log of 2 in your calculation.

3. Calculate the total clearance (Cl) of a drug if its volume of distribution (V_d) is 40 L and the elimination rate constant (k_e) is $0.2 hr^{-1}$.

A. 0.005 L/hr
B. 200 L/hr
C. 8 L/hr
D. 80 L/hr

Answer: C) 8 L/hr

Expert Tip: Clearance represents the volume of plasma cleared of drugs per unit time.

4.The AUC for an oral dose of 100 mg is 40µg.hr/ml. For a 100 mg IV dose, the AUC is 50µg.hr/ml. Calculate the absolute bioavailability (F).

    A. 0.4
    B. 0.8
    C. 0.5
    D. 1.25

Answer: B) 0.8

Expert Tip: Compare the drug exposure of the oral route against the 100% efficient IV route.

5. A patient requires a steady-state plasma concentration (C_{ss}) of 15 mg/L. If the V_d is 30 L, calculate the required loading dose (D_L).

    A. 900 mg
    B. 150 mg
    C. 2 mg
    D. 450 mg

Answer: D) 450 mg

Expert Tip: Think about the total amount of drug needed to fill the initial volume of distribution.

6. Calculate the maintenance dose (D_M) for a drug to maintain a C_{ss} of 10 mg/L, given the clearance (Cl) is 2 L/hr and the dosing interval is 6 hours.

    A. 20 mg
    B. 12 mg
    C. 120 mg
    D. 60 mg

Answer: C) 120 mg

Expert Tip: *Consider the amount of drug that must be replaced over the entire dosing interval.*

7. If the renal clearance of a drug is 10 ml/min and the total clearance is 50 ml/min, what is the non-renal clearance?

    A. 500 ml/min
    B. 5 ml/min
    C. 60 ml/min
    D. 40 ml/min

Answer: D) 40ml/min

Expert Tip: *The body clears drugs through multiple parallel pathways that add up to a total rate.*

8. A drug has a half-life of 4 hours. How much time is required for 93.75% of the drug to be eliminated from the body?

    A. 12 hours
    B. 16 hours
    C. 20 hours
    D. 8 hours

Answer: B) 16 hours

Expert Tip: *Determine how many half-life cycles it takes to leave only 6.25% of the dose.*

9. Calculate the Extraction Ratio (ER) if the arterial drug concentration entering the liver is 100 mg/L and the venous concentration leaving is 20 mg/L.

    A. 5.0
    B. 0.2
    C. 80 mg/L
    D. 0.8

Answer: D) 0.8

Expert Tip: *The ratio measures the efficiency of the organ in removing the drug from the blood.*

10. If a drug follows Michaelis-Menten kinetics, what happens to the elimination rate when the drug concentration is much higher than K_m?

    A. It follows zero-order kinetics
    B. The rate becomes zero
    C. The rate becomes infinite
    D. It follows first-order kinetics

Answer: A) It follows zero-order kinetics

Expert Tips: *Consider the state of the enzymes when they are completely saturated with substrate.*

11. A drug with a V_d of 15 L is cleared at a rate of 1.5 L/hr. Calculate its elimination rate constant (k_e).

    A. $1.0hr^{-1}$
    B. $0.1hr^{-1}$
    C. $10hr^{-1}$
    D. $0.225hr^{-1}$

Answer: B) $0.1hr^{-1}$

Expert Tip: *The rate constant is the fraction of the volume of distribution cleared per hour.*

12. Calculate the creatinine clearance (Cl_{cr}) for a 70 kg male (25 years old) if his serum creatinine is 1.0 mg/dl. (Use Cockcroft-Gault formula).

    A. 95.0 ml/min
    B. 80.5 ml/min
    C. 111.8 ml/min
    D. 140 ml/min

Answer: C) 111.8 ml/min

Expert Tip: Recall the standard formula used to estimate GFR based on age, weight, and creatinine.

13. If the dose of a drug is doubled in a first-order process, what happens to the half-life?

    A. Increases by 1.44 times
    B. Halves
    C. Remains unchanged
    D. Doubles

Answer: C) Remains unchanged

Expert Tip: First-order kinetics are characterized by a constant percentage of drugs being removed over time.

14. A drug has an absorption rate constant (k_a) of 1.5hr^{-1} and an elimination rate constant (k_e) of 0.2hr^{-1}. Calculate the time to reach maximum concentration (t_{max}).

    A. 7.5 hours
    B. 0.5 hours
    C. 1.55 hours
    D. 3.2 hours

Answer: C) 1.55 hours

Expert Tip: Apply the logarithmic ratio of the two rate constants divided by their difference.

15. Calculate the Hepatic Clearance if the liver blood flow (Q) is 1.5 L/min and the hepatic extraction ratio (ER) is 0.4.

    A. 3.75 L/min
    B. 1.1 L/min
    C. 0.6 L/min
    D. 0.15 L/min

Answer: C) 0.6 L/min

Expert Tip: The organ can only clear drugs from the volume of blood that actually reaches it.

16. A drug is 90% protein-bound. If the total plasma concentration is 100 mg/L, what is the concentration of the free (unbound) drug?

    A. 90 mg/L
    B. 10 mg/L
    C. 50 mg/L
    D. 1 mg/L

Answer: B) 10 mg/L

Expert Tip: Only the portion of the drug not attached to plasma proteins is considered 'free'.

17. Calculate the dose required to achieve a C_{ss} of 20 mg/L for a drug with V_d=25 L and bioavailability F=0.5.

    A. 1000 mg
    B. 250 mg
    C. 2000 mg
    D. 500 mg

Answer: A) 1000 mg

Expert Tip: Adjust the target body amount by dividing by the fraction that actually reaches circulation.

18. For a drug following zero-order kinetics, if the elimination rate is 10 mg/hr, how much drug will be eliminated in 5 hours?

    A. 2 mg
    B. 10 mg
    C. 50 mg
    D. Depends on initial concentration

Answer: C) 50 mg

Expert Tip: *Zero-order processes remove a fixed amount of drug every hour regardless of how much is present.*

19. Calculate the AUC from 0 to ∞ if C_0=100 mg/L and k_e=0.1hr^{-1}.

    A. 500 mg.hr/L
    B. 1000 mg.hr/L
    C. 100 mg.hr/L
    D. 10 mg.hr/L

Answer: B) 1000 mg.hr/L

Expert Tip: *The total area under the curve is the initial concentration divided by the elimination rate constant.*

20. A drug has a $t_{1/2}$ of 2 hours. If the initial concentration is 80 mg/L, what will be the concentration after 6 hours?

    A. 5 mg/L
    B. 40 mg/L
    C. 10 mg/L
    D. 20 mg/L

Answer: C) 10 mg/L

Expert Tip: *Determine how many times the concentration will be halved in the given time period.*