I. Select the one lettered answer or completion that is best in each case (2% each)

1. The passage of drug molecules from a region of high drug concentration to a region of low drug concentration is known as
   A. active transport
   B. bioavailability
   C. biopharmaceutics
   D. simple diffusion
   E. pinocytosis

2. Characteristics of pyrogens include the following:
   I. They usually cause a febrile reaction in humans
   II. They may cause pains in the back and legs
   III. They may cause chills

   A. I only
   B. II only
   C. I and II only
   D. I and III only
   E. I, II and III

3. GMP regulations primarily apply to
   A. controlled drugs
   B. wholesalers
   C. pharmaceutical manufacturers
   D. hospital pharmacy
   E. drug stores

4. Freeze drying is based on
   A. pressure filtration
   B. sublimation
   C. polymerization
   D. pasteurization
   E. densification

5. Which of the following is a true statement regarding transdermal delivery systems?
   A. Products from different manufacturers require identical amounts of active ingredient to yield equivalent responses
   B. Skin thickness is not a factor in drug absorption
   C. The transdermal unit should always be placed at the same site
   D. The transdermal unit contains more drug than is intended for delivery into the body over the prescribed period of use
   E. The transdermal unit may remain attached to the skin after the labelled delivery period because drug absorption ceases

II. Please describe two methods used to prepare semisolid dosage forms. (10%)

III. What are the advantages of controlled-release dosage forms over conventional dosage forms? (10%)

264101-2

IV. Define the following terms (3% each):
1. Bioequivalence
2. First–Pass Effect
3. Pharmacogenetics
4. Pharmacodynamics
5. Therapeutic Drug Monitoring

V. The average plasma acetaminophen data over 6hr after swallowing a single tablet (500mg) while standing or lying down are listed below. (15%)

Time (min)	Plasma Acetaminophen Concentration (mg/L)	
	Subjects Standing	Subjects Lying Down
0	0	0
10	2.1	0.1
20	5.6	0.3
30	5.8	1.1
40	6.3	1.9
50	4.7	2.8
60	4.1	3.2
90	3.5	3.9
120	2.8	3.1
150	2.2	2.9
180	1.8	2.4
210	1.7	2.0
240	1.5	1.8
360	0.8	1.0

1. What effect does posture have on the speed and extent of absorption of acetaminophen.
2. Based on the finding, what would you recommend for the use of acetaminophen in the case of pain relief.

VI. A drug is administered by constant-rate intravenous infusion (R_{inf} = 3 mg/min) for 60 minutes. The following table gives the plasma concentration of the drug at different times until the end of the infusion period. (ln2=0.693, ln3=1.099, ln5=1.609, ln7=1.946) (20%)

Time (min)	10	20	30	40	50	60
Plasma drug concentration (mg/l)	2.1	3.3	4.0	4.4	4.8	5.0

Assuming that the plasma concentration of the drug has reached a plateau at the end of the infusion.
(1) Calculate the elimination rate constant and the volume of distribution of the drug.
(2) What is the concentration expected 25 min after the end of the infusion?
(3) If the infusion rate is 6 mg/min, what are the expected plasma concentrations of the drug at 20, 40, 60 min during the infusion?
(4) What is the loading dose required to attain immediately a concentration of 7 mg/l and what is the infusion rate necessary to maintain it?

VII. Calculate the pH of a 1% weak acid solution. (The molecular weight is 400, and K_a = 1×10^{-7}). (log2=0.301, log3=0.477, log5=0.699, log7=0.845) (10%)

VI. The pK_b of pilocarpine is 7.15 at 25°C. What is the mole percent of free base present at a pH of 7.35 on 25°C. ($\sqrt{2}$=1.414, $\sqrt{3}$=1.732, $\sqrt{5}$=2.236, $\sqrt{7}$=2.646) (10%)