1. Drugs do not metabolize the same way in all people. For what patient would a nurse expect to assess for an alteration in drug metabolism?
   A) A 35-year-old woman with cervical cancer
   B) A 41-year-old man with kidney stones
   C) A 50-year-old man with cirrhosis of the liver
   D) A 62-year-old woman in acute renal failure
   Ans: C
   Feedback:
   The liver is the most important site of drug metabolism. If the liver is not functioning effectively, as in patients with cirrhosis, drugs will not metabolize normally so that toxic levels could develop unless dosage is reduced. A patient with cervical cancer or kidney stones would not be expected to have altered ability to metabolize drugs so long as no liver damage existed. The patient with renal failure would have altered excretion of the drugs through the renal system but metabolism would not be impacted.

2. A patient presents to the emergency department with a drug level of 50 units/mL. The half-life of this drug is 1 hour. With this drug, concentrations above 25 units/mL are considered toxic and no more drug is given. How long will it take for the blood level to reach the non-toxic range?
   A) 30 minutes
   B) 1 hour
   C) 2 hours
   D) 3 hours
   Ans: B
   Feedback:
   Half-life is the time required for the serum concentration of a drug to decrease by 50%. After 1 hour, the serum concentration would be 25 units/mL (50/2) if the body can properly metabolize and excrete the drug. After 2 hours, the serum concentration would be 12.5 units/mL (25/2) and reach the nontoxic range. In 30 minutes the drug level would be 37.5 units/mL, whereas in 3 hours the drug level would be 6.25.

3. A patient has recently moved from Vermont to Southern Florida. The patient presents to the clinic complaining of "dizzy spells and weakness." While conducting the admission assessment, the patient tells the nurse that he have been on the same antihypertensive drug for 6 years and had stable blood pressures and no adverse effects. Since his move, he has been having problems and he feels that the drug is no longer effective. The clinic nurse knows that one possible reason for the change in the effectiveness of the drug could be what?
   A) The impact of the placebo effect on the patient's response.
   B) The accumulative effect of the drug if it has been taken for many years.
   C) The impact of the warmer environment on the patient's physical status.
   D) Problems with patient compliance with the drug regimen while on vacation.
   Ans: C
   Feedback:
   Antihypertensive drugs work to decrease the blood pressure. When a patient goes to a climate that is much warmer than usual, blood vessels dilate and the blood pressure falls. If a patient is taking an antihypertensive drug and moves to a warmer climate, there is a chance that the patient's blood pressure will drop too low, resulting in dizziness and feelings of weakness. Even mild dehydration could exacerbate these effects. Most antihypertensives are metabolized and excreted and do not accumulate in the body. Patients must be very compliant with their drug regimen on vacation. After several years on an antihypertensive drug, the effects of that drug are known; therefore, the placebo effect should not be an issue.

4. An important concept taught by the nurse when providing medication teaching is the need to provide a complete list of medications taken to health care providers to avoid what?
   A) Spending large amounts of money on medications
   B) Allergic reactions to medications
   C) Drug–drug interactions
   D) Critical concentrations of medications in the body
   Ans: C
   Feedback:
   It is important that all health care providers have a complete list of the patient's medications to avoid drug–drug interactions caused by one provider ordering a medication, unaware of another medication the patient is taking that could interact with the new prescription. Using the same pharmacist for all prescriptions will also help to prevent this from happening. Informing the provider of all medications taken will not reduce costs of medications, which is best accomplished by requesting generic medications. Allergies should be disclosed to all health care providers as well, but this is not why it is important to provide a complete list of medications taken. Critical concentrations are desirable because that is the amount of drug needed to cause a therapeutic effect, or, in other words, to have the effect the drug is prescribed for.

5. A pharmacology student asks the instructor what an accurate description of a drug agonist is. What is the instructor's best response?
   A) A drug that reacts with a receptor site on a cell preventing a reaction with another chemical on a different receptor site
   B) A drug that interferes with the enzyme systems that act as catalyst for different chemical reactions
   C) A drug that interacts directly with receptor sites to cause the same activity that a natural chemical would cause at that site
   D) A drug that reacts with receptor sites to block normal stimulation, producing no effect
   Ans: C
   Feedback:
   Agonists are drugs that produce effects similar to those produced by naturally occurring neurotransmitters, hormones, or other substances found in the body. Noncompetitive antagonists are drugs that react with some receptor sites preventing the reaction of another chemical with a different receptor site. Drug–enzyme interactions interfere with the enzyme systems that stimulate various chemical reactions.

6. A nurse is caring for a patient who has been receiving a drug by the intramuscular route but will receive the drug orally after discharge. How does the nurse explain the increased dosage prescribed for the oral dose?
   A) Passive diffusion
   B) Active transport
   C) Glomerular filtration
   D) First-pass effect
   Ans: D
   Feedback:
   The first-pass effect involves drugs that are absorbed from the small intestine directly into the portal venous system, which delivers the drug molecules to the liver. After reaching the liver, enzymes break the drug into metabolites, which may become active or may be deactivated and readily excreted from the body. A large percentage of the oral dose is usually destroyed and never reaches tissues. Oral dosages account for the phenomenon to ensure an appropriate amount of the drug in the body to produce a therapeutic action. Passive diffusion is the major process through which drugs are absorbed into the body. Active transport is a process that uses energy to actively move a molecule across a cell membrane and is often involved in drug excretion in the kidney. Glomerular filtration is the passage of water and water-soluble components from the plasma into the renal tubule.

7. A nurse is working as a member of a research team involved in exploring the unique response to drugs each individual displays based on genetic make-up. What is this area of study is called?
   A) Pharmacotherapeutics
   B) Pharmacodynamics
   C) Pharmacoeconomics
   D) Pharmacogenomics
   Ans: D
   Feedback:
   Pharmacogenomics is the area of study that includes mapping of the human genome. In the future, medical care and drug regimens may be personally designed based on a patient's unique genetic make-up. Pharmacotherapeutics is the branch of pharmacology that deals with the uses of drugs to treat, prevent, and diagnose disease. Pharmacodynamics involves how a drug affects the body. Pharmacoeconomics includes the costs involved in drug therapy.

8. The nurse uses what term to describe the drug level required to have a therapeutic effect?
   A) Critical concentration
   B) Dynamic equilibrium
   C) Selective toxicity
   D) Active transport
   Ans: A
   Feedback:
   A critical concentration of a drug must be present before a reaction occurs within the cells to bring about the desired therapeutic effect. A dynamic equilibrium is obtained from absorption of a drug from the site of drug entry, distribution to the active site, metabolism in the liver, and excretion from the body to have a critical concentration. Selective toxicity is the ability of a drug to attach only to those systems found in foreign cells. Active transport is the process that uses energy to actively move a molecule across a cell membrane and is often involved in drug excretion in the kidney.

9. A nurse is caring for a patient who is supposed to receive two drugs at the same time. What is the nurse's priority action?
   A) Wash her hands before handling the medications.
   B) Consult a drug guide for compatibility.
   C) Question the patient concerning drug allergies.
   D) Identify the patient by checking the armband and asking the patient to state his name.

   Ans: B

   Feedback:

   A nurse should first consult a drug guide for compatibility when two or more drugs are being given at the same time. After compatibility is determined the medication can be administered. The nurse will perform hand hygiene, check for patient allergies, and ensure the right patient receives the medication by using two identifiers.

10. The nurse is talking with a group of nursing students who are doing clinical hours on the unit. A student asks if all intramuscular (IM) drugs are absorbed the same. What factor would the floor nurse tell the students to affect absorption of the IM administration of drugs?
    A) Perfusion of blood to the subcutaneous tissue
    B) Integrity of the mucous membranes
    C) Environmental temperature
    D) Blood flow to the gastrointestinal tract

    Ans: C

    Feedback:

    A cold environmental temperature can cause blood vessels to vasoconstrict and decreases absorption or in a hot environment vasodilate and increase absorption of IM medications. Blood flow to the subcutaneous tissues interferes with subcutaneous injection and blood flow to the gastrointestinal (GI) tract causes alterations in absorption for oral medications. The condition of mucous membranes can interfere with sublingual (under the tongue) and buccal (in the cheek) administration of drugs.

11. The patient is taking a drug that affects the body by increasing cellular activity. Where does this drug work on the cell?
    A) Receptor sites
    B) Cell membrane
    C) Golgi body
    D) Endoplasmic reticulum
    Ans: A
    Feedback:
    Many drugs are thought to act at specific areas on cell membranes called receptor sites. After the receptor site is activated, this in turn activates the enzyme systems to produce certain effects, such as increased or decreased cellular activity, changes in cell membrane permeability, or alterations in cellular metabolism. Receptor sites are generally located on the outside of cells and allow the drug to bypass the cell membrane. The Golgi body and endoplasmic reticulum are not involved in this process.

12. Several processes enable a drug to reach a specific concentration in the body. Together they are called dynamic equilibrium. What are these processes? (Select all that apply.)
    A) Distribution to the active site
    B) Biotransformation
    C) Absorption from the muscle
    D) Excretion
    E) Interaction with other drugs
    Ans: A, B, D
    Feedback:
    The actual concentration that a drug reaches in the body results from a dynamic equilibrium involving several processes: Absorption from the site of entry (can be from the muscle, the gastrointestinal (GI) tract if taken orally, of the subcutaneous tissue if given by that route); Distribution to the active site; biotransformation (metabolism) in the liver; excretion from the body. Interaction with other drugs is not part of the dynamic equilibrium.

13. A nurse is administering digoxin to a patient. To administer medications so that the drug is as effective as possible, the nurse needs to consider what?
    A) Pharmacotherapeutics
    B) Pharmacokinetics
    C) Pharmacoeconomics
    D) Pharmacogenomics
    Ans: B
    Feedback:
    When administering a drug, the nurse needs to consider the phases of pharmacokinetics so that the drug regimen can be made as effective as possible. Pharmacogenomics is the area of study that includes mapping of the human genome. Pharmacotherapeutics is the branch of pharmacology that deals with the uses of drugs to treat, prevent, and diagnose disease. Pharmacoeconomics includes all costs involved in drug therapy.

14. The nurse is explaining how medications work to a group of peers and explains that disruption of a single step in any enzyme system disrupts what?
    A) Cell life
    B) Cell membrane
    C) Cell receptor sites
    D) Cell function
    Ans: D
    Feedback:
    If a single step in one of the many enzyme systems is blocked, normal cell function is disrupted. Cell life and cell membrane may be impacted by disruption of some enzymes but not all enzymes. Receptor sites would not be disrupted by disruption in a single step in the enzyme system.

15. The processes involved in dynamic equilibrium are key elements in the nurse's ability to determine what?
    A) Dosage scheduling
    B) Amount of solution for mixing parenteral drugs
    C) Timing of other drugs the patient is taking
    D) How long the patient has to take the drug
    Ans: A
    Feedback:
    These processes are key elements in determining the amount of drug (dose) and the frequency of dose repetition (scheduling) required to achieve the critical concentration for the desired length of time. The processes in dynamic equilibrium are not key elements in determining the amount of diluents for intramuscular (IM) drugs; they do not aid in the timing of the other drugs the patient is taking or how long the patient has to take the drug.

16. What factor influences drug absorption?
    A) Kidney function
    B) Route of administration
    C) Liver function
    D) Cardiovascular function
    Ans: B
    Feedback:
    Drug absorption is influenced by the route of administration. IV administration is the fastest method; drug absorption is slower when given orally. Kidney function impacts excretion, liver function impacts metabolism, and cardiovascular function impacts distribution.

17. What does the lipid solubility of the drug influence?
    A) Absorption of the drug
    B) Metabolism of the drug
    C) Excretion of the drug
    D) Distribution of the drug
    Ans: D
    Feedback:
    Factors that can affect distribution include the drug's lipid solubility and ionization and the perfusion of the reactive tissue. The lipid solubility of a drug does not influence absorption, metabolism, or excretion.

18. The nursing students are learning about the half-life of drugs. A student asks the instructor to explain half-life. What is the instructor's best response?
    A) Half-life of a drug is the time it takes for the amount of drug in the body to decrease to half of the peak level it previously achieved.
    B) Half-life is the amount of time it takes for the drug to be metabolized by the body.
    C) Half-life is the amount of time it takes for half of the drug to reach peak level in the body.
    D) Half-life of a drug is the time it takes for the drug to reach half its potential peak level in the body.
    Ans: A
    Feedback:
    The half-life of a drug is the time it takes for the amount of drug in the body to decrease to half the peak level it previously achieved. Therefore Options B, C, and D are not correct.

19. The patient is taking a 2-mg dose of ropinerol XR. The drug has a half-life of 12 hours. How long will it be before only 0.25 mg of this drug remains in the patient's system?
    A) 24 hours
    B) 36 hours
    C) 48 hours
    D) 60 hours
    Ans: B
    Feedback:
    The half-life of a drug is the time it takes for the amount of drug in the body to decrease to half of the peak level it previously achieved. At 12 hours there will be 1 mg of the drug available to the body. At 24 hours there will be 0.5 mg; at 36 hours there will be 0.25 mg; at 48 hours there will be 0.125 mg, and at 60 hours there will be 0.0625 mg.

20. The patient has a diagnosis of multiple sclerosis and is taking the drug interferon beta-1a (Rebif). The patient takes this drug by subcutaneous injection three times a week. The dosage is 44 mcg per injection. If the patient takes an injection on Monday, how much of the drug would still be in the patient's system when she takes her next injection on Wednesday, assuming the half-life of the drug is 24 hours?
    A) 22 mcg
    B) 16.5 mcg
    C) 11 mcg
    D) 5.5 mcg
    Ans: C
    Feedback:
    The half-life of a drug is the time it takes for the amount of drug in the body to decrease to 1 half the peak level it previously achieved. On Tuesday, there would be 22 mcg remaining in the body, so option A is incorrect. On Wednesday 11 mcg would remain, so option C is the correct answer. At 12 hours before taking the next dose on Wednesday, there would be 16.5 mcg remaining. If the injection were not taken on Wednesday, 12 hours after the dose was due, there would be 5.5 mcg remaining.

21. The patient is a 6-year-old child who is taking 125 mg of amoxicillin every 6 hours. Assuming that the half-life of Amoxicillin is 3 hours, how much Amoxicillin would be in the child's body at the time of the next administration of the drug?
    A) 62.5 mg
    B) 46.875 mg
    C) 31.25 mg
    D) 15.625 mg
    Ans: C
    Feedback:
    The half-life of a drug is the time it takes for the amount of drug in the body to decrease to 1 half the peak level it previously achieved. Option A would occur at 3 hours after the original dose of amoxicillin. Option B would occur 4 1/2 hours after the original dose. Option C would occur at 6 hours after the original dose. Option D would occur at 7 1/2 hours after the original dose.

22. A drug with a half-life of 4 hours is administered at a dosage of 100 mg. How much of the drug will be in the patient's system 8 hours after administration?
    A) 75 mg
    B) 50 mg
    C) 37.5 mg
    D) 25 mg
    Ans: D
    Feedback:
    The half-life of a drug is the time it takes for the amount of drug in the body to decrease to 1 half the peak level it previously achieved. Option A would occur 2 hours after administration of the drug. Option B would occur at 4 hours. Option C would occur at 6 hours. Option D would occur at 8 hours after the original administration of the drug.

23. The nurse administers amoxicillin 500 mg. The half-life of this drug is approximately 1 hour. At what point would the drug level in the body be 62.5 mg if the drug was not administered again?
    A) 1 hours after the original dose
    B) 2 hours after the original dose
    C) 3 hours after the original dose
    D) 4 hours after the original dose
    Ans: C
    Feedback:
    The half-life of a drug is the time it takes for the amount of drug in the body to decrease to one-half of the peak level it previously achieved. At a dose of 500 mg the drug level would be 250 mg in 1 hour, 125 mg in 2 hours, 62.5 mg in 3 hours, and 31.25 mg in 4 hours so the correct answer is 3 hours.

24. The nurse is caring for a patient who is receiving gentamicin, 250 mg and fluconazole (Diflucan), 500 mg at the same time. The nurse knows that if these two drugs competed with each other for protein-binding sites, what would this do?
    A) Make the patient gentamicin deficient
    B) Make the patient fluconazole deficient
    C) Counteract any positive benefit the drugs would have
    D) Alter the effectiveness of both drugs
    Ans: D
    Feedback:
    Some drugs compete with each other for protein-binding sites, altering effectiveness or causing toxicity when the two drugs are given together. Nothing in the scenario would indicate that the patient would be either Gentamicin or Diflucan deficient, nor does it indicate that these drugs cannot be given together because they would counteract each other.

25. The student nurse asks the instructor why a patient with a central nervous system infection is receiving antibiotics that will not cross the blood–brain barrier. What is the instructor's most correct response?
    A) A severe infection alters the blood–brain barrier to allow the drug to cross.
    B) A medication that is water soluble is more likely to cross the blood-brain barrier.
    C) Antibiotics are the exception to the blood–brain barrier and cross easily.
    D) An infection that spreads outside the central nervous system helps drugs cross the barrier.
    Ans: A
    Feedback:
    Effective antibiotic treatment can occur only when the infection is severe enough to alter the blood–brain barrier and allow antibiotics to cross. Lipid-soluble, not water-soluble, medications cross the blood–brain barrier more easily and most antibiotics are lipid soluble, so they are not the exception. No matter where the infection originates, drugs must cross the blood–brain barrier to treat central nervous system infections.

26. The patient is taking low dose aspirin daily for his heart. The nurse knows only a portion of the medication taken actually reaches the tissue due to what process?
    A) Distribution
    B) First-pass effect
    C) Reduced absorption
    D) Gastrointestinal circulation
    Ans: B
    Feedback:
    Drugs that are taken orally are usually absorbed from the small intestine directly into the portal venous system and then delivers these absorbed molecules into the liver, which immediately break the drug into metabolites, some of which are active and cause effects in the body, and some of which are deactivated and can be readily excreted from the body. As a result, a large percentage of the oral dose is destroyed at this point and never reaches the tissues. This process is not caused by distribution, absorption, or gastrointestinal circulation.

27. What needs to happen to the protein–drug complex for the drugs to reach the cells where the drug can act?
    A) The protein–drug complex must break itself into smaller pieces to enter the capillaries.
    B) The binding site on the protein picks up a chemical to make it soluble in the serum.
    C) The drug must break away from the protein-binding site and float freely.
    D) The drug must be dissolved in the plasma so it can enter the capillaries and then the tissues.
    Ans: C
    Feedback:
    Most drugs are bound, to some extent, to proteins in the blood to be carried into circulation. The protein–drug complex is relatively large and cannot enter into capillaries and then into tissues to react. The drug must be freed from the protein's binding site at the tissues. This occurs without the introduction of another chemical or by dissolving in it plasma.

28. The nurse is reviewing the results of the patient's laboratory tests. What must the nurse keep in mind when reviewing these results related to medication administration?
    A) The patient's emotional response to the disease process
    B) The timing of the last dose of medication relative to when blood was drawn
    C) The possibility of a drug–laboratory test interaction
    D) A change in the body's responses or actions related to the drug
    Ans: C
    Feedback:
    The body works through a series of chemical reactions. Because of this, administration of a particular drug may alter results of tests that are done on various chemical levels or reactions as part of a diagnostic study. This drug–laboratory test interaction is caused by the drug being given and not necessarily by a change in the body's responses or actions. The patient's emotional response or timing of the last dose is not important in drug-laboratory interactions.

29. A patient has come to the clinic and been diagnosed with Lyme disease. The physician has ordered oral tetracycline. What is important for the nurse to include in the teaching plan about tetracycline? (Select all that apply.)
    A) Do not take the drug with anything high in sodium content to keep from producing a state of hypernatremia in the body.
    B) Do not take the drug with foods or other drugs that contain calcium.
    C) Do not take the drug at the same time you take an iron supplement or with foods that are high in iron content.
    D) Avoid exposure to the sun when taking this drug as it can turn your skin purple.
    E) Avoid eating bananas at the same time you take this drug as the potassium content of the tetracycline can produce hyperkalemia in the body.
    Ans: B, C
    Feedback:
    The antibiotic tetracycline is not absorbed from the gastrointestinal (GI) tract if calcium or calcium products (e.g., milk) are present in the stomach. It cannot be taken with iron products because a chemical reaction occurs preventing absorption. Although tetracycline can increase sun sensitivity, it does not turn the skin purple. Patients who take tetracycline do not need to avoid eating bananas or foods that are high in potassium.

30. A nurse is caring for a patient taking multiple drugs and is concerned about a possible drug–drug interaction. What is the nurse's first and best means of avoiding this problem?
    A) Consult a drug guide.
    B) Call the pharmacist.
    C) Contact the provider.
    D) Ask another nurse.
    Ans: A
    Feedback:
    Whenever two or more drugs are being given together, first consult a drug guide for a listing of clinically significant drug–drug interactions. Sometimes problems can be avoided by staggering the administration of the drugs or adjusting their dosages. Consulting the pharmacist is not wrong, but it would not be the first action to take. The nurse holds responsibility for his or her own practice so asking a health care provider or another nurse is based on the assumption that that professional is knowledgeable about *all* drug–drug interactions, which is likely not the case.

31. The nurse promotes optimal drug effectiveness by doing what? (Select all that apply.)
    A) Incorporate basic history and physical assessment factors into the plan of care.
    B) Evaluate the effectiveness of drugs after they have been administered.
    C) Modify the drug regimen to modify adverse or intolerable effects.
    D) Minimize the number of medications administered to patients.
    E) Examine factors known to influence specific drugs if they are to be effective.
    Ans: A, B, C, E
    Feedback:
    Incorporate basic history and physical assessment factors into any plan of care so that obvious problems can be identified and handled promptly. If a drug simply does not do what it is expected to do, further examine the factors that are known to influence drug effects. Frequently, the drug regimen can be modified to deal with that influence. Minimizing the number of medications administered is usually not an option because each drug is ordered for a reason of necessity for the patient.

32. The nurse administers a specific medication to an older adult patient every 4 hours. The patient has a history of chronic renal failure. Why would this patient be at risk for toxic drug levels?
    A) Cumulative effect
    B) First-pass effect
    C) Drug interactions
    D) Cross-tolerance effect
    Ans: A
    Feedback:
    If a drug is taken in successive doses at intervals that are shorter than recommended, or if the body is unable to eliminate a drug properly, the drug can accumulate in the body, leading to toxic levels and adverse effects. This is a cumulative effect. First-pass effect addresses the reduction of available drug when taken orally due to metabolism in the liver before the drug reaches the bloodstream. Drug interactions occur when taken with other drugs, food, or complementary alternative therapies. Cross-tolerance is resistance to drugs within the same class.

33. The patient, diagnosed with cancer, is receiving morphine sulfate (a potent narcotic pain reliever) to relieve cancer pain. Approximately every 7 days the medication is no longer effective in controlling the patient's pain and a larger dose is needed to have the same effect. How might the nurse explain why this is happening?
    A) Tolerance
    B) Cumulation
    C) Interactions
    D) Addiction
    Ans: A
    Feedback:
    The body may develop a tolerance to some drugs over time. Tolerance may arise because of increased biotransformation of the drug, increased resistance to its effects, or other pharmacokinetic factors. When tolerance occurs, the amount of the drug no longer causes the same reaction. Therefore, increasingly larger doses are needed to achieve a therapeutic effect. Cumulative effect occurs when the drug is not properly eliminated and more of the drug is administered, resulting in toxic levels accumulating. Interactions occur when the drug reacts badly with another substance such as food, another drug, or an alternative or complementary therapy. Addiction is the psychological need for a substance.

34. While administering a medication that the nurse has researched and found to have limited effectiveness, the patient tells the nurse, “I have read all about this drug and it is such a wonder drug. I'm so lucky my doctor prescribed it because I just know it will treat my problem.” The nurse suspects this drug will be more effective than usual for this patient because of what effect?
    A) Cumulative effect
    B) First-pass effect
    C) Placebo effect
    D) Cross-tolerance effect
    Ans: C
    Feedback:
    A drug is more likely to be effective if the patient thinks it will work than if the patient believes it will *not* work. This is called the placebo effect. If a drug is taken in successive doses at intervals that are shorter than recommended, or if the body is unable to eliminate a drug properly, the drug can accumulate in the body, leading to toxic levels and adverse effects. This is a cumulative effect. First-pass effect addresses the reduction of available drug when taken orally due to metabolism in the liver before the drug reaches the bloodstream. Cross-tolerance is resistance to drugs within the same class.

35. The nurse administers an intravenous medication with a half-life of 24 hours but recognizes what factors in this patient could extend the drug's half-life? (Select all that apply.)
    A) Gastrointestinal disease
    B) Kidney disease
    C) Liver disease
    D) Cardiovascular disease
    E) Route of administration
    Ans: B, C, D
    Feedback:
    Kidney disease could slow excretion and extend the drug's half-life. Liver disease could slow metabolism resulting in an extended half-life. Cardiovascular disease could slow distribution resulting in a longer half-life. Gastrointestinal disease would not impact half-life because the medication was injected directly into the bloodstream. Route of administration would not extend half-life because IV injection eliminates the absorption step in the process.