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Name:_____ Class:_____ Date:_____

Chapter 01: Multiple Choice

1. The process of _____ takes place during the metabolism of a drug.
   a. absorption
   b. distribution
   c. detoxification
   d. elimination

ANSWER: c

2. The process of _____ takes place during the molecular breakdown of a drug.
   a. metabolism
   b. distribution
   c. absorption
   d. elimination

ANSWER: a

3. _____ is determined by the quantity of drug that reaches its target.
   a. Absorption
   b. Distribution and metabolism
   c. Metabolism and elimination
   d. The process of absorption, distribution, and metabolism

ANSWER: d

4. _____ is the study of the movement of a drug through the body over time.
   a. Pharmacology
   b. Physiology
   c. Pharmacodynamics
   d. Pharmacokinetics

ANSWER: d

5. The study of how the body processes drugs is termed:
   a. pharmacology.
   b. physiology.
   c. pharmacodynamics.
   d. pharmacokinetics.

ANSWER: d

6. Pharmacokinetics is the study of:
   a. the movement of drugs through the body.
   b. drug mechanisms of action within the body.
   c. drugs and neuroscience.
   d. drugs and behavior.

ANSWER: a

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7. *Kinetics* refers to:
   a. dependence and tolerance.
   b. speed and dose.
   c. movement and time.
   d. absorption and distribution.

ANSWER: c

8. In its simplest form, pharmacokinetics describes a drug's:
   a. strength.
   b. time course.
   c. main effects.
   d. toxicity levels.

ANSWER: b

9. The term *kinetics* implies _____ and time.
   a. place
   b. direction
   c. space
   d. movement

ANSWER: d

10. The main difference between the two anti-anxiety drugs, *lorazepam* (Ativan) and *triazolam* (Halcion), can best be described as:
   a. psychological.
   b. pharmacodynamic.
   c. homeostatic.
   d. pharmacokinetic.

ANSWER: d

11. Drugs administered sublingually (under the tongue) and drugs administered orally are absorbed mostly in the _____ and _____, respectively.
   a. stomach; small intestine
   b. small intestine; large intestine
   c. mouth; stomach
   d. mouth; small intestine

ANSWER: d

12. Enteral drug administration involves:
   a. parental routes of administration.
   b. inhalation.

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c. injection.
d. swallowing.

ANSWER: d

13. Which is NOT an parenteral route?
a. skin absorption
b. swallowing
c. injection
d. inhalation

ANSWER: b

14. A suppository would be absorbed:
a. enterally
b. parenterally
c. orally
d. by injection

ANSWER: a

15. A drug inhaled is considered to be absorbed via the ____ route.
a. dermal
b. oral
c. enteral
d. parenteral

ANSWER: d

16. Which drug attribute increases the likelihood of drug absorption?
a. high water-solubility
b. low lipid-solubility
c. large size
d. small size

ANSWER: d

17. Which drug attributes increase the rate of absorption?
a. low water-solubility and low lipid-solubility
b. low water-solubility and high lipid-solubility
c. high water-solubility and low lipid-solubility
d. high water-solubility and high lipid-solubility

ANSWER: b

18. Passive diffusion usually occurs when molecules pass from an area of _____ concentration to an area of _____ concentration.

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a. low; low
b. low; high
c. high; low
d. high; high

ANSWER: a

19. From the intestines, digested nutrients and drugs first flow into the _____ and then into the _____.
a. hepatic artery; capillaries
b. capillaries; hepatic artery
c. capillaries; hepatic portal vein
d. hepatic portal vein; capillaries

ANSWER: c

20. First-pass metabolism refers to a drug passing through the:
a. small intestine
b. large intestine
c. stomach
d. liver

ANSWER: c

21. One substance capable of inhibiting enzymatic degradation in the liver and gastrointestinal tract is:
a. SSRI-type antidepressants.
b. grapefruit juice.
c. *carbamazepine* (Tegretol).
d. cytochrome P450 enzymes.

ANSWER: b

22. Rectal drug administration may be used in place of oral drug administration to avoid:
a. absorption into bloodstream.
b. irritation to mucous membranes.
c. too rapid drug absorption.
d. nausea and vomiting.

ANSWER: d

23. The main advantage of administering a drug through transdermal patches is:
a. lack of irritation to tissue.
b. speed of onset of drug action.
c. ability to avoid absorption into bloodstream.
d. relative constancy of drug levels in plasma.

ANSWER: d

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24. The following are disadvantages of drug administration by injection EXCEPT:
    a. There is little time to correct an unexpected drug reaction or accidental overdose.
    b. Once a drug is injected, it cannot be removed from the body as an orally administered drug can.
    c. Drug injection requires that sterile procedures are used, otherwise infection may be introduced into the body.
    d. This method of drug administration is slower and the response may be unpredictable.

ANSWER: d

25. With the exception of the mode employed with some gas anesthetics, the fastest mode of drug administration is:
    a. inhalation.
    b. intramuscular injection.
    c. subcutaneous injection.
    d. intravenous injection.

ANSWER: d

26. The mode of drug administration that poses the most risk is:
    a. inhalation.
    b. intramuscular injection.
    c. subcutaneous injection.
    d. intravenous injection.

ANSWER: d

27. Drawback(s) to intravenous injection, as opposed to other forms of administration, of drugs include all of the following EXCEPT:
    a. a constant danger of allergic reaction and/or respiratory collapse.
    b. the greatest risk of blood clots.
    c. the greatest risk of infection.
    d. an increased risk of unpredictable absorption.

ANSWER: d

28. The subcutaneous administration of a drug takes place:
    a. in the heart.
    b. in the muscle.
    c. under the skin.
    d. via a transdermal patch.

ANSWER: c

29. The meninges protects the:
    a. brain only
    b. spinal cord only

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c. brain and spinal cord
d. blood vessels

ANSWER: c

30. The middle layer of the meninges is the:
a. pia mater.
b. arachnoid mater.
c. dura mater.
d. epidural space.

ANSWER: b

31. Intrathecal injections are administered via the:
a. muscle.
b. heart.
c. subarachnoid space.
d. epidural space.

ANSWER: c

32. Lumbar punctures are targeted in the:
a. muscle.
b. blood vessels.
c. subarachnoid space.
d. epidural space.

ANSWER: c

33. Enzymes that degrade a drug in the gastrointestinal tract and liver decrease the amount of drug that reaches the circulation by a mechanism known as:
a. enzymatic degradation.
b. gastroenteritis.
c. drug tolerance.
d. first-pass metabolism.

ANSWER: d

34. When administered by injection and inhalation, drugs enter the _____ and _____ side of the heart, respectively.
a. right; right
b. right; left
c. left; right
d. left; left

ANSWER: b

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35. The entire blood volume circulates in the body about once every _____ seconds.
    a. 30
    b. 60
    c. 120
    d. 180

ANSWER: b

36. Ventricles are important for:
    a. blood circulation.
    b. CSF circulation.
    c. drug absorption.
    d. drug metabolism.

ANSWER: b

37. What function is NOT related to cerebral spinal fluid?
    a. protection
    b. circulate nutrients
    c. circulate hormones
    d. drug metabolism

ANSWER: d

38. Which membrane does NOT affect drug distribution?
    a. intestinal wall
    b. capillary wall
    c. placental barrier
    d. blood–brain barrier

ANSWER: a

39. What are the two main differences between capillaries in the periphery and capillaries surrounding the brain?
    a. Capillaries surrounding the brain have no pores and are surrounded by membranes of astrocyte cells.
    b. Capillaries surrounding the brain have pores and are surrounded by membranes of astrocyte cells.
    c. Capillaries surrounding the brain have no pores and are not surrounded by membranes of astrocyte cells.
    d. Capillaries surrounding the brain have pores and are not surrounded by membranes of astrocyte cells.

ANSWER: a

40. A drug that can pass rapidly and easily through the capillary wall surrounding the brain must be:
    a. highly water soluble.
    b. highly lipid soluble.
    c. either highly water soluble or highly lipid soluble.

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d. neither highly water soluble nor highly lipid soluble.

ANSWER: b

41. Penicillin cannot be used to treat infections located in the central nervous system because:
    a. it is destroyed by enzymes in the brain and spinal cord.
    b. it cannot pass through the blood–brain barrier.
    c. it is too highly lipid soluble.
    d. it is too large a molecule to fit though pores surrounding brain cells.

ANSWER: b

42. Large molecules, such as glucose and vitamins, reach the brain through:
    a. passive diffusion across the cell membrane.
    b. passive diffusion through ion channels.
    c. transcytosis.
    d. special transport systems.

ANSWER: d

43. Iron is a large molecule reaching the brain by:
    a. passive diffusion across the cell membrane.
    b. passive diffusion through ion channels.
    c. transcytosis.
    d. special transport systems.

ANSWER: c

44. Why can't steroids and beta blockers pass the blood–brain barrier?
    a. low lipid-solubility
    b. high water-solubility
    c. detected as foreign bodies
    d. readily metabolized

ANSWER: c

45. The membranes that separate fetal blood from maternal blood:
    a. resemble other cell membranes in their general permeability.
    b. are unique in their permeability.
    c. are impermeable to drugs in maternal blood.
    d. are impermeable to lipid-soluble substances.

ANSWER: a

46. The membranes that separate fetal blood from maternal blood are:
    a. highly permeable to psychoactive drugs.
    b. unique in their permeability.

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c. impermeable to psychoactive drugs.
d. impermeable to water-soluble substances.

ANSWER: a

47. Drug cross the placental barrier through _____ with _____ soluble drugs crossing more readily.
a. active transport; water
b. active transport; fat
c. passive diffusion; water
d. passive diffusion; fat

ANSWER: d

48. The presence of the placental barrier means that drugs will be _____ in concentration when compared to concentrations in the maternal bloodstream.
a. lower
b. higher
c. similar
d. wildly different

ANSWER: c

49. All of the following EXCEPT _____ are considered secondary paths for drug elimination
a. bile
b. sweat
c. urine
d. saliva

ANSWER: c

50. Most of the products of body metabolism are excreted by the:
a. liver.
b. kidneys.
c. intestines.
d. skin.

ANSWER: b

51. The majority of drugs leave the body in:
a. bile.
b. exhalation.
c. sweat.
d. urine.

ANSWER: d

52. Jerri is being hired by a large multinational company. They are likely to request a sample of _____ to test

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for drug use because it is a convenient means of detecting drug metabolites.

a. hair
b. skin
c. saliva
d. urine

ANSWER: d

53. *Biotransformation* is another term for:

a. distribution.
b. elimination.
c. absorption.
d. metabolism.

ANSWER: d

54. P450 enzymes are part of:

a. Phase I reactions.
b. Phase II reactions.
c. conjugation.
d. glucuronidation.

ANSWER: a

55. Phase II reactions involve:

a. P450 enzymes.
b. cerebral spinal fluid.
c. conjugation.
d. kidneys.

ANSWER: c

56. Phase I reactions involve:

a. P450 enzymes.
b. cerebral spinal fluid.
c. conjugation.
d. first-pass metabolism.

ANSWER: a

57. "Biotransformation" is carried out by the _____ and usually makes a drug _____ soluble.

a. kidneys; more fat
b. kidneys; more water
c. liver; more fat
d. liver; more water

ANSWER: d

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58. Biotransformation is carried out by the following organ:
    a. liver.
    b. small intestine.
    c. kidneys.
    d. brain.

ANSWER: a

59. The cytochrome P450 enzyme family in a hepatocyte:
    a. is typically capable of metabolizing one and only one drug.
    b. is typically capable of metabolizing one and sometimes two drugs.
    c. cannot, without the help of additional enzymes, metabolize a drug.
    d. is typically capable of metabolizing a wide variety of drugs.

ANSWER: d

60. Which of the following statements regarding biotransformation is TRUE?
    a. Every drug is metabolized by a unique enzyme found in hepatocytes.
    b. Hundreds of enzyme families are involved in drug biotransformation.
    c. A few enzyme families are involved in drug biotransformation.
    d. One enzyme family carries out all drug biotransformation.

ANSWER: c

61. Biotransformation is carried out by the following organ: _____. It usually involves making a drug _____ water soluble. The increased ability of this organ to carry out biotransformation after repeated exposure to a drug is termed _____ tolerance. The *increased* ability of this organ to biotransform drugs other than the one administered previously is termed _____.
    a. small intestine; more; metabolic; cross-tolerance
    b. kidneys; less; metabolic; cellular-adaptive
    c. liver; less; pharmacodynamic; cross-tolerance
    d. liver; more; metabolic; cross-tolerance

ANSWER: a

62. Dave has a particularly efficient CYP2D6 enzyme system in his liver. Based on this information, one would predict that he would:
    a. be efficient at metabolizing most psychoactive medications.
    b. be efficient at metabolizing some psychoactive medications more than others.
    c. not be particularly efficient at metabolizing psychoactive medications.
    d. have trouble with the biotranformation of many drugs.

ANSWER: b

63. _____ factors has the potential to determine how someone will metabolize a drug.
    a. Genetic

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b. Environmental
c. Cultural
d. Experiential

ANSWER: a

64. The *microbiome* refers to:
a. bacteria.
b. enzymes.
c. metabolic tolerance.
d. kidney function.

ANSWER: a

65. Neuroactive substances affecting the microbiome are known as:
a. prebiotics.
b. probiotics.
c. psychobiotics.
d. antibiotics.

ANSWER: c

66. Which is NOT a function of the microbiome?
a. provide vitamins
b. metabolize drugs
c. digest food
d. inhibit pathogens

ANSWER: b

67. Which class of drugs are metabolized by CYP enzymes in the liver?
a. antidepressants
b. antipsychotics
c. anxiolytics
d. pain relievers

ANSWER: d

68. The _____ regulates the levels of most of the substances found in body fluids.
a. liver
b. kidneys
c. enzymes
d. microbiome

ANSWER: b

69. _____ are the functional units that make up the kidneys.

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a. Nephrons
b. Glomerulus
c. Globules
d. Capsules

ANSWER: a

70. Nephrons consist of:
a. capillaries.
b. arteries.
c. veins.
d. CSF.

ANSWER: a

71. Once plasma is filtered through the kidneys, about _____ percent of the filtered plasma gets reabsorbed.
a. 1
b. 10
c. 50
d. 99

ANSWER: a

72. The initial decline of drug plasma concentration occurs rapidly due to:
a. first-pass metabolism.
b. an amplified liver response.
c. increased enzyme concentrations.
d. the drug entering body tissues.

ANSWER: d

73. The half-life of a drug _____ over time.
a. accelerates
b. slows down
c. remains constant
d. fluctuates

ANSWER: c

74. A drug is, for all intents and purposes, completely eliminated from the body in:
a. one half-life.
b. two half-lives.
c. four half-lives.
d. six half-lives.

ANSWER: d

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75. The time for the plasma level of a drug to fall by 50 percent is termed the:
    a. distribution half-life.
    b. time course.
    c. "drug hangover."
    d. elimination half-life.

ANSWER: d

76. The time to reach steady-state concentrations of a drug, that is, the level of drug achieved in the blood with repeated, regular-interval dosing, is:
    a. dependent upon the actual dosage of drug.
    b. achieved when the amount of drug administered per unit time equals the amount eliminated per unit time.
    c. independent of dose interval and half-life.
    d. reached after one elimination half-life.

ANSWER: b

77. Therapeutic drug monitoring (TDM) involves measuring:
    a. enzyme levels.
    b. drug plasma concentrations.
    c. drug CSF concentrations.
    d. rate of elimination.

ANSWER: b

78. In therapeutic drug monitoring (TDM), drug plasma concentrations correlate well with:
    a. enzyme levels.
    b. receptor concentrations.
    c. drug CSF concentrations.
    d. rate of drug elimination.

ANSWER: b

79. The goal of therapeutic drug monitoring (TDM) is to obtain the optimal:
    a. enzyme levels.
    b. therapeutic window.
    c. drug CSF concentrations.
    d. rate of drug elimination.

ANSWER: b

80. The increased ability of the liver to carry out "biotransformation" *after prolonged exposure to a drug* is termed _____ tolerance.
    a. pharmacodynamic
    b. metabolic

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c. enzyme-induction
d. drug-metabolizing

ANSWER: b

81. Pharmacodynamic tolerance occurs in the _____, while metabolic tolerance occurs in the _____.
a. small intestine; mitochondria
b. synapse/neuron; mitochondria
c. small intestine; liver
d. synapse/neuron; liver

ANSWER: d

82. During the process of behavioral drug tolerance, after repeated and frequent use of a drug in the same environment:
a. environmental cues elicit conditioned responses that oppose the direct effects of the drug.
b. environmental cues elicit conditioned responses that closely resemble the direct effects of the drug.
c. one becomes sensitized (i.e., more sensitive) to the drug's effects.
d. environmental cues that elicited conditioned responses that oppose the direct effects of the drug no longer have the same effect.

ANSWER: a

83. The reduction in the number or sensitivity of receptors in response to prolonged activation by a drug is known as:
a. down regulation.
b. metabolic tolerance.
c. homeostasis.
d. physical dependence.

ANSWER: a

84. The ability of liver enzymes to degrade a drug more efficiently in the continued presence of the drug is known as:
a. down regulation.
b. metabolic tolerance.
c. homeostasis.
d. physical dependence.

ANSWER: b

85. The ability of receptors in the brain to adapt to the continued presence of a drug is known as:
a. pharmacokinetic tolerance.
b. pharmacodynamic tolerance.
c. metabolic tolerance.
d. physical dependence.

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ANSWER: b

86. Once a person becomes physically dependent upon a drug:
    a. the person needs to take the drug to avoid withdrawal symptoms.
    b. the person will no longer be physically dependent as soon as drug administration is terminated.
    c. after stopping drug administration, the person will still be physically dependent but will no longer experience abstinence syndrome.
    d. the person will be physically dependent until they come to terms with their involuntary behavior.

ANSWER: a

87. Which statement is TRUE?
    a. Physical dependence only occurs with illicit drugs such as heroin.
    b. Withdrawal signs are only seen with addictive behavior.
    c. There is a strong link between physical dependence and addiction.
    d. Withdrawal may be observed after discontinuation of numerous drugs.

ANSWER: d

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Chapter 01: Essay

1. What are the four processes under pharmacokinetics?

ANSWER: Suggested Answer:
1) absorption, 2) distribution, 3) metabolism, 4) elimination.

2. Define parenteral route and present the different routes.

ANSWER: Suggested Answer:
Parenteral: administration not involving the GI tract; injection, inhalation, skin absorption, mucous membrane absorption.

3. Explain why prodrugs are used for oral administration.

ANSWER: Suggested Answer:
Anticipation of chemical conversion to active agent during digestion.

4. What are the possible disadvantages of oral administration of drugs?

ANSWER: Suggested Answer:
1) stomach distress, 2) genetic differences, 3) manufacturing differences, 4) stomach acid can destroy some drugs.

5. What are the disadvantages of rectal administration of drugs?

ANSWER: Suggested Answer:
Absorption can be irregular, unpredictable, incomplete, and irritate lining of rectum.

6. Discuss the two reasons why inhalation allows for quick absorption.

ANSWER: Suggested Answer:
1) large surface area of lungs, 2) lung capillaries feed directly to the heart via the pulmonary vein.

7. Describe the structural features of the blood–brain barrier.

ANSWER: Suggested Answer:
Astrocytes and capillary; tight junctions; molecule size and lipid solubility.

8. How many half-lives does it take to reach a steady-state plasma concentration? Show the calculations to demonstrate this effect.

ANSWER: Suggested Answer:
5 to 6 half-lives.

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