

CHAPTER 2

Pharmacodynamics: How Drugs Act

MULTIPLE-CHOICE QUESTIONS

Pharmacodynamics: How Drugs Act**Page: 36, Answer: c**

1. The study of how a drug interacts with a receptor is termed:
 - a. pharmacology.
 - b. pharmacokinetics.
 - c. pharmacodynamics.
 - d. molecular physiology.

Receptors for Drug Action**Page: 38, Answer: a**

2. The naturally occurring compounds that bind to receptors are termed:
 - a. transmitters.
 - b. drugs.
 - c. pharmaceuticals.
 - d. second messengers.

Receptors for Drug Action**Page: 38, Answer: b**

3. A _____ can usually bind to many _____.
 - a. receptor; neurotransmitters
 - b. neurotransmitter; receptors
 - c. ligand; neurotransmitters
 - d. neurotransmitter; ligands

Receptors for Drug Action**Page: 38, Answer: a**

4. A _____ usually binds to only one _____.
 - a. receptor; neurotransmitter
 - b. neurotransmitter; receptor
 - c. ligand; neurotransmitter
 - d. neurotransmitter; ligand

Receptors for Drug Action**Page: 38, Answer: b**

5. New advances in pharmacology enable, for the first time, the development of drugs that bind to:
- more than one receptor.
 - one receptor only.
 - more than one neurotransmitter.
 - one neurotransmitter only.

Receptors for Drug Action**Page: 39, Answer: d**

6. Remarkably, molecular biological techniques such as receptor “cloning” have allowed for the development of drugs that are more selective than endogenous:
- receptors.
 - ligands.
 - neurotransmitters.
 - ligands and neurotransmitters.

Receptors for Drug Action**Page: 39, Answer: c**

7. A drug that exerts an effect similar to, and occupies the same receptor site as, the naturally occurring compound is termed:
- a mimicker.
 - an antagonist.
 - an agonist.
 - a facilitator.

Receptors for Drug Action**Page: 39, Answer: b**

8. A drug that blocks the effect of, and occupies the same receptor site as, the naturally occurring compound is termed:
- a mimicker.
 - an antagonist.
 - an agonist.
 - a facilitator.

Receptors for Drug Action**Page: 39, Answer: b**

9. An ion channel within a postsynaptic receptor responds to binding of a neurotransmitter by altering:
- both its permeability to, and selectivity for, ions.
 - its permeability to, but not selectivity for, ions.
 - its selectivity for, but not permeability to ions.
 - neither its permeability to, nor selectivity for, ions.

Receptors for Drug Action**Page: 41, Answer: d**

10. The anxiolytic (anxiety-reducing) effect of benzodiazepines such as *diazepam* occurs through:
- antagonist action at the serotonin receptor.
 - agonist action at the serotonin receptor.
 - antagonist action at the GABA receptor.
 - agonist action at the GABA receptor.

Receptors for Drug Action**Page: 41, Answer: c**

11. The benzodiazepines (such as *diazepam*) bind at:
- the same site on the receptor as the endogenous neurotransmitter and mimic the action of the neurotransmitter.
 - the same site on the receptor as the endogenous neurotransmitter and block the action of the neurotransmitter.
 - a different site on the receptor as the endogenous neurotransmitter to facilitate the action of the neurotransmitter.
 - a different site on the receptor as the endogenous neurotransmitter to inhibit the action of the neurotransmitter.

Receptors for Drug Action**Page: 42, Answer: d**

12. The benzodiazepine antagonist *flumazenil* binds at the same site on the receptor as the:
- endogenous neurotransmitter to mimic the action of the neurotransmitter.
 - endogenous neurotransmitter to block the action of the neurotransmitter.
 - benzodiazepines to mimic the action of the benzodiazepines.
 - benzodiazepines to block the action of the benzodiazepines.

Receptors for Drug Action**Pages: 42–45, Answer: d**

13. G protein-coupled receptors respond to binding of a neurotransmitter by altering :
- ion channel function.
 - energy metabolism of the neural cell.
 - cell division
 - All of the answers are correct.

Receptors for Drug Action**Pages: 42–45, Answer: d**

14. G proteins can control the following cellular function(s):
- opening and closing of ion channels.
 - energy metabolism of the neural cell.
 - neural cell division and differentiation.
 - All of the answers are correct.

Receptors for Drug Action**Page: 43, Answer: d**

15. In metabotropic receptors:
- G proteins activate the extracellular recognition site.
 - the associated ion channel activates the G protein.
 - the associated ion channel activates the receptor recognition site.
 - the activated extracellular receptor in turn activates the G protein.

Receptors for Drug Action**Pages: 43–47, Answer: c**

16. Membrane-spanning receptor proteins include:
- G-protein-coupled receptors, but not carrier/transport proteins.
 - carrier/transport proteins, but not G-protein/coupled receptors.
 - both G-protein-coupled receptors and carrier/transport proteins.
 - neither G-protein-coupled receptors nor carrier/transport proteins.

Receptors for Drug Action**Page: 46, Answer: c**

17. Drugs that block the action of *carrier proteins* would be expected to _____; drugs that facilitate the action of *carrier proteins* would be expected to _____.
- decrease the level of neurotransmitter in the synapse; decrease the level of neurotransmitter in the synapse
 - increase the level of neurotransmitter in the synapse; increase the level of neurotransmitter in the synapse
 - increase the level of neurotransmitter in the synapse; decrease the level of neurotransmitter in the synapse
 - decrease the level of neurotransmitter in the synapse; increase the level of neurotransmitter in the synapse

Receptors for Drug Action**Page: 46, Answer: d**

18. Based on the concept of homeostatic control, you might expect drugs that block the action of *carrier proteins* to _____ the number of postsynaptic receptors for the endogenous neurotransmitter; further, you might expect drugs that facilitate the action of *carrier proteins* to _____ the number of postsynaptic receptors for the endogenous neurotransmitter.
- decrease; decrease
 - increase; increase
 - increase; decrease
 - decrease; increase

Receptors for Drug Action**Page: 48, Answer: c**

19. Exposure to a drug that inhibits the breakdown of a neurotransmitter (NT):
- increases the level of NT by inhibiting breakdown in the synapse; an example of such a drug is acetylcholine esterase.
 - increases the level of NT by inhibiting breakdown mainly in the presynaptic terminal; an example of such a drug is monoamine oxidase.
 - increases the level of NT by inhibiting breakdown in the synapse; an example of such a drug is an acetylcholine esterase inhibitor.
 - increases the level of NT by inhibiting breakdown in the presynaptic terminal; an example of such a drug is an acetylcholine esterase inhibitor.

Receptors for Drug Action**Page: 48, Answer: d**

20. Acetylcholine esterase and monoamine oxidase are examples of:
- G-protein-coupled receptors.
 - carrier/transport proteins.
 - directly gated ion channels.
 - enzyme receptor proteins.

Receptors for Drug Action**Page: 49, Answer: d**

21. "Isomers" represent forms of a molecule that are:
- identical in all respects.
 - identical save for a handful of different atoms.
 - charged versus uncharged.
 - mirror images of one another.

Receptors for Drug Action**Pages: 49, Answer: a**

22. The intensity of a drug's effect is proportional to:
- the "fit" of the drug to the receptor and the percentage of receptors occupied by the drug.
 - the "fit" of the drug to the receptor but not the percentage of receptors occupied by the drug.
 - neither the "fit" of the drug to the receptor nor the percentage of receptors occupied by the drug.
 - the percentage of receptors occupied by the drug but not the "fit" of the drug to the receptor.

Dose-Response Relationships**Page: 51, Answer: a**

23. A drug that is more *efficacious* than another drug has:
- a larger maximum effect.
 - a larger TI.
 - a larger ED_{50} .
 - a smaller LD_{50} .

Dose-Response Relationships**Page: 51, Answer: a**

24. *Potency* refers to:
- the absolute number of molecules of drug required to elicit a response.
 - the maximum effect obtainable.
 - the individual differences in drug response.
 - the relative safety of the drug.

Dose-Response Relationships**Pages: 51, 55, Answer: d**

25. A drug that is more *potent* than another drug has:
- a larger maximal effect.
 - a larger ED_{50} .
 - a larger LD_{50} .

d. a smaller ED_{50} .

Dose-Response Relationships

Page: 51, Answer: d

26. The location of the dose-response curve along the horizontal axis reflects:
- the therapeutic index of a drug.
 - the efficacy of a drug.
 - individual differences in drug response.
 - the potency of a drug.

Dose-Response Relationships

Page: 51, Answer: d

27. The variability and slope of the dose-response curve refer to:
- the number of molecules of drug required to elicit a response.
 - the maximum effect obtainable with the drug.
 - whether the drug acts on presynaptic or postsynaptic receptors.
 - individual differences in response to the drug.

Dose-Response Relationships

Pages: 51–52, Answer: b

28. The peak of the dose-response curve indicates:
- the therapeutic index of a drug.
 - the efficacy of a drug.
 - individual differences in drug response.
 - the potency of a drug.

Dose-Response Relationships

Page: 52, Answer: b

29. The fact that caffeine cannot exert as much central nervous system stimulation as amphetamine indicates that caffeine:
- is less potent than amphetamine.
 - is less efficacious than amphetamine.
 - has a lower therapeutic index than amphetamine.
 - has a steeper slope than amphetamine on a dose-response curve.

Drug Safety and Effectiveness

Pages: 53–54, Answer: d

30. The therapeutic index refers to the:
- absolute number of molecules of drug required to elicit a response.
 - maximum effect obtainable.
 - individual differences in drug response.
 - relative safety of the drug.

Drug Safety and Effectiveness

Pages: 53–54, Answer: d

31. The *therapeutic index* is defined as the ratio of:
- efficacy to potency.
 - potency to efficacy.
 - ED_{50} to LD_{50} .
 - LD_{50} to ED_{50} .

Drug Safety and Effectiveness**Page: 53, Answer: c**

32. The dose of drug that produces the effect desired in half of subjects is called the drug's:
- half-life.
 - therapeutic index.
 - ED₅₀.
 - LD₅₀.

Drug Safety and Effectiveness**Page: 54, Answer: d**

33. In a given population, the dose-response curve for the dose of drug that produces the desired effect may overlap with the dose response curve for the lethal dose of the drug. For this reason, a more useful index of the margin of safety for a drug is the ratio of the:
- LD₅₀ to ED₅₀.
 - ED₅₀ to LD₅₀.
 - ED₉₉ to LD₁.
 - LD₁ to ED₉₉.

Drug Safety and Effectiveness**Pages: 55–56, Answer: d**

34. Side effects of a drug are usually:
- not apparent until the maximum effect of the drug is observed and are independent of the purpose for which the drug was taken.
 - not apparent until the maximum effect of the drug is observed and are dependent on the purpose for which the drug was taken.
 - apparent well before the maximum effect of the drug is observed and are independent of the purpose for which the drug was taken.
 - apparent well before the maximum effect of the drug is observed and are dependent on the purpose for which the drug was taken.

Drug Safety and Effectiveness**Page: 57, Answer: b**

35. The term *placebo* is best described as:
- a pharmacologically active substance that elicits a significant therapeutic response.
 - a pharmacologically inactive substance that elicits a significant therapeutic response.
 - a pharmacologically active substance that fails to elicit a significant therapeutic response.
 - a pharmacologically inactive substance that fails to elicit a significant therapeutic response.

Drug Safety and Effectiveness**Page: 58, Answer: d**

36. Possible mechanisms for the placebo effect include:
- biological action of the active ingredient in the placebo.
 - a clearly defined set of traits in the patient.
 - side effects of the placebo.
 - genetics of the patient.

TRUE OR FALSE QUESTIONS**Pharmacodynamics: How Drugs Act****Page: 37, Answer: False**

37. With rare exception, the binding of a drug to a receptor is irreversible.

Receptors for Drug Action**Page: 38, Answer: False**

38. A given receptor is usually capable of binding to more than one neurotransmitter.

Receptors for Drug Action**Page: 38, Answer: True**

39. A given neurotransmitter is usually capable of binding to more than one receptor.

Receptors for Drug Action**Page: 39, Answer: False**

40. An antagonist binds to the same receptor site as the endogenous compound but produces an effect opposite to the endogenous compound.

Receptors for Drug Action**Page: 39, Answer: True**

41. An antagonist binds to the same receptor site as the endogenous compound but prevents the endogenous compound from acting.

Receptors for Drug Action**Page: 43, Answer: False**

42. Metabotropic receptors form a membrane-spanning pore through which ions pass.

Receptors for Drug Action**Page: 43–45, Answer: True**

43. The G protein can directly, as well as indirectly, activate an ion channel.

Receptors for Drug Action**Page: 45, Answer: False**

44. Ionotropic and metabotropic receptors mediate the effect of the steroid hormones.

Receptors for Drug Action**Page: 49, Answer: False**

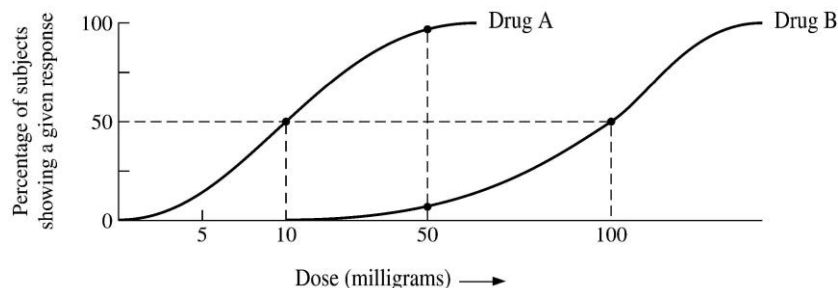
45. Two *enantiomers* of a given drug are almost always roughly equal to each other in biological activity.

Drug Safety and Effectiveness**Page: 57, Answer: False**

46. The double-blind randomized clinical trial without placebo is currently the gold standard for studying the effectiveness and safety of drugs in humans.

Dose-Response Relationships and Drug Safety and Effectiveness

The following True or False questions refer to the figure below, in which two dose-response curves are shown.



If these two curves represent dose-response relationships of two drugs (Drug A on the left; Drug B on the right), then:

- Dose-Response Relationships and Drug Safety and Effectiveness**
Pages: 50–54, Answer: False
47. The two dose-response curves represent drugs that are equipotent.
- Dose-Response Relationships and Drug Safety and Effectiveness**
Pages: 50–52, Answer: True
48. Drug A and Drug B each have a different ED_{50} .
- Dose-Response Relationships and Drug Safety and Effectiveness**
Pages: 50–52, Answer: False
49. Drug B is more potent than Drug A.
- Dose-Response Relationships and Drug Safety and Effectiveness**
Pages: 50–52, Answer: True
50. Drug A and Drug B are equally efficacious.
- Dose-Response Relationships and Drug Safety and Effectiveness**
Pages: 50–52, Answer: False
51. Drug B is five times more efficacious than Drug A.
- Dose-Response Relationships and Drug Safety and Effectiveness**
Pages: 50–52, Answer: False
52. Drug A is more efficacious than Drug B.
- Dose-Response Relationships and Drug Safety and Effectiveness**
Pages: 50–52, Answer: False
53. Drug B is 10 times more potent than Drug A.
- Dose-Response Relationships and Drug Safety and Effectiveness**
Pages: 50–52, Answer: False
54. Drug A is five times more potent than Drug B.

Dose-Response Relationships and Drug Safety and Effectiveness

Pages: 50–52, Answer: True

55. Drug A is 10 times more potent than Drug B.

Dose-Response Relationships and Drug Safety and Effectiveness

Pages: 50–52, Answer: False

56. Drug A is 10 times more efficacious than Drug B.