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:
a. more than one receptor.
b. one receptor only.
c. more than one neurotransmitter.
d. 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:
a. receptors.
b. ligands.
c. neurotransmitters.
d. 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. a mimicker.
b. an antagonist.
c. an agonist.
d. 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. a mimicker.
b. an antagonist.
c. an agonist.
d. 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:
a. both its permeability to, and selectivity for, ions.
b. its permeability to, but not selectivity for, ions.
c. its selectivity for, but not permeability to ions.
d. 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:
a. antagonist action at the serotonin receptor.
b. agonist action at the serotonin receptor.
c. antagonist action at the GABA receptor.
d. agonist action at the GABA receptor.

Receptors for Drug Action
Page: 41, Answer: c

11. The benzodiazepines (such as *diazepam*) bind at:
a. the same site on the receptor as the endogenous neurotransmitter and mimic the action of the neurotransmitter.
b. the same site on the receptor as the endogenous neurotransmitter and block the action of the neurotransmitter.
c. a different site on the receptor as the endogenous neurotransmitter to facilitate the action of the neurotransmitter.
d. 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:
a. endogenous neurotransmitter to mimic the action of the neurotransmitter.
b. endogenous neurotransmitter to block the action of the neurotransmitter.
c. benzodiazepines to mimic the action of the benzodiazepines.
d. 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 :
a. ion channel function.
b. energy metabolism of the neural cell.
c. cell division
d. 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):
a. opening and closing of ion channels.
b. energy metabolism of the neural cell.
c. neural cell division and differentiation.
d. All of the answers are correct.

Receptors for Drug Action
Page: 43, Answer: d

15. In metabotropic receptors:
a. G proteins activate the extracellular recognition site.
b. the associated ion channel activates the G protein.
c. the associated ion channel activates the receptor recognition site.
d. 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:
a. G-protein-coupled receptors, but not carrier/transport proteins.
b. carrier/transport proteins, but not G-protein/coupled receptors.
c. both G-protein-coupled receptors and carrier/transport proteins.
d. 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 _____.
a. decrease the level of neurotransmitter in the synapse; decrease the level of neurotransmitter in the synapse
b. increase the level of neurotransmitter in the synapse; increase the level of neurotransmitter in the synapse
c. increase the level of neurotransmitter in the synapse; decrease the level of neurotransmitter in the synapse
d. 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.
a. decrease; decrease
b. increase; increase
c. increase; decrease
d. decrease; increase

Receptors for Drug Action
Page: 48, Answer: c

19. Exposure to a drug that inhibits the breakdown of a neurotransmitter (NT):
a. increases the level of NT by inhibiting breakdown in the synapse; an example of such a drug is acetylcholine esterase.
b. increases the level of NT by inhibiting breakdown mainly in the presynaptic terminal; an example of such a drug is monoamine oxidase.
c. increases the level of NT by inhibiting breakdown in the synapse; an example of such a drug is an acetylcholine esterase inhibitor.
d. 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:
a. G-protein-coupled receptors.
b. carrier/transport proteins.
c. directly gated ion channels.
d. enzyme receptor proteins.

Receptors for Drug Action
Page: 49, Answer: d

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

Receptors for Drug Action
Pages: 49, Answer: a

22. The intensity of a drug's effect is proportional to:
a. the "fit" of the drug to the receptor and the percentage of receptors occupied by the drug.
b. the "fit" of the drug to the receptor but not the percentage of receptors occupied by the drug.
c. neither the "fit" of the drug to the receptor nor the percentage of receptors occupied by the drug.
d. 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. a larger maximum effect.
c. a larger TI.
b. a larger ED_{50}.
d. a smaller LD_{50}.

Dose-Response Relationships
Page: 51, Answer: a

24. *Potency* refers to:
a. the absolute number of molecules of drug required to elicit a response.
b. the maximum effect obtainable.
c. the individual differences in drug response.
d. 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. a larger maximal effect.
b. a larger ED_{50}.
c. 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:
a. the therapeutic index of a drug.
b. the efficacy of a drug.
c. individual differences in drug response.
d. the potency of a drug.

Dose-Response Relationships
Page: 51, Answer: d

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

Dose-Response Relationships
Pages: 51–52, Answer: b

28. The peak of the dose-response curve indicates:
a. the therapeutic index of a drug.
b. the efficacy of a drug.
c. individual differences in drug response.
d. 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:
a. is less potent than amphetamine.
b. is less efficacious than amphetamine.
c. has a lower therapeutic index than amphetamine.
d. 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:
a. absolute number of molecules of drug required to elicit a response.
b. maximum effect obtainable.
c. individual differences in drug response.
d. relative safety of the drug.

Drug Safety and Effectiveness
Pages: 53–54, Answer: d

31. The *therapeutic index* is defined as the ratio of:
a. efficacy to potency.
b. potency to efficacy.
c. ED_{50} to LD_{50}.
d. 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:
a. half-life.
b. therapeutic index.
c. ED_{50}.
d. LD_{50}.

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:
a. LD_{50} to ED_{50}.
b. ED_{50} to LD_{50}.
c. ED_{99} to LD_{1}.
d. LD_{1} to ED_{99}.

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

34. Side effects of a drug are usually:
a. not apparent until the maximum effect of the drug is observed and are independent of the purpose for which the drug was taken.
b. not apparent until the maximum effect of the drug is observed and are dependent on the purpose for which the drug was taken.
c. apparent well before the maximum effect of the drug is observed and are independent of the purpose for which the drug was taken.
d. 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. a pharmacologically active substance that elicits a significant therapeutic response.
b. a pharmacologically inactive substance that elicits a significant therapeutic response.
c. a pharmacologically active substance that fails to elicit a significant therapeutic response.
d. 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:
a. biological action of the active ingredient in the placebo.
b. a clearly defined set of traits in the patient.
c. side effects of the placebo.
d. 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.

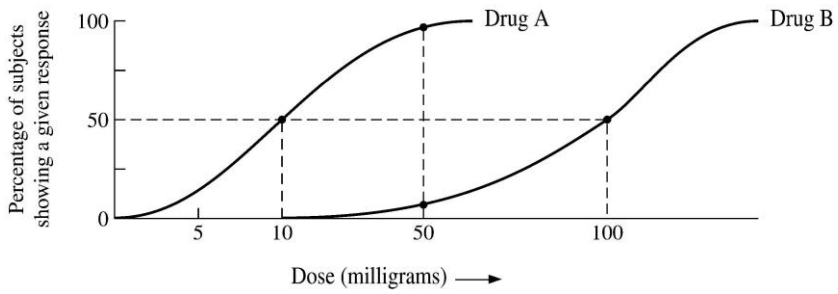
Receptors for Drug Action
Page: 43–45, Answer: True
43. The G protein can directly, as well as indirectly, activate an ion channel.

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 that 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.