1. The structure of synapses is best viewed with a(n):
   __ A. electron microscope.
   __ B. light microscope.
   __ C. confocal microscope.
   __ D. nissle-stained microscopic procedure.

   Rationale: p.155

2. Electron microscopy is a useful tool in the study of synaptic morphology. The resolution of an electron microscope is much greater than that of a light microscope because:
   __ A. smaller electron waves scatter less than light waves.
   __ B. light waves scatter less than electron waves.
   __ C. larger electron waves scatter more than light waves.
   __ D. larger light waves scatter in similar patterns as electron waves.

   Rationale: p.155

3. The contents of a synaptic vesicle include:
   __ A. neurotransmitters.
   __ B. structural proteins.
   __ C. DNA.
   __ D. all of the above.

   Rationale: p.157

4. Which of the following are characteristic of the postsynaptic membrane?
   __ A. thickened appearance
   __ B. receptor proteins
   __ C. synaptic vesicles
   __ D. all of the above
   __ E. a and b

   Rationale: p.157
5. Precursor chemicals that form the building blocks for neurotransmitters are absorbed from the:
   __ A. mitochondria.
   __ B. blood.
   __ C. cell nucleus.
   __ D. Golgi apparatus.

Rationale:
p.158

6. Which of the following would not be found at the axon terminals?
   __ A. mitochondria
   __ B. cell membrane
   __ C. synaptic vesicles
   __ D. axon hillock

Rationale:
p.158

7. Voltage-gated calcium ion channels that function in neurotransmission are primarily found on the:
   __ A. postsynaptic membrane.
   __ B. presynaptic membrane.
   __ C. synaptic vesicles.
   __ D. dendrites.

Rationale:
p.159

8. Immediately before neurotransmission, calcium ions entering the presynaptic membrane bind to:
   __ A. calcitonin.
   __ B. calmodulin.
   __ C. calretenin.
   __ D. calpactin.

Rationale:
p.159

9. Synaptic vesicles release neurotransmitters through the process of:
   __ A. endocytosis.
   __ B. pinocytosis.
   __ C. exocytosis.
   __ D. phagocytosis.

Rationale:
p.159
10. When a neurotransmitter diffuses across the synaptic cleft and binds to a transmitter-activated receptor, which of the following occurs in the postsynaptic cell?
   __ A. membrane depolarization
   __ B. membrane hyperpolarization
   __ C. initiation of chemical reactions
   __ D. all of the above
   __ E. a and b only

Rationale: p.160

11. For an action potential to be elicited:
   __ A. one quantum of neurotransmitter must be released from the presynaptic cell.
   __ B. multiple quanta of neurotransmitter must be released from the presynaptic cell.
   __ C. calcium ions must enter the postsynaptic cell.
   __ D. a and c.

Rationale: p.160

12. How is a neurotransmitter removed from the synaptic cleft?
   __ A. diffusion
   __ B. enzymatic degradation
   __ C. uptake by surrounding glial cells
   __ D. all of the above
   __ E. a and b

Rationale: p.160

13. Hormones are diffusely released to the rest of the body via:
   __ A. axodendritic synapses.
   __ B. axosomatic synapses.
   __ C. axosecretory synapses.
   __ D. axoaxonic synapses.

Rationale: p.161
14. Which of the following best characterizes type I and/or type II synapses?
   __ A. Type I synapses are excitatory and have round synaptic vesicles.
   __ B. Type II synapses are inhibitory and have a greater postsynaptic density than type I synapses.
   __ C. Type I synapses are inhibitory and have larger active zones than type II synapses.
   __ D. Type II synapses are excitatory and have flattened synaptic vesicles.

Rationale: p.162

15. Which of the following is not a classification type of neurotransmitters?
   __ A. small-molecule
   __ B. nucleic-acid
   __ C. gas
   __ D. peptide

Rationale: p.165

16. Small-molecule neurotransmitters are:
   __ A. synthesized in the soma and packaged in the terminals.
   __ B. synthesized in the terminals and packaged in the soma.
   __ C. synthesized in the soma and packaged in the soma.
   __ D. synthesized in the terminals and packaged in the terminals.

Rationale: p.165

17. Which of the following is not part of the amine subtype of small-molecule neurotransmitters?
   __ A. dopamine
   __ B. glycine
   __ C. serotonin
   __ D. norepinephrine

Rationale: p.166

18. Which of the following is not an amino acid neurotransmitter?
   __ A. dopamine
   __ B. glutamate
   __ C. histamine
   __ D. GABA

Rationale: p.166
19. Which two neurotransmitters are synthesized from the same precursor molecule?
   __ A. glycine and dopamine
   __ B. glutamate and GABA
   __ C. histamine and serotonin
   __ D. acetylcholine and glycine

Rationale:
   p.166

20. What is the predominant inhibitory neurotransmitter in the spinal cord?
   __ A. GABA
   __ B. glutamate
   __ C. glycine
   __ D. histamine

Rationale:
   p.166

21. Which of the following shows the correct sequence of a biochemical pathway in tyrosine-based neurotransmitters?
   __ A. tyrosine, l-dopa, DA, NE, EP
   __ B. tyrosine, NE, EP, l-dopa, DA
   __ C. tyrosine, EP, NE, l-dopa, DA
   __ D. tyrosine, l-dopa, DA, EP, NE

Rationale:
   p.166

22. Type I synapses are found on the ________, while type II synapses are found on the ________.
   __ A. spines and dendritic shafts of the neuron; neuron cell body
   __ B. neuron cell body; spines and dendritic shafts of the neuron
   __ C. axons and axon terminals; neuron cell body
   __ D. neuron cell body; axons and axon terminals

Rationale:
   p.162
23. Which of the following presynaptic events are in correct chronological order?
   __ A.  calcium ion influx, action potential reaches axon terminal, vesicle fuses with membrane, diffusion of neurotransmitter
   __ B.  action potential reaches axon terminal, calcium ion channels open, exocytosis, diffusion of neurotransmitter
   __ C.  exocytosis, calcium ion influx, action potential reaches axon terminal, membrane depolarization
   __ D.  action potential reaches axon terminal, calcium ion channels open, neurotransmitter diffusion, exocytosis

   Rationale:
   p.159

24. The active zone on type I synapses is ________ when compared to the active zone on type II synapses.
   __ A.  smaller
   __ B.  larger
   __ C.  the same size
   __ D.  of varying size

   Rationale:
   p.162

25. Which of the following criteria are used to determine if a substance is a neurotransmitter?
   I. The chemical must be synthesized in the neuron.
   II. When the neuron is active, the chemical is released and produces a response.
   III. Injection of the chemical mimics the effects of neuronal stimulation.
   IV. Mechanisms exist for the removal of the chemical.

   __ A.  II, III, IV
   __ B.  I, II, III, IV
   __ C.  II and IV only
   __ D.  I, II, III

   Rationale:
   pp.163-164

26. A chemical that has not yet met all the conditions that constitute a neurotransmitter is referred to as a(n):

   __ A.  chemical signaler.
   __ B.  secondary messenger.
   __ C.  putative neurotransmitter.
   __ D.  unclassified neurotransmitter.

   Rationale:
   p.164
27. A neurotransmitter is a chemical that is involved with:
   __ A. synaptic transmission.
   __ B. inducing changes to synaptic structure.
   __ C. affecting the voltage on the postsynaptic cell.
   __ D. all of the above.
   __ E. a and c.

   Rationale: pp.164-165

28. In the nervous system peptides play a role in:
   __ A. regulating feeding and drinking behavior.
   __ B. hormonal functions.
   __ C. pain and pleasure regulation.
   __ D. all of the above.
   __ E. a and b.

   Rationale: p.167

29. Which one of the following synthesizes acetylcholine from its component molecules?
   __ A. acetylcholinesterase
   __ B. choline acetyl transferase
   __ C. coenzyme A
   __ D. acetate and choline

   Rationale: pp.165-166

30. Met-enkephalin, leu-enkephalin, and beta-endorphin are endogenous neuropeptides whose function is mimicked by:
   __ A. opium.
   __ B. dopamine.
   __ C. morphine.
   __ D. all of the above.
   __ E. a and c.

   Rationale: p.167
31. Unlike small-molecule neurotransmitters, peptide transmitters:
   __ A. do not bind directly to ion channels.
   __ B. directly alter the voltage of the postsynaptic cell.
   __ C. indirectly influence cell structure and function.
   __ D. all of the above.
   __ E. a and c.

   Rationale: p.167

32. Nitric oxide (NO) is a gas neurotransmitter which:
   __ A. is stored in synaptic vesicles.
   __ B. is synthesized in the soma.
   __ C. dilates blood vessels in active areas.
   __ D. is degraded by digestive enzymes.

   Rationale: p.167

33. Ionotropic receptors:
   __ A. change in shape when neurotransmitters bind to them.
   __ B. have no openings for ion diffusion.
   __ C. activate second messenger systems.
   __ D. are more metabolically expensive than metabotropic receptors.

   Rationale: pp.167-169

34. Metabotropic receptors consist of:
   __ A. complex units of membrane-spanning proteins.
   __ B. a single membrane-spanning protein.
   __ C. a single, non-membrane-spanning protein.
   __ D. complex units of non-membrane-spanning proteins.

   Rationale: p.169

35. Ionotropic receptors consist of:
   __ A. a binding site.
   __ B. a pore.
   __ C. G proteins.
   __ D. all of the above.
   __ E. a and b.

   Rationale: p.167
36. A second messenger system can:
   __ A. alter ion flow through the membrane channels.
   __ B. cause a series of reactions that result in the formation of new membrane ion channels.
   __ C. initiate the production of new proteins.
   __ D. all of the above.
   __ E. a and c.

Rationale:
   p.170

37. What chemical represents the "first messenger"?
   __ A. G proteins
   __ B. alpha subunits
   __ C. neurotransmitters
   __ D. sodium ions

Rationale:
   p.170

38. The thought that an individual neuron releases only one type of neurotransmitter is known as ______ and is _______.
   __ A. Dale's law; true
   __ B. Dale's law; false
   __ C. Hebb's law; true
   __ D. Hebb's law; false

Rationale:
   p.170

39. Within a synapse, it is possible to find:
   __ A. a classical neurotransmitter and a neuropeptide.
   __ B. two types of classical neurotransmitters.
   __ C. only one type of classical neurotransmitter.
   __ D. all of the above.
   __ E. a and c.

Rationale:
   pp.166-167
40. Acetylcholine is the classical neurotransmitter for:
   __ A. all skeletal motor synapses.
   __ B. 95 percent of skeletal motor synapses.
   __ C. half of skeletal motor synapses.
   __ D. no skeletal motor synapses.

Rationale:
   p.171

41. The nicotinic acetylcholine receptor (nAChr) is:
   __ A. ionotropic.
   __ B. found in all skeletal motor synapses.
   __ C. permissive to the diffusion of both sodium ions and potassium ions.
   __ D. all of the above.
   __ E. a and b.

Rationale:
   p.171

42. Sympathetic neurons are _______ while parasympathetic neurons are ________.
   __ A. only cholinergic; cholinergic and adrenergic
   __ B. cholinergic and adrenergic; only cholinergic
   __ C. adrenergic; cholinergic
   __ D. cholinergic; adrenergic

Rationale:
   p.172

43. Whether a neurotransmitter has an excitatory or inhibitory effect depends on:
   __ A. the particular neurotransmitter.
   __ B. the postsynaptic receptors.
   __ C. if it's a fight or flight response.
   __ D. the organism's current state of arousal.

Rationale:
   p.172

44. NMDA receptors are:
   __ A. reversibly blocked with a magnesium ion.
   __ B. involved with long-term enhancement (LTE).
   __ C. "doubly gated channels."
   __ D. all of the above.
   __ E. b and c.

Rationale:
   pp.181-182
45. Regarding structural changes in sensory neurons, habituation results in ______ with the motor neuron, and sensitization results in ______ with the motor neuron.

   __ A. an increased number of synapses; a decreased number of synapses
   __ B. no change in number of synapses; a decreased number of synapses
   __ C. a decreased number of synapses; an increased number of synapses
   __ D. a decreased or increased number of synapses; no change in the number of synapses

Rationale:
pp.178-180