

3.1

Q3.1.1 Short Answer: What is psychopharmacology, and why do we study it?

Answer:

Q3.1.2 Multiple Choice: Which of the following is NOT a function of psychopharmacology?

- (A) Study the effects of drugs on the nervous system
- (B) Study the effects of drugs on behavior
- (C) Study the effects of drugs on the immune system
- (D) Study the effects of drugs on neurotransmitter systems

Q3.1.3 Fill in the Blank: The location at which a drug interacts with the body to produce its effects is called the _____.

Q3.1.4 Short Answer: What is the difference between an agonist and an antagonist?

Answer:

Q3.1.5 True or False: Drugs directly create effects in the body.

Answer:

Q3.1.6 Multiple Choice: Which of the following is an example of a drug that acts as an agonist?

- (A) Naloxone
- (B) Morphine
- (C) Curare
- (D) Atropine

Q3.1.7 Short Answer: What is selective action?

Answer:

Q3.1.8 Multiple Choice: What is a precursor?

- (A) A substance that inhibits neurotransmitter release
- (B) A substance that enhances neurotransmitter release
- (C) A substance from which another substance is formed
- (D) A substance from which a neurotransmitter is broken down



Q3.1.9 Short Answer: What is an example of how an agonistic effect can become antagonistic?

Answer:

Q3.1.10 Fill in the Blank: The process of creating a neurotransmitter from its precursors is called _____.

Q3.1.11 Fill in the Blanks: A(n) _____ agonist binds to the same receptor as the neurotransmitter and _____ its effects, while a(n) _____ agonist binds to a different site on the receptor and _____ the effects of the neurotransmitter.

Q3.1.12 Fill in the Blanks: A(n) _____ antagonist binds to a different site on the receptor and _____ the effects of the neurotransmitter, while a(n) _____ antagonist binds to the same receptor as the neurotransmitter and _____ its effects.

Q3.1.13 Multiple Choice: Drugs that cause the action potential to stay in a depolarized state are called:

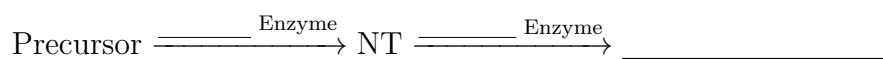
(A) Agonists

(B) Depolarizing agents

(C) Antagonists

(D) Inverse agonists

Q3.1.14 Fill in the Blanks: In the following diagram, label the specific enzyme for each arrow, and identify the outcome:



Q3.1.15 Long(-ish) Answer: Describe the difference between a neurotransmitter and a neuromodulator.

Answer:



Q3.1.16 Matching: Match the following examples with them either being an antagonist or an agonist.

Choices

- (a) *Curare*
- (b) *Atropine*
- (c) *Morphine*
- (d) *Naloxone*
- (e) *Botulinum Toxin*
- (f) Interfering with docking proteins
- (g) Blocking the reuptake of a neurotransmitter
- (h) *Sarin*
- (i) Interfering with vesicles
- (j) Blocking receptors
- (k) Black widow spider venom
- (l) Cobra and krait venom
- (m) Parathion
- (n) DFP
- (o) *Physostigmine*

- (1) Direct antagonist _____
- (2) Indirect antagonist _____
- (3) Direct agonist _____
- (4) Indirect agonist _____

3.2

Q3.2.1 Multiple Choice: Which of the following neurochemicals does NOT transmit information (according to our notes)?

- (A) Dopamine (B) Glutamate (C) GABA (D) Glycine



- Q3.2.2 Fill in the Blank:** Peptides are short chains of _____.
- Q3.2.3 Fill in the Blanks:** The difference between opioids and opiates are that opioids are _____ and opiates are _____.
- Q3.2.4 Short Answer:** What is the pain pathway for the face? What about from the neck down? (Generally speaking.)
Answer:
- Q3.2.5 Fill in the Blanks:** The three types of opioid receptors are _____, _____, and _____.
- Q3.2.6 Long Answer:** What are each of the three opioid receptors responsible for, and what neurochemicals bind to each the most?
Answer:
- Q3.2.7 Multiple Choice:** Prostaglandins become active during
(A) Resting-and-Digesting (B) Crying
(C) Daydreaming (D) Bleeding
- Q3.2.8 True or False:** *Celecoxib (Celebrex)*, a COX-2 Inhibitor, was removed from the market because it causes heart attacks and stroke.
Answer:
- Q3.2.9 Fill in the Blank:** *Cyclooxygenase (COX)* is an enzyme that converts inactive _____ to its active state.
- Q3.2.10 Long Answer:** List the characteristics for the direct pain pathway and the indirect pain pathway.
Answer:
- Q3.2.11 Fill in the Blanks:** Pain arrives at the _____, then travels to the _____. Once there, it is processed by several brain regions. First, the _____ contributes to arousal. Then, the _____, particularly the anterior cingulate cortex (ACC), processes the emotional aspects of pain. When the pain is overwhelming, the _____ activates and releases endogenous opioids to reduce the sensation—this allows a person, for example, to escape danger despite a severe injury. Finally, the _____ and other areas help interpret and associate the pain with context.



Q3.2.12 Matching: Match the following drugs with their respective NSAID class.

Choices

- (a) Ibuprofen
- (b) Aspirin
- (c) Diflunisal
- (d) Naproxen
- (e) Salsalate
- (f) Ketoprofen

- (1) Propionic Acid Derivatives _____
- (2) Salicylates _____

Q3.2.13 Long Answer: Some studies show that both the placebo effect and acupuncture can be blocked by Naloxone, an opioid antagonist. What does this suggest about the mechanism of acupuncture's pain-relieving effects? Does this prove that acupuncture is not entirely a placebo?

Answer:

Q3.2.14 Short Answer: What are some of the functions of opioids? (List the main effects and the side effects.)

Answer:

Q3.2.15 True or False: The term *colocalized* means two or more neurotransmitters are released from two separate neurons at the same time.

Answer:

Q3.2.16 Short Answer: What is the definition of pain? (DO NOT say this exam!!!!!!!)

Answer:

3.3

Q3.3.1 True or False: The amines (monoamines) are derived from amino acids.

Answer:

Q3.3.2 Fill in the Blank: The two indolamines are _____ and _____.



Q3.3.3 Multiple Choice: What amino acid are indolamines derived from?

- (A) Tryptophan (B) Tyrosine (C) Thymine (D) Phenylalanine

Q3.3.4 Fill in the Blank: The precursor to glutamate is _____, and the enzyme that synthesizes glutamate from it is _____.

Q3.3.5 Short Answer: What receptor does ketamine bind to, and what is its effect?

Answer:

Q3.3.6 Fill in the Blank: The enzyme _____ deactivates anandamide.

Q3.3.7 True or False: The most common excitatory neurotransmitter in the brain is GABA.

Answer:

Q3.3.8 Short Answer: What transporters are responsible for glutamate reuptake, and why is this process important?

Answer:

Q3.3.9 Multiple Choice: Which receptor is closely associated with glutamate and is important for synaptic plasticity and memory formation?

- (A) GABA receptor (B) NMDA receptor
(C) Serotonin receptor (D) Dopamine receptor

Q3.3.10 Short Answer: What enzyme converts glutamate into GABA, and what type of neurotransmitter is GABA?

Answer:

Q3.3.11 Fill in the Blanks: The three catecholamine neurotransmitters are _____, _____, and _____.

Q3.3.12 Fill in the Blank: The drug _____ is a direct antagonist of the NMDA receptor and can cause hallucinations and dissociation.

Q3.3.13 Multiple Choice: What does DA, NE, and Adrenaline all contain, and what amino acid are they derived from?

- (A) Catechol and are derived from tryptophan
(B) Catechol and are derived from tyrosine
(C) Indole and are derived from tryptophan
(D) Indole and are derived from tyrosine

Q3.3.14 Fill in the Blank: The enzyme _____ converts tyrosine into L-DOPA.



Q3.3.15 Short Answer: Explain how botox interferes with emotional expression.

Answer:

Q3.3.16 Fill in the Blank: The orbicularis oculi muscle influences _____.

Q3.3.17 True or False: Tyrosine is the precursor for serotonin.

Answer:

Q3.3.18 Short Answer: What are the names of the systems that use dopamine, norepinephrine, and epinephrine? *Answer:*

Q3.3.19 Fill in the Blanks: Melatonin is synthesized from _____ and is involved in regulating _____.

Q3.3.20 Short Answer: What is another name for peptides in the context of neurotransmitters, and give an example.

Answer:

Q3.3.21 Multiple Choice: What is the name of the endogenous cannabinoid neurotransmitter whose name means “bliss” in Sanskrit?

- | | |
|--------------------------------|-----------------------------------|
| (A) Anandamide | (B) Cannabidiol |
| (C) Tetrahydrocannabinol (THC) | (D) 2-Arachidonoylglycerol (2-AG) |

Q3.3.22 Short Answer: How are lipid-based neurotransmitters synthesized and stored?

Answer:

Q3.3.23 Fill in the Blank: The gaseous neurotransmitter that is required for an erection is _____.

Q3.3.24 Long Answer: Describe the study that addressed the question, “Does Botox decrease emotional experience?” Describe the sample, the method, and the results

Answer:

Q3.3.25 Short Answer: Name one neurotransmitter that is a nucleoside. What is its function?

Answer:

Q3.3.26 Fill in the Blanks: Fill in the following spaces that describe the process of dopamine metabolism: DA is broken down by _____ into _____. Then, _____ converts it into _____.



Q3.3.27 Short Answer: What were the results of the study into depression that asks “Can Botox be used as a good thing?”

Answer:



3.4:

Q3.4.1 Short Answer: What does cholinergic mean?

Answer:

Q3.4.2 Short Answer: What are the four main functions of acetylcholine in the central nervous system?

Answer:

Q3.4.3 Multiple Choice: Who first discovered acetylcholine in 1921?

(A) Otto von Loewy

(B) James Olds

(C) Neal Miller

(D) Peter Milner

Q3.4.4 Fill in the Blanks: The following describes the experiment of the scientist that discovered acetylcholine.

He took a(n) _____, put it in _____, and stimulated the _____ part of the vagus nerve, which slowed it. When he put the solution into another _____, it also slowed down, showing a chemical (ACh) was released.

Q3.4.5 Fill in the Blanks: The _____ runs parallel to the spinal cord. This is why when you get anxious, _____ of your body responds at once.

Q3.4.6 Fill in the Blank: The original name given to acetylcholine by its discoverer was _____.

Q3.4.7 Short Answer: What are the two types of ACh receptors?

Answer:

Q3.4.8 True or False: Acetylcholine is the primary neurotransmitter used in the parasympathetic branch of the autonomic nervous system.

Answer:

Q3.4.9 Multiple Choice: Which of the following is NOT a function of ACh in the CNS?

(A) Learning and alertness

(B) Memory

(C) REM sleep generation

(D) Pain modulation



Q3.4.10 Fill in the Blanks The following describes the synthesis and metabolism process of acetylcholine.

_____ attaches to an acetate ion, of which is derived from _____. Then, _____ transfers the acetate from the first chemical to choline, which forms acetylcholine. When it is time to be broken down, ACh is broken down by _____ into acetate and _____. The acetate is then broken down and eliminated, while the latter chemical is taken back up by _____ and reused.

Q3.4.11 Multiple Choice: Which type of ACh receptor is ionotropic?

- (A) Nicotinic receptors
- (B) Muscarinic receptors
- (C) Both nicotinic and muscarinic receptors
- (D) Neither nicotinic nor muscarinic receptors

Q3.4.12 Short Answer: Explain what the sympathetic chain is, and identify where it is located.

Answer:

Q3.4.13 Fill in the Blank: The drug _____ is a direct antagonist of nicotinic receptors, causing paralysis.

Q3.4.14 True or False: Atropine blocks nicotinic receptors and is derived from the plant known as belladonna alkaloids (deadly nightshade).

Answer:

Q3.4.15 Short Answer: How does Botulinum Toxin interfere with acetylcholine function?

Answer:

Q3.4.16 Fill in the Blanks: Black widow spider venom causes _____ of ACh, while (cobra and) krait venom _____ ACh receptors.

Q3.4.17 Multiple Choice: Which of the following is a reversible AChE blocker used to treat myasthenia gravis?

- (A) *Deprenyl* (**Eldepryl**)
- (B) *Tetrabenazine* (**Xenazine**)
- (C) *Physostigmine* (**Antilirium**)
- (D) *Neostigmine* (**Prostigmin**)

Q3.4.18 True or False: *Xanomeline* (**Cobenfy**) crosses the blood-brain barrier and is used to treat the cognitive symptoms of Alzheimer's disease.

Answer:



Q3.4.19 True or False: Nicotinic receptors are antagonists at low doses, but agonists at high doses.

Answer:

Q3.4.20 Multiple Choice: In the PNS, where are nicotinic receptors predominantly located?

- (A) Brain and spinal cord
- (B) Neuromuscular junctions
- (C) Autonomic ganglia
- (D) None of the above

Q3.4.21 Fill in the Blanks: The _____ is the synapse between a motor neuron and a muscle fiber, where ACh is released to stimulate muscle contraction. The _____ is part of the sympathetic nervous system, located near the spinal cord, where preganglionic neurons synapse with postganglionic neurons.

Q3.4.22 Multiple Choice: In the sympathetic nervous system, which neurotransmitter is used at the neuromuscular junction with smooth muscles and glands?

- (A) Acetylcholine
- (B) Norepinephrine
- (C) Dopamine
- (D) Serotonin

Q3.4.23 Short Answer: Compare the neurotransmitters used in the parasympathetic nervous system versus the sympathetic nervous system.

Answer:

Q3.4.24 Multiple Choice: Which of the following statements about acetylcholine in the autonomic nervous system is FALSE?

- (A) ACh is the primary neurotransmitter in the parasympathetic branch
- (B) ACh is used at preganglionic synapses in both sympathetic and parasympathetic branches
- (C) ACh is used at postganglionic synapses to sweat glands in the sympathetic branch
- (D) ACh is the primary neurotransmitter at the neuromuscular junction with smooth muscles in the sympathetic branch

Q3.4.25 Fill in the Blank: In the somatic nervous system, ACh _____ the neuromuscular junction.

Q3.4.26 Multiple Choice: Which structure in the basal forebrain that uses ACh is primarily responsible for activating the cortex and facilitating learning?

- (A) Nucleus Basalis
- (B) Medial Septal Nucleus
- (C) Nucleus of Diagonal Band
- (D) Pedunculopontine nucleus

Q3.4.27 True or False: The Medial Septal Nucleus, which uses ACh, primarily modulates the amygdala.

Answer:



Q3.4.28 Fill in the Blanks: For one of the four functions in the CNS, acetylcholine facilitates _____ generation through the actions of the _____ and _____. These cholinergic structures project to the pons and thalamus, activating brain regions for this time period.

Q3.4.29 Fill in the Blanks: The _____ and _____ are structures that use acetylcholine and project to the hippocampus through the fornix. This is important for learning and memory.

Q3.4.30 Multiple Choice: Which of the following correctly describes the neurotransmitter pathway in the parasympathetic nervous system?

- (A) ACh at preganglionic synapse, ACh at postganglionic synapse
- (B) ACh at preganglionic synapse, NE at postganglionic synapse
- (C) NE at preganglionic synapse, ACh at postganglionic synapse
- (D) NE at preganglionic synapse, NE at postganglionic synapse

Q3.4.31 Short Answer: How did vikings and Koryaks engage with ACh?

Answer:

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### 3.5:

**Q3.5.1 Fill in the Blanks:** The three catecholamines are \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.

**Q3.5.2 Short Answer:** How does *deprenyl* (**Eldepryl**) (also called selegiline (**Jumex**)) work?

*Answer:*

**Q3.5.3 Multiple Choice:** What is the precursor for dopamine?

- (A) Tyrosine
- (B) L-DOPA
- (C) Tryptophan
- (D) Choline

**Q3.5.4 Fill in the Blank:** The rate-limiting enzyme in the synthesis of catecholamines is \_\_\_\_\_.

**Q3.5.5 Short Answer:** Describe the pathway of dopamine synthesis from its amino acid precursor.

*Answer:*

**Q3.5.6 True or False:** The word “tyrosine” is derived from the word British variation of the word “tire” (spelled “tyre”) for its circular shape.

*Answer:*



**Q3.5.7 Multiple Choice:** Which pathway is involved in movement and motor control?

- (A) Nigrostriatal system (B) Mesocortical system  
(C) Mesolimbic system (D) Tuberoinfundibular system

**Q3.5.8 Fill in the Blanks:** The following describes the nigrostriatal system for movement:

We start at the \_\_\_\_\_, which then sends an inhibitory \_\_\_\_\_ signal to the \_\_\_\_\_, who sends a reciprocal inhibitory \_\_\_\_\_ signal back. Then, the first system sends an inhibitory \_\_\_\_\_ signal to the \_\_\_\_\_. Then, that system excites the \_\_\_\_\_, who then excites the \_\_\_\_\_, which causes voluntary movement.

**Q3.5.9 Short Answer:** List four symptoms of Parkinson's disease.

*Answer:*

**Q3.5.10 Short Answer:** What is a drug that was used to lower blood pressure, but gave Parkinson's-like symptoms as a side effect?

*Answer:*

**Q3.5.11 Fill in the Blank:** The misfolded proteins found in the brains of people with Parkinson's disease are called \_\_\_\_\_.

**Q3.5.12 True or False:** In Huntington's Chorea, there is too much GABA from the Striatum to the Substantia Nigra.

*Answer:*

**Q3.5.13 Long Answer:** Explain how the MPTP incident in 1982 contributed to our understanding of Parkinson's disease.

*Answer:*

**Q3.5.14 Fill in the Blank:** *Methylphenidate* (**Ritalin**) increases levels of \_\_\_\_\_ and \_\_\_\_\_ in the brain.

**Q3.5.15 Multiple Choice:** Which system is primarily responsible for reward and reinforcement?

- (A) Nigrostriatal system (B) Mesocortical system  
(C) Mesolimbic system (D) Tuberoinfundibular system



**Q3.5.16 Short Answer:** What neuropeptide, also called orexin, is involved in the regulation of sleep and wakefulness?

*Answer:*

**Q3.5.17 Multiple Choice:** What neurotoxin led to the development of an animal model for Parkinson's disease?

- (A) MPTP                      (B) MPPP                      (C) MPP+                      (D) MAO

**Q3.5.18 Fill in the Blank:** The drug \_\_\_\_\_ is an orexin receptor antagonist used to treat insomnia.

**Q3.5.19 True or False:** The mesocortical system is involved in short-term memory, planning, and problem-solving.

*Answer:*

**Q3.5.20 Multiple Choice:** Which researchers discovered that electrical stimulation of certain brain areas could be rewarding rather than aversive?

- (A) Otto von Loewy                      (B) James Olds and Peter Milner  
(C) Neal Miller and Delgado                      (D) Lateral hypothalamus researchers

**Q3.5.21 Short Answer:** What structure within the limbic system is considered the "pleasure center" of the brain?

*Answer:*

**Q3.5.22 Fill in the Blanks:** The following is a paragraph that describes dopamine synthesis: Tyrosine is converted to \_\_\_\_\_ by the enzyme \_\_\_\_\_. This converted form is then used to create dopamine by the enzyme \_\_\_\_\_.

**Q3.5.23 Multiple Choice:** Which of the following is NOT a function of dopamine in the CNS?

- (A) Movement and motor control                      (B) Reward and reinforcement  
(C) Learning and memory                      (D) Sleep-wake cycles and REM sleep

**Q3.5.24 Short Answer:** Describe the metabolism of dopamine.

*Answer:*

**Q3.5.25 Short Answer:** Define choreoathetotic movements.

*Answer:*

**Q3.5.26 Fill in the Blanks:** The term \_\_\_\_\_ refers to slow, continuous writhing movements, while \_\_\_\_\_ (from the Greek word for "dance") refers to rapid, purposeless, involuntary movements.



**Q3.5.27 True or False:** Both athetosis and choreic movements are characterized by too little movement.

*Answer:*

**Q3.5.28 Short Answer:** Where in the brain is hypocretin produced?

*Answer:*

**Q3.5.29 Multiple Choice:** Which drug is an orexin agonist and can be used to treat narcolepsy?

(A) *Suvorexant* (**Belsomra**)

(B) *Methylphenidate* (**Ritalin**)

(C) TAK-994

(D) Hypocretin

**Q3.5.30 Short Answer:** Explain the difference between athetosis and choreic movements.

*Answer:*

**Q3.5.31 Fill in the Blank:** \_\_\_\_\_ is a neuropeptide involved in the regulation of sleep and wakefulness that is also known as orexin.

**Q3.5.32 Short Answer:** What is the role of adenosine in the body?

*Answer:*

**Q3.5.33 True or False:** Nucleosides and neuropeptides are the same thing.

*Answer:*

**Q3.5.34 Multiple Choice** Spinal nerves leave the spinal cord and synapses in the paravertebral ganglion. This action is part of the \_\_\_\_\_ system.

(A) Sympathetic

(B) Parasympathetic

(C) Somatic

(D) Central Nervous System (CNS)

**Q3.5.35 Fill in the Blank** What type of neurotransmitter was used in the previous problem?

*Answer:*