

## Psychotropic Drugs – Critical Thinking - **KEY**

**Background:** The blood-brain barrier is a network of tightly packed cells in the walls of capillaries that prevents many harmful substances, including some poisons, from entering the brain and spinal cord. In order to produce changes in thought, mood, perception, or behavior a drug must be capable of crossing this barrier. Drugs capable of penetrating the blood-brain barrier are called psychotropic or psychoactive drugs.

### Part I

**Directions:** Complete the following by filling in the missing term. In some cases, a word choice has been provided (*Information for this exercise was obtained from the website of the National Institute on Drug Abuse*).

1. THC, the active ingredient in the drug marijuana mimics the natural neurotransmitter anandamide making this an \_\_\_\_\_ (**agonist** or antagonist) drug. The brain uses the neurotransmitter anandamide remove unnecessary short-term memories. The drug THC acts like anandamide and accelerates this process. Which brain area is impacted by the THC in marijuana? \_\_\_\_\_ (**hippocampus or frontal lobe**)

2. Ecstasy or MDMA can be placed into either of two drug categories. Ecstasy increases heart rate and can cause muscle spasms, which is why it can be classified as a \_\_\_\_\_ (**stimulant**) drug but the fact that it causes distorted perceptions makes this also a \_\_\_\_\_ (**hallucinogen**) drug.

3. Ecstasy or MDMA mimics the natural neurotransmitters serotonin and dopamine making this an \_\_\_\_\_ (**agonist** or antagonist) drug. Ecstasy impacts serotonin pathways related to mood, sleep, aggression, appetite, anxiety, memory, perception, and appetite.

Both ecstasy and methamphetamine interfere with the body's ability to regulate internal temperature. On unpredictable occasions, this can lead to a sharp increase in body temperature (hyperthermia), which can result in liver, kidney, or cardiovascular system failure or even death. Which area of the brain is being disrupted when hyperthermia occurs as a result of ecstasy or methamphetamine use? \_\_\_\_\_ (**hypothalamus**)

Ecstasy can result in influence strong emotions related to fear and anxiety and alter memory. Which group of brain structures is being disrupted when MDMA alters emotions and memory? \_\_\_\_\_. (**Limbic system**)

4. Marijuana and alcohol both impair fine motor coordination and balance. As a result driving ability is impaired because these drugs have depressed brain area responsible for this function. Which area of the brain has been impaired if an individual has a loss of balance and fine motor coordination? \_\_\_\_\_ (**Cerebellum**)

5. When individuals are under the influence of alcohol they are less inhibited because the areas of the brain responsible for decision-making, reason, planning, and risk evaluation are depressed. Which area of the brain is being slowed down as a result of alcohol causing these cognitive and behavioral changes? \_\_\_\_\_ (**Frontal lobe or Pre-frontal cortex**)
6. Individuals who are under the influence of cocaine experience elevated heart and respiratory rates that can become life threatening. Which area of the brain is causing these physiological changes? \_\_\_\_\_ (**Medulla; Hindbrain**) In which drug category should cocaine be classified? \_\_\_\_\_ (**Stimulant**)
7. Individuals who abuse steroids, methamphetamine or prescription stimulants may experience high levels of anxiety and hostility by affecting many different parts of the brain, including the \_\_\_\_\_, which is a subcortical structure that controls strong emotions. (**Amygdala**)
8. Although the various drugs classified as CNS depressants work differently, they all have a calming or drowsiness-inducing effect because they increase the transmission of the major inhibitory neurotransmitter \_\_\_\_\_, (**GABA**) which is why some are used for sleep disturbances and anxiety. CNS depressants increase the transmission of a particular neurotransmitter making them \_\_\_\_\_ (**agonist** or antagonist) drugs.
9. Drugs (such as opioids) with addictive properties work on the reward pathway in the brain by increasing transmission of the pleasure producing neurotransmitter \_\_\_\_\_ (**Dopamine**) and the body's natural pain relieving neurotransmitter \_\_\_\_\_ (**Endorphins**).
10. Individuals under the influence of cocaine may experience surges of adrenaline due to the overstimulation of the part of the brain responsible for regulating the fight or flight response. The result can be hyper-alertness, paranoia, and aggression. What area of the brain controls the fight or flight reaction? \_\_\_\_\_ (**Hypothalamus**)
11. Individuals sometimes find that the day after drinking alcohol that they cannot recall some or all of the events that occurred when they were drinking. Which brain structure that is responsible for encoding new memories was likely not functioning due to the depressant alcohol? \_\_\_\_\_ (**Hippocampus**)
12. Which area of the hindbrain is impaired when heroin or alcohol depresses the area of the brain responsible for heart rate and breathing? \_\_\_\_\_ (**Medulla**)

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### Part II

**Directions:** Listed below are several brain parts. For each brain part listed, indicate how an individual's behavior might be changed if a psychotropic drug crossed the blood brain barrier and impacted that brain part. You may use the same drug more than one time.

Use at least one drug from each of the following categories:

- Depressant
- Stimulant
- Opioid

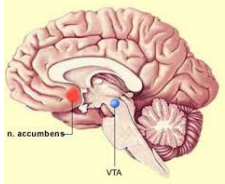
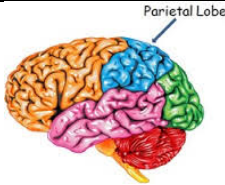
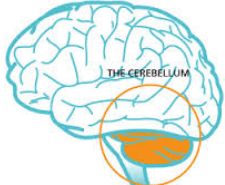

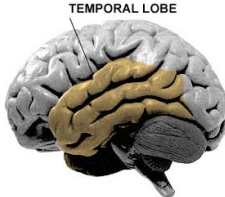
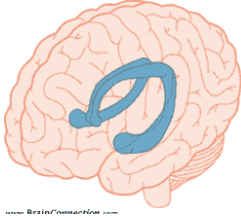
### Example: Reticular Formation


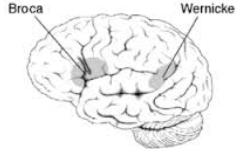
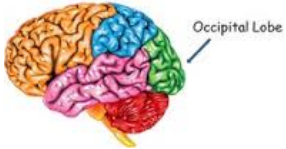
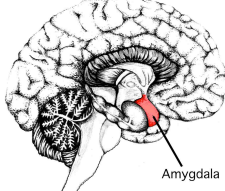
**Specific Drug:** Heroin

**Drug Category:** Depressant (Opioid)

**Responsibility of Brain area:** Plays a role in alertness and arousal

**Impact on behavior:** When heroin crosses the blood-brain barrier to impact the reticular formation the result can be an individual losing consciousness because the reticular formation is responsible for arousal.

Brain Area	Specific Drug	Drug Category	Responsibility of Brain Area	Impact on Behavior	Location in Brain
Nucleus Accumbens					
Parietal Lobe					
Cerebellum					
Prefrontal Cortex					
Temporal Lobe					
Hippocampus					

Brain Area	Specific Drug	Drug Category	Responsibility of Brain Area	Impact on Behavior	Location in Brain
Medulla					
Broca's Area					
Occipital Lobe					
Amygdala					
Hypothalamus					