The Nicotine Cycle

Trace how brain changes and learned cues can shape drug use.

SS24.P.5e "Explain how psychoactive drugs affect people, including the mechanisms of addiction, tolerance, and withdrawal."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline how nicotine changes brain signaling, circle a cue that can trigger an urge, and write T beside the explanation of tolerance and W beside the explanation of withdrawal.

Why a Break Can Become a Trigger

1. An adult at a bus stop sees a vape advertisement and remembers the quick effect of nicotine. Nicotine is a psychoactive drug, a substance that changes activity in the brain and can change feelings or behavior. After nicotine enters the bloodstream, it reaches the brain and attaches to receptors normally activated by the messenger acetylcholine. This action increases activity in circuits that release dopamine, a messenger involved in reward and learning. The person may feel more alert, and their heart rate may rise. These effects do not mean every person who tries nicotine will become addicted.

2. Suppose this adult starts vaping on every break at work. The brain can link the break, the device, and the nicotine effect. Later, simply stepping outside may trigger a strong urge to vape. Addiction means continuing to seek and use a drug despite harmful consequences, not just enjoying its first effects. Nicotine's action on reward circuits can strengthen the learned habit, making the urge harder to ignore even when the adult wants to stop. With repeated exposure, the brain adapts, and the same amount of nicotine may have less effect. This reduced response is called tolerance.

3. If the adult stops using nicotine after regular use, the adapted brain no longer receives the drug it has come to expect. Irritability, trouble concentrating, and cravings may follow. These withdrawal symptoms are signs of physical dependence; they do not, by themselves, prove that someone has an addiction. Taking nicotine again may briefly relieve the discomfort, which can help keep the cycle going. Yet a person can experience withdrawal and still make changes to stop using the drug. Understanding the whole chain, drug action, learned cues, tolerance, and withdrawal, explains why stopping can be difficult without treating addiction as a failure of willpower.

2 ANSWER WITH EVIDENCE

Use the passage

1. How does nicotine change brain signaling, and what effect might the adult notice soon afterward?

2. Why might stepping outside at work trigger an urge to vape even when the adult wants to stop?

3. Why might the adult get less effect from the same amount of nicotine after repeated use?

4. How could withdrawal make continued nicotine use more likely, and why does withdrawal alone not prove addiction?

3 YOUR TURN

Your own words

Imagine a made-up psychoactive drug that briefly increases dopamine signaling. Regular use reduces the brain's response, and stopping can cause restlessness. Write four sentences about a fictional adult that connect a specific learned cue, continued use despite a cost, tolerance, and withdrawal.

ANSWER KEY

The Nicotine Cycle

PART 1 · READ AND MARK

Underline how nicotine changes brain signaling, circle a cue that can trigger an urge, and write T beside the explanation of tolerance and W beside the explanation of withdrawal. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How does nicotine change brain signaling, and what effect might the adult notice soon afterward?	**Nicotine attaches to receptors normally activated by acetylcholine and increases activity in dopamine-releasing circuits. The adult may feel more alert.**
2	Why might stepping outside at work trigger an urge to vape even when the adult wants to stop?	**Repeated vaping on breaks links stepping outside with nicotine's effects. That learned cue can trigger an urge, while nicotine's action on reward circuits strengthens the habit.**
3	Why might the adult get less effect from the same amount of nicotine after repeated use?	**The brain adapts to repeated nicotine exposure, so the same amount has less effect. This is tolerance.**
4	How could withdrawal make continued nicotine use more likely, and why does withdrawal alone not prove addiction?	**Taking nicotine again may briefly relieve withdrawal discomfort, encouraging continued use. Withdrawal shows physical dependence, while addiction involves continued use despite harmful consequences.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

A fictional adult takes the drug on the walk home and feels a brief reward as dopamine signaling rises. After often taking it near a train station, the station's sounds spark a craving, and the adult continues using it despite spending money needed for rent. As the brain adapts, the usual dose has less effect, showing tolerance. When the adult stops, restlessness appears, and taking the drug again might briefly ease that withdrawal symptom.

Accept other immediate effects named in the passage for question 1. For the open task, look for a plausible invented cue and a clear causal link for each mechanism, not a claim that every user becomes addicted.