Small-Group Guided Inquiry:

**How Drugs Work**

**Before you begin, consider what you already know:**

1. In your own words, define what a “**drug**” is.
2. **Why do you think** people use drugs?
3. How does the **brain** work as the human body’s “**control center**?”

**Part 1**

**Read the background article, “How Drugs Work,” and answer these questions about the chemistry of drug molecules:**

1. How long do **historians** and **archeologists** believe humans have been using **drug-like substances**?
2. Summarize how humans in **ancient societies** used drugs.
3. What is the **most widely used drug in the world** today? What is its **chemical name**?
4. The end of the article’s first section (“Where do drugs come from?”) mentions the **importance of “synthetic molecules.”**  What is a synthetic molecule? In your own words, explain how this “**major new development**” has **changed the world**.
5. **What is the** **difference** between a “**medicine**” and a “**drug**”?
6. How could **caffeine** be considered a drug?
7. **Think of an example** of a **common legal substance** that could be considered a drug. Explain how this definition would apply.
8. The first paragraph of the third section (“Who uses illegal drugs?”) outlines some **statistics about drug use in the United States** and North America.

**Summarize** this paragraph in **1 sentence**.

Which piece of information in this paragraph makes the **strongest impression** on you? **Why?**

List **2 specific questions** you have after reading these statistics.

1. **Why is it important** to know that **China** and **India** do not keep **reliable statistics on illegal drug use**? Why do you think **many African nations** do not have **clear data** about illegal drug use within their country?
2. **Why do you think** “**bath salts**” are so appealing to **young people**? What makes them **dangerous**?
3. **Generally**, how do drug molecules **affect the human body**?
4. What **role** does the **three-dimensional shape and structure of a drug molecule** play in determining its effects? (Use the terms **receptors** and **neurotransmitters**.)
5. **In your own words**, why are drugs dangerous?

**Watch the first video segment, “Brain Chemistry,” to see how drug molecules interact with our body to change the way our brain is working.**

1. The video begins with some important visuals from **inside the human brain**. Answer the questions below about how **nerves** and **neurons** work in our **brain**:

What do **nerves** do?

What are **neurotransmitters** and what do they do?

Draw a **diagram** of a **nerve synapse**. Label the following: presynaptic neuron, postsynaptic neuron, synaptic cleft, vesicles, neurotransmitters, neurotransmitter transporters, and neurotransmitter receptors.

1. The video continues to explain how the nerves actually **communicate throughout the body**:

In your own words, **explain** how nerves use **neurotransmitters** to **send messages** from neuron to neuron, and around the body. (If you need more help with **how nerves send chemical messages**, try this [explanation and video](http://www.bbc.co.uk/schools/gcsebitesize/science/add_ocr_pre_2011/brain_mind/informationrev2.shtml) from BBC.)

Name 2 **neurotransmitter molecules** scientists have found in the human brain. Tell what **chemical message** each neurotransmitter is thought to send.

1. The video shows an example of a drug molecule – **methamphetamine hydrochloride** – and explains how it **interrupts the brain’s communication process**:

What is the role of **dopamine** in the human body?

Summarize how **meth changes the** **dopamine communication pathway** in the brain?

What makes **meth** so **addictive**?

**Go to the** [**first weblink**](http://learn.genetics.utah.edu/content/addiction/drugs/) **to see how specific drugs impact the human body and our brains. Follow the instructions below and answer the questions to record the most important information.**

1. Start by listening to Dr. Glen Hanson’s introduction to the **basic chemistry of drug abuse**. Click [listen] and answer the questions below:

What do **all drugs of abuse** have **in common**?

Dr. Hanson explains the role of **dopamine** in the human brain. In your own words, **explain** why a person might want to **use drugs repeatedly**, in terms of their **chemistry**.

**Use the same website to gather more information about specific drugs of abuse, their effects, and how they work in the human body.**

**You *might* want to divide the next few steps among your group.**

**Warning!** Make sure **everyone** has access to **all** of the information from this website.

It will be very important as we continue focusing on **teen drug use** and **brain chemistry**.

1. Click on “**Explore! Drugs of Abuse**.” This area of the website introduces you to 12 different categories of drugs. Fill in the **“Drugs of Abuse” chart** to organize important information about each drug. (**Make sure to include *how* the drug is taken *into* the body**.)
2. In the space below, **name 1 other substance that could be called a “drug of abuse”** that is not mentioned on the website. Explain **why you think it could be a “drug of abuse”** and **why you think the website doesn’t include it**.
3. From the original website, click on “**Explore! Mouse Party**.” This area of the website simulates an animal testing lab that shows **some of the major drugs of abuse *in action***. Fill in the **“Mouse Party” chart** to organize how each drug impacts the **chemistry of the human brain**.
4. In your own words, **summarize** how any drug molecule is **taken into the human body** and **influences the brain**, and how that leads to its **effects**. **Use several well-written sentences and a diagram to support your work.**
5. On the original website, spend some time looking at the **other resources**. There are links to games, demonstrations, and explanations of **how drugs get into the human body**, their **long-term impact on the brain**, and the process of **addiction**. Use the space below to make notes of important information: