

# Teacher's Guide for ODYSSEY

October 2011: Slimes and Other Messy Science

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## **Teacher's Note:**

This guide contains project ideas, short answer, extended response, fill-in, and true/false with correction. The variation is designed to have the students think critically, as well as to test their comprehension. An answer key to the short answer sections can be found at the end of the guide.

## **Extended Response: Comprehension & Critical Thinking**

The questions below can be used as written, simply answered in complete sentences or easily transformed into longer essay (ELA) style questions, or even research topics. In any case, have the students support their answers with details from the text or use critical thinking skills to create a thorough and interesting answer. The questions, essays and projects have been aligned with the **Common Core Standards**. Consider the level of your students when deciding how to use the questions.

### **"They're sneaky..They're Slimy..They're Biofilms" p. 6-9**

1. What is biofilm?
2. Explain the two different lifestyles that almost all types of bacteria can alternate between.
3. Why is a biofilm colony of sessile bacteria much more resistant to antibiotics?
4. Explain the science behind the sliminess of biofilm.
5. How is purple die used in a microbiology lab?
6. Why can you sometimes get an upset stomach when taking antibiotics?
7. Why is happening biologically when you get an earache? How are scientists working to treat this condition more effectively?

### **"The Slippery World of Slimes" p. 12-15**

*This article consists of True or False scenarios. The student is given the correct answer at the bottom of the page. When using this section, encourage the students to provide more than a basic true or false answer before reading the truth. Have them use their knowledge base of biology to provide reasons for why they came up with their answers.*

### **"The Messy Room Mistake" p. 16-19**

1. What is the scientific name for disorder?
2. What is the meaning of the word 'thermodynamic'?
3. Explain the First Law of Thermodynamics.
4. Define the Second Law of Thermodynamics.
5. How do the first and second laws apply to the glass of spilt milk?

**Essay:** Although the Second Law of Thermodynamics states that the amount of disorder in the universe is always increasing, we know that it is possible to maintain order. Write a short essay explaining how it is that we commonly see pattern and structure in the universe.

**"Wanted for Breaking the Law" p. 20-23**

Mark the following statements TRUE or FALSE. Provide the correct answer if false.

- \_\_\_\_\_ 1. A fluid is anything that flows, whether it is a liquid, gas, plasma - or something in between.
- \_\_\_\_\_ 2. Newton's Law of Viscosity has no exceptions.
- \_\_\_\_\_ 3. Shear-thickening is caused by particles suspended in the solution.
- \_\_\_\_\_ 4. Shear-thinning is when a fluid flows more easily when less force is applied.
- \_\_\_\_\_ 5. Shear-thickening fluids are used in lightweight personal body armor, in the all-wheel-drive systems of some vehicle, and by the military.
- \_\_\_\_\_ 6. Magnetorheological fluids are normally liquids, but they act more like solids when a magnetic force is applied.

**"Better than Books" p. 24-27**

1. What is "rock snot"?
2. What are the characteristics of didymosphenia geminata?
3. What kind of problems do didymo cause in a lake?
4. Why has didymo suddenly become a nuisance beyond its home range?
5. Explain how tiny, single-celled algae can have a gigantic impact on the environment.
6. What part of the food chain do diatoms belong to and how do they function?
7. What are didymo blooms and how do they cause problems?
8. What is the one positive result of the didymo blooms?

**"The Adventures of Jack Jetblast" p. 29-31**

**Essay:** This article tells the story of Jack Jetblast and a huge slimy monster. The purpose of the story is to provide factual information about 'mucus' in a fictional format. Use information from the article, as well as from another source (book, computer), to write a short essay describing the role of mucus in the human body.

**"Reach the Guts" p. 33-34**

Read the article and fill in the blanks below with the correct answer.

1. Cattle, sheep, deer and goats are called \_\_\_\_\_ because they chew their cud.
2. \_\_\_\_\_ is pre-chewed food that has been returned to the mouth for more chewing.

3. A cow's intestine can hold up to \_\_\_\_\_ liters of slick grass and other plant material, all smothered in saliva.
4. A process called \_\_\_\_\_ is when complex molecules like cellulose are broken into simple molecules such as glucose.
5. Each cow produces up to 800 liters of \_\_\_\_\_ per day.
6. One way to release the gas before it kills an animal is to implant a \_\_\_\_\_, which is a tube that is inserted into the intestine.
7. \_\_\_\_\_ are knoblike structures that help in absorbing digested food.
8. The intestinal goo in the rumen is created by the activity of several thousand kinds of \_\_\_\_\_.

**"The Plus Side of Pus" p. 35-37**

1. What happens to the lining of the sebaceous gland as the body sexually matures?
2. How does a pore get blocked?
3. Why is it bad to break open the plug?
4. What is the difference between a boil and a blister?
5. When should you seek medical help if you have an infection?

**"Oooh, Goo! Slimy Ships May Save the Ocean" p. 39-41**

1. What problems do barnacles cause for a ship?
2. How does 'fouling' cause the Navy one billion dollars a year?
3. Although arsenic and lime helped to reduce fouling, it had to stop being used. Why?
4. What are some alternative remedies for fouling that have been created?
5. Explain the three major reasons that ship hulls get fouled.
6. What characteristic of the pilot whale's skin did Ganguli try to replicate and why?
7. What type of model are Ganguli and his team trying to perfect? Explain the prototypes that have been created and the plans for the future.
8. What does Ganguli hope to accomplish?

**"One-Foot Wonder" p. 42-43**

1. How does a snail's one foot and 'slime' help it to move?
2. What kind of work would someone with a mechanical engineering degree do?
3. How does Randy Ewoldt use 'slime' for his robots' movements in a way that mimics the snail?

**ANSWER KEY:**

**"Wanted for Breaking the Law"**

1. True
2. False, many exceptions
3. True
4. False, when more force is applied
5. True
6. True

**"Reach the Guts"**

1. ruminants
2. cud
3. 95
4. fermentation
5. gas
6. fistula
7. papillae
8. microbes