**Oil Spill Reclamation: Cleaning Up Our Mess**

Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period:\_\_\_\_\_

Oil is the most common ***pollutant*** in the oceans. More than 3 million metric tons of oil contaminate the sea every year. The majority of oil pollution in the oceans comes from land. Runoff and waste from cities, industry, and rivers carries oil into the ocean. Ships cause about a third of the oil pollution in the oceans when they wash out their tanks or dump their bilge water. Oil spills account for less than 15% of the total oil in the oceans but are probably the most obvious form of oil pollution. The damage caused by oil spills is certainly seen right away. We’ve all seen images of the water’s surface and shoreline covered with oil and dying animals and plants. Oil spills will continue to be problem and source of pollution as long as ships and barges move most of our petroleum products around the world. When oil leaks or spills into water it floats on the surface of both freshwater and saltwater. Oil floats because it is less dense than water. Density tells how much mass is in a specific volume (mass divided by the volume) of a material, and is calculated using the equation: *Density* *mass/ volume*

It’s much easier to clean-up an oil spill because of oil’s lower density. Because oil floats at the surface, we’ve managed to come up with several types of technologies that can help clean up oil spills. These classes of technology are listed as follows:

**Mechanical**

Americans primarily use mechanical methods to clean-up oil spills. Listed here are the three categories of mechanical tools used to contain and recovery spilled oil.

1. *Booms*- It’s easier to clean-up oil if it’s all in one spot, so equipment called containment
 booms act like a fence to keep the oil from spreading or floating away. Booms float on the
 surface and have three parts: a ‘freeboard’ or part that rises above the water surface and
 contains the oil and prevents it from splashing over the top, a ‘skirt’ that rides below the
 surface and prevents the oil from being pushed under the booms and escaping, and some kind
 of cable or chain that connects, strengthens, and stabilizes the boom.

2. *Skimmers*- Once you’ve contained the oil, you need to remove it from the water surface.
 Skimmers are machines that suck the oil up like a vacuum cleaner, blot the oil from the
 surface with oil-attracting materials, or physically separate the oil from the water so that it
 spills over a dam into a tank. Much of the spilled oil can be recovered with skimmers.

3. *Sorbents-* These are materials that soak up liquids by either ***absorption*** or ***adsorption***. Oil will
 coat some materials by forming a liquid layer on their surface (adsorption). This property
 makes removing the oil from the water much easier, but might make the oil heavier.

**Chemical**

Chemicals, such as detergents, break apart floating oil into small particles or drops so that the oil is no longer in a layer on the water’s surface. These chemicals break up a layer of oil into small droplets. These small droplets of oil then disperse or mix with the water. The problem with this method is that ***dispersants*** often harm marine life and the dispersed oil remains in the body of water where it is toxic to marine life.

**Physical***Burning-* Burning of oil can actually remove up to 98% of an oil spill. The spill must be a
 minimum of three millimeters thick and it must be relatively fresh for this method to work.

**Biological**

*Bioremediation-* There are bacteria and fungi that naturally break down oil. This process is
 usually very slow- it would take years for oil to be removed by microorganisms. Adding either
 fertilizer or microorganisms to the water where the spill is located can speed up breakdown.

Over time, a number of things can happen to oil that has been spilled. The oil may evaporate, reach the shore and cover beaches, remain suspended in the water for long periods, or sink into ocean sediments. Cleaning up oil often becomes more difficult the longer the oil is in the water.

**MATERIALS:**

Container for the oil and water mixture

Beakers for Measuring

Oil

Plastic cup

Soda straws

Water

Styrofoam pieces

Spoon

Plastic pipette

Paper towels

Powdered and/or liquid detergent

You will be using a small container, water, and vegetable oil. The water represents an ocean and the vegetable oil is the oil that is spilled into the water. Weather conditions influence what happens to oil once it’s spilled in the sea. You will provide the ‘wind’ that moves spilled oil around your ocean.

**PROCEDURE:**

1. Fill your “ocean” container about half full with water.

2. Hold one end of a straw just above the surface of the water. Gently blow air through the straw
 so that air comes out onto the surface of the water. Describe what happens to the water
 surface, and draw a picture of the currents here:

3. With your small beaker, measure out 20ml of oil. SLOWLY pour the oil into your container so
 that the surface of the water is covered. The layer formed should be less a ¼ inch thick.

4. What happens to the oil? Does it sink or float?

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5. Again pick up your straw and blow lightly on the surface of the water. What happens? How
 is it different from when there was just water in the ocean? Describe and diagram here:

6. You are faced with the job of cleaning up the spilled oil using any of the clean-up tools
 provided. As you are doing this, think about which clean-up method works the quickest and
 cleaned up the most oil. Using **one** of the clean-up tools at a time, try to remove as much of
 the oil from the water surface as possible. Try to do this without having the oil mix into the
 water. Use a cup to store the oil you collect. Write down your observations under the data
 section of this sheet about how each method worked. Remember that you want to recover as
 much oil possible in the fastest time.

7. After trying one method, choose another of the clean-up tools to see if it works better than the
 first. Continue trying other clean-up tools until you have used all of them. On your data table,
 rank each method to show which worked the best.

8. If you have time, combine two clean-up methods to see if you can clean-up more oil in a
 shorter amount of time. Record your results on the worksheet.

9. Answer the comprehension questions in the space provided.

**DATA TABLE:**



**Paper Towel**

**Spoon**

**Styrofoam Pieces**

**Liquid Detergent**

**Other?**

**Plastic Pipette**

**Rank order from least effective🡪most effective:**

**COMPREHENSION QUESTIONS: Answer all in complete sentences for full credit.**

1. Define density in your own words.

2. What are some potential effects oil could have on the environment? Describe at least three.

3. Which clean-up method has the least impact on the environment? Explain why.

4. How would strong winds effect the movement of the oil as well as the cleanup of spilled oil?

5. Was cleaning up your oil spill more difficult or easier than you thought it would be? Why?

**Big Ideas:**6. How are oil spills dangerous at all levels of an ecosystem? Think about where the oil spills hit and what effects they might have.

7. What might happen if an oil spill occurs in the middle of the ocean? Who would clean it up and how?

8. How might oil pollution affect the other spheres of the Earth (lithosphere, atmosphere, biosphere)?