That's Slick – Oil Absorbing Polymer

Name: _____

pH Lab Materials:

- Mystery Oil, 15-ml
- Enviro-Bond Polymer, 4.5-g
- 1M HCl, 1-ml
- 1M NaOH, 1-ml
- 50-ml beaker, 3
- Lab Quest Device with pH probe
- Ring stand with clamp
- 10-ml graduated cylinder
- 25-ml graduated cylinder
- Eye protective goggles
- Gloves
- Absorbing pad
- Weigh dish, 3
- Balance
- Pipet, 4

1. Set up ring stand with clip positioned so you can dangle the pH probe on it.
2. Label your pipets: Oil, Water, NaOH, HCl.
3. Lay open your absorbing pad (make sure all of your measuring is done on the pad).
4. Add 25-ml of water into each 50-ml beaker. Use 25-ml GRADUATED CYLINDER to measure.
5. Label you beakers: HCl, Water, NaOH.
6. Use the probe to test the pH of the beaker labeled "water". Record the pH in the data table.
7. Add 5-ml of Oil to the beaker labeled "water" (measure oil with the 10-ml graduated cylinder).
8. Add 1.5-g of polymer to the beaker labeled "water" and set aside for later.
9. Acquire 1-ml of 1M HCl using the pipet labeled HCl (you will see a notch on the pipet that reads 1-ml, measure the HCl to that notch).
10. Add 1-ml of 1M HCl to beaker labeled "HCl."
11. Record the pH of the beaker labeled "HCl" in the data table. RINSE THE PROBE OFF AFTER USE!
12. Add 5-ml of Oil to the beaker labeled "HCl" (measure oil with the 10-ml graduated cylinder).
13. Add 1.5-g of polymer to the beaker labeled "HCl" and set aside for later.
14. Acquire 1-ml of 1M NaOH using the pipet labeled NaOH (you will see a notch on the pipet that reads 1-ml).
15. Add 1-ml of 1M NaOH to beaker labeled "NaOH."
16. Record the pH of the beaker labeled "NaOH" in the data table. RINSE THE PROBE OFF AFTER USE!
17. Add 5-ml of Oil to the beaker labeled "NaOH" (measure oil with the 10-ml graduated cylinder).
18. Add 1.5-g of polymer to the beaker labeled "NaOH".
19. Wait 5 minutes. While you are waiting write down detailed observations about what you see in each beaker (ex: color, texture, smell, noticeable differences in appearance if any, etc).
20. With gloves on, carefully remove the polymer from the beaker labeled "Water" and dab dry on the absorbing pad.
21. Place a weigh dish on the scale, zero it out, and mass the polymer. Record the mass on the chart.
22. Repeat sets 20-21 for the other two beakers.
23. Finish your data table and state your findings in the space provided.

Temperature Lab Materials:

- Mystery Oil, 10-ml
- Enviro-Bond Polymer, 3.0-g
- 600-ml beaker
- 50-ml beaker, 2
- 10-ml graduated cylinder
- 25-ml graduated cylinder
- Lab Quest Device with temperature probe
- Stop watch (cell phone)
- Hot plate
- Ice
- Eye protective goggles
- Gloves
- Absorbing pad
- Pipet, 2

1. Thoroughly clean two 50-ml beakers and add 25-ml of water to each using a graduated cylinder.
2. Label one beaker “hot” and the other “cold.”
3. Obtain a 600-ml beaker and fill it with ice. This will be your ice bath.
4. Take the 50-ml beaker labeled “cold” and place it into the ice bath. Be sure to surround the 50-ml beaker with ice but do not allow any ice into the 50-ml beaker. Let it cool and move on to step 5.
5. Obtain a lab quest device and a temperature probe. Make sure it works properly.
6. Obtain 1.5-g of oil absorbing polymer and 5-ml of oil (using 10-ml graduated cylinder).
7. Obtain a hot plate, place the 50-ml beaker labeled “hot” onto the hotplate and heat it until the water reaches 80 C. Carefully use the temperature probe to measure the temperature.
8. Carefully remove the “hot” beaker from the hotplate and add 5-ml of oil to the beaker.
9. Add 1.5-g of oil absorbing polymer. BEGIN TIMER IMMEDIATELY and gently prod the forming patty until you determine that it has fully formed and is solid (you can tell it’s solid if you can gently spin the patty without it coming apart – use the end of the oil pipet to do this).
10. Record the time it took for the patty to harden in the data table.
11. Obtain 1.5-g of oil absorbing polymer and 5-ml of oil (using 10-ml graduated cylinder).
12. Record the temperature of the water in the “cold” 50-ml beaker. Make sure that the temperature is 5.0 C or below before recording. If it’s not that cold, then you must pack the ice bath with more ice and wait.
13. Record the temperature of the “cold” beaker in the data table.
14. Remove the “cold” beaker from the ice bath, add 5-ml of oil.
15. Add 1.5-g of oil absorbing polymer. BEGIN TIMER IMMEDIATELY and gently prod the forming patty until you determine that it has fully formed and is solid (you can tell it’s solid if you can gently spin the patty without it coming apart).
16. Record the time it took for the patty to harden in the data table.
17. Finish your data table questions.

Salinity Lab Materials:

- Mystery Oil, 10-ml
- Enviro-Bond Polymer, 3.0-g
- 50-ml beaker, 2
- 10-ml graduated cylinder
- 25-ml graduated cylinder
- NaCl(s), 0.90-g
- Gloves
- Eye protective goggles
- Absorbing pad
- Balance
- Weigh dish, 2
- Pipet, 2

1. Thoroughly clean two 50-ml beakers and add 25-ml of water to each using a graduated cylinder.
2. Label one beaker “Seawater” and the other “Freshwater.”
3. Add 0.90-g of NaCl(s) to the “Seawater” beaker. This simulates how much salt would actually be in 25-ml of seawater.
4. Thoroughly mix all of the NaCl(s) into the water until you no longer see any solid NaCl on the bottom. Use your water pipet to do stir.
5. Add 5-ml of oil to the beaker labeled “Seawater.”
6. Add 5-ml of oil to the beaker labeled “Freshwater.”
7. Record any noticeable difference between the interaction of the oil and water in your data table.
8. Add 1.5-g of polymer to the beaker labeled “Seawater.”
9. Add 1.5-g of polymer to the beaker labeled “Freshwater.”
10. Wait 5 minutes to allow the polymer to absorb the oil.
11. With gloves on, carefully remove the patty from the beaker labeled “Seawater” and dab it dry on the absorbing pad.
12. Place a weigh dish on the scale, zero it out, and mass the polymer. Record the mass on the chart.
13. Repeat steps 11-12 with the beaker labeled “Freshwater.”
14. Finish your data table questions.

Feather Test Materials:

- Mystery Oil, 2-ml
- Enviro-Bond Polymer, 5.0-g
- Dawn dish soap, 1-ml
- Feather, 2
- Watch glass, 2
- 600-ml beaker
- Pipet, 2

1. Obtain two watch glasses, label one “Soap” and the other “Polymer.”
2. Fill a 600-ml beaker half way with warm water. This is called a warm water bath.
3. Obtain a clean pipet and label it “soap.”
4. Obtain two feathers and cut them so they fit onto a watch glass.
5. Put a feather on each watch glass.
6. Drip 1-ml of oil on each feather using your oil pipet. Do this slowly and make sure each feather is saturated.
7. Pack the feather on the watch glass labeled “Polymer” with up to 5.0-g of polymer.
8. Drip 1-ml of Dawn dish soap on the watch glass labeled “Soap.” Gently rub soap in with your fingers (wear gloves) and rinse the feather by dipping it into the warm water bath.
9. Complete your data table and conclusion questions.

Laboratory Data:

pH Lab Data Table:

	Water	Hydrochloric Acid (HCl)	Sodium Hydroxide (NaOH)
Initial pH			
Observations: Step 19			
Mass of polymer paddy after it has been thoroughly dabbed			
Subtract 1.5-g from each mass (the initial mass of the polymer)			
5-ml of oil has a mass of 4.00-g. What is the percentage of oil absorbed by the polymer?			

Under which of the three pH conditions does this polymer seem to be most effective?

_____

Specifically state any experimental error that may have occurred and affected your data while you performed this pH experiment.

_____
_____
_____

Temperature Lab Data Table:

	"Hot" Beaker	"Cold" Beaker
Temperature before adding polymer		
Time required for polymer to form a patty		

Which of the two temperatures seemed to be most effective for the polymer to work?

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Why do you think the temperature above is the most effective? Explain your reasoning by discussing the effects of intermolecular forces on the molecules.

_____
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Specifically state any experimental error that may have occurred while you performed this temperature experiment, which could have affected your data.

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_____

Salinity Test Data Table:

	Seawater	**Freshwater**
Record your observations between interaction of oil and water for both water samples.		
Mass of the polymer patty		
Subtract the mass of the polymer from the total mass of the polymer patty to find the total mass of oil absorbed.		
Divide the mass of the oil absorbed by 4.00-g (mass of 5-ml of oil)		
Percentage of oil absorbed		

Is there a major difference between the absorption of oil in seawater vs freshwater? Be specific in your reasoning by referencing your data.

_____
_____
_____

Why do you think this is so? Use what you've learned about intermolecular forces in your reasoning.

_____
_____
_____

Specifically state any experimental error that may have occurred while you performed this salinity experiment, which could have affected your data.

_____
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_____

Feather Test Data Table:

	Soap	Polymer
Color of feather before adding oil		
For each substance, state at least two challenges when attempting to remove the oil from the feather		
Color of feather after attempting to remove the oil		

Which substance effectively removed the oil from the bird feather?

_____

Why do you think one seemed to work better than the other?

_____
_____

Do you think the polymer should be used to remove oil from birds during oil disasters? State your reasoning and be specific.

_____
_____
_____
_____

General Questions:

You performed four experiments. Excluding the feather experiment, under which combination of conditions (pH, temperature, and salinity) do you think the polymer would work best. *Use your data* to specifically support your reasoning.

_____
_____
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_____

Based on your experiments, do you think using this polymer during oil spill disasters is reasonable? ALSO, if so, how should it be used if there is another disaster?

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_____
_____
_____
_____

What other experiment do you think could be done on this polymer to test its effectiveness in real-life situations? Why?

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_____
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Design an advertisement for this oil absorbing polymer below: