Name:_____Date:_____Class:_____

Student Worksheet

Part 1: Properties of Fluids: Stationary Phase

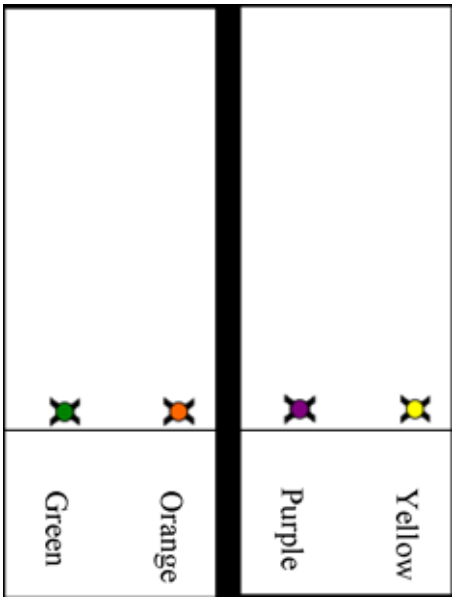
Safety
Wear protective gloves and goggles. Avoid splashing chemicals. Do not inhale alcohol fumes.

Quick Tip
Always wear gloves so that oils from your hand do not contaminate the paper.

Remember: While doing your lab activity today, you need to come up with at least three questions related to this activity that you would like to research further during the next class.

Materials per student
- nitrile gloves
- goggles

Materials for each group of 2 students
- 2 strips of white chromatography paper, cut into 25 cm strips
- sheet protector
- 4 different colored markers (e.g., green, orange, purple, yellow)
- ruler
- pencil
- 75 ml rubbing alcohol
- graduated cylinder or plastic 150 ml measuring cup
- paper towels



Procedure

1. Use a pencil to draw a line 2.5 cm from the bottom of each strip. Mark two "X"s on each strip.
2. Use the green marker to quickly and lightly put a dot on one "X", then use orange on the next "X", purple on the next one, and yellow on the final one. In other words, each "X" should

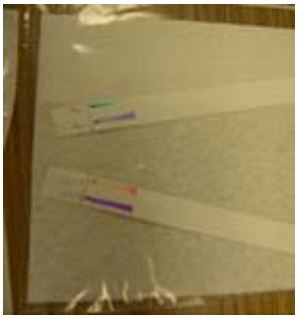
Copyright©2007 Board of Regents, University of California, Santa Barbara
Permission granted for printing and copying for local classroom use without modification
Developed by Angela Berenstein and Urenia Hernandez
Development and distribution partially funded by the

NNIN Document: NNIN-1217

have a different color (green, orange, purple, and yellow). *Note: If too much ink is applied to the paper, it will make color identification very difficult later in the lab.*

3. Use a pencil to label each dot below the line as shown in the drawing above and the photo to the right.
4. Fold the 2 strips of chromatography paper in half lengthways and place it in the beaker with the starting line at the bottom. *Important: make sure that the two strips do not touch each other.*

5. *Most important:* Carefully add 75 ml of rubbing alcohol to your beaker *making sure no alcohol gets on the side walls of the beaker or on your paper*—it will interfere with the experiment.
6. Do not touch or move the paper or the beaker after you have added the alcohol—it will interfere with the experiment. Without touching the experiment and using Table #6 in the *Record Your Observations* section on the next page, record any changes you observe with your sense of sight 5 minutes and then 15 minutes after adding the alcohol to the beaker.



7. After 20 minutes, remove the strips from the beaker and place on a dry paper towel. With a #2 pencil, mark the final place where each marker ink has traveled as well as the place where the solvent (liquid; i.e., alcohol) has traveled.
8. Identify the color components present in each ink sample. Carefully measure the distance traveled by each color by measuring from the center of the ink spot to the line marking the final place where each ink has traveled. Also measure the distance traveled by the solvent (liquid; i.e., alcohol) by measuring from the center of the ink spot to the line marking the final place where the solvent has traveled. Use the diagram in the *Record Your Observations* section on the next page to sketch what happened being sure to label the measurements as well. Then complete Table #8 in the *Record Your Observations* section.
9. Finally, determine the Rf value (retention factor) of each ink you spotted on the chromatography paper. (Hint: The retention factor is the ratio between the distance the component travels and the distance the solvent travels from a shared starting point.) Show your calculations and results using the table in the *Analyze the Results* section.

Copyright©2007 Board of Regents, University of California, Santa Barbara
Permission granted for printing and copying for local classroom use without modification
Developed by Urenia Hernandez; edited by Angela Berenstein
Development and distribution partially funded by the

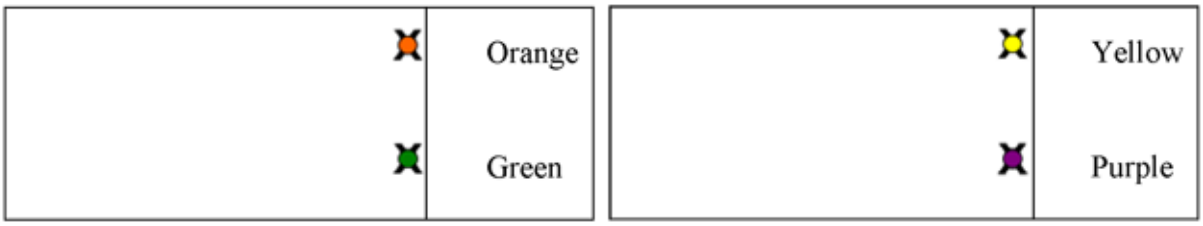
NNIN Document: NNIN-1217

Record Your Observations

Procedure #6 Table

Time	Changes you observe with your sense of sight
After 5 minutes	
After 15 minutes	
After 25 minutes *(optional for a 90 minute class)*	
After 45 minutes *(optional for a 90 minute class)*	

Procedure #8 Diagram



Procedure #8 Table

ink sample	components	ink measurement	solvent measurement
orange			
green			
yellow			
purple			

Copyright©2007 Board of Regents, University of California, Santa Barbara
Permission granted for printing and copying for local classroom use without modification
Developed by Urenia Hernandez; edited by Angela Berenstein
Development and distribution partially funded by the

NNIN Document: NNIN-1217

Analyze the Results

ink sample	Rf value calculation	Rf value
orange		
green		
yellow		
purple		

Cleanup

- Label the sheet protector with the names of everyone in your group. Put a paper towel into the sheet protector. Put the chromatography paper strips inside without dripping any liquid.
- Your teacher will collect the fluid waste from you at the end of the lab. The alcohol is reusable. Collect in waste bottle. Never pour alcohol or chemical waste down a sink.
- Gather materials into bin. Throw gloves in plastic recycle bin or trash if recycling bin is unavailable.

Copyright©2007 Board of Regents, University of California, Santa Barbara
Permission granted for printing and copying for local classroom use without modification
Developed by Urenia Hernandez; edited by Angela Berenstein
Development and distribution partially funded by the

NNIN Document: NNIN-1217

Name:_____ Date:_____ Class:_____

Student Worksheet

Part 2, Properties of Fluids: Stationary Phase

Going Further

Directions: Come up with at least three questions related to part 1 of this lab that you would like to research further.

1. Question: _____

   _____

   Prediction: _____

   _____

   _____

   _____

   Category: _____

2. Question: _____

   _____

   Prediction: _____

   _____

   _____

   _____

   Category: _____

3. Question: _____

   _____

   Prediction: _____

   _____

   _____

   _____

   Category: _____

Copyright©2007 Board of Regents, University of California, Santa Barbara
Permission granted for printing and copying for local classroom use without modification
Developed by Urenia Hernandez; edited by Angela Berenstein
Development and distribution partially funded by the

NNIN Document: NNIN-1217

Procedure: Choose one of your questions from the previous page and research the answer. Use these websites as a starting point: www.ask.com
www.yahoo.com
http://www.altavista.com
www.google.com

Look for information that will help answer your questions. Look for about 3–5 articles and choose the one that is easiest to read from beginning to end. If you haven't found anything useful after 15 minutes, type any of the words below in the search box:

- paper chromatography
- dye speeds
- paper chromatography calculations
- alcohol as a solvent in paper chromatography
- rate of flow
- chromatography as a physical change
- chromatography as a chemical change

Draw Conclusions

1. Which question did you end up researching?

   _____

2. Was your prediction correct? Explain.

   _____

   _____

3. What did you discover today about paper chromatography?

   _____

   _____

   _____

4. List your sources (where you got the information).

   _____ _____

   _____ _____

Extra Credit

From your research, can you devise a new experiment that will allow a deeper understanding of the properties of fluids? Describe it.

_____

_____

_____

Copyright©2007 Board of Regents, University of California, Santa Barbara
Permission granted for printing and copying for local classroom use without modification
Developed by Urenia Hernandez; edited by Angela Berenstein
Development and distribution partially funded by the

NNIN Document: NNIN-1217

Copyright©2007 Board of Regents, University of California, Santa Barbara
Permission granted for printing and copying for local classroom use without modification
Developed by Urenia Hernandez; edited by Angela Berenstein
Development and distribution partially funded by the