FLUIDS REVIEW

Module 1

Self-Test

1. Identify which of the following substances are fluids and which are non-fluids:

   _____ a. Substance A flows into a beaker. It spreads out and fills the space evenly.

   _____ b. Substance B can be poured into a beaker. As it is being poured, a pile of the substance forms in the beaker.

   _____ c. Substance C can be poured into a metal box. The flames of lit candles that line the bottom of the box go out as the fluid spreads over the bottom of the box.

2. Mrs. B's class was given an assignment to develop and conduct an experiment involving the characteristics of viscosity.

   Use the following words to identify the components of these investigations:

independent variable	*hypothesis*	*dependent variable*
controlled variable	*conclusion*	*variables*
observations	*fair test*	*testable question*

a)	Group 1 decided to investigate **how the viscosity of a fluid affected which material travelled a specific distance the quickest.**
b)	Types of fluids, distance travelled, and the amount of a fluid are all factors involved in the experiment.
c)	Group 1 collected several types of fluids, some of which were very viscous and others less viscous. The members of the group realized that this variable was the **manipulated or "cause" portion of the experiment.**

(continued)

d)	**Which fluid crossed the finish line first** was determined to be an important type of variable.
e)	Prior to the experiment, most members of Group 1 believed that **the less viscous the fluid, the faster the fluid would travel the specified distance.**
f)	The group knew they would have to present their results to the class and they wanted **to ensure they were actually measuring what they wanted to measure and would have results that were accurate and reliable.**
g)	Group members knew that some variables would have to be kept the same to be fairly compared to the results from each fluid. They decided to test 10 mL of each fluid and have each of them travel the same distance.
h)	Group 1 collected their data and displayed it in chart form. They then ranked the fluids in order from the quickest to the slowest.
i)	Following the experiment, Group 1 was able to comment on the relationship between the viscosity of the fluid and provide a ranking of the fluids based on their viscosity.

Comparing Flow Rates

3. Which of the following would have a faster flow rate?

_____ a. A straw with a narrow diameter or a straw with a larger diameter?

_____ b. A milkshake with a temperature of +5°C, or a milkshake with a temperature of –5°C?

_____ c. A milkshake with large chunks of ice cream or a milkshake that is smooth and has been thoroughly mixed?

Density

Calculate the densities and solve the following problems.

Remember: density = $\frac{\text{mass}}{\text{volume}}$. Show your work.

4. A gas has a mass of .05 g and fills a 100 mL container. What is its density?

5. Object B is a solid that has a mass of 20 g and a volume of 10 cm^3. What is its density?

6. Object C is a solid that has a volume of 15 cm^3 and a mass of 6 g. What is its density?

7. If objects B and C were placed in pure water, which has a density of 1.0 g/mL, what would happen? Why?

_____

_____

_____

_____

_____

8. Objects D and E have the same volume. Object D has a greater mass. Identify which has a greater density and explain your reasoning.

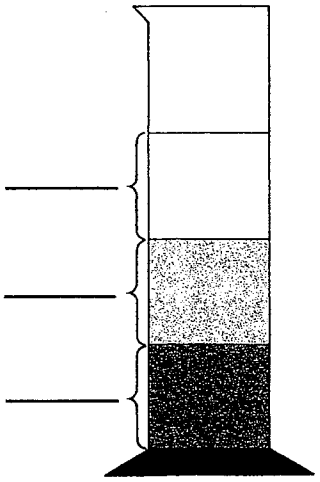
9. An irregularly shaped object with a mass of 20 g is placed in 50 mL of water. The water level then rises to the 60 mL mark on the beaker. What is the density of the object described?

10. a. What is the relationship between density and buoyant force?

    b. How can a hydrometer illustrate this relationship?

11. Why do large boats of steel float even though steel has a higher density than water?

12. In order to build a density tower, students had to find the density of three different liquids. The denser liquid would be placed first in the glass and the least dense liquid would be placed last in the glass.

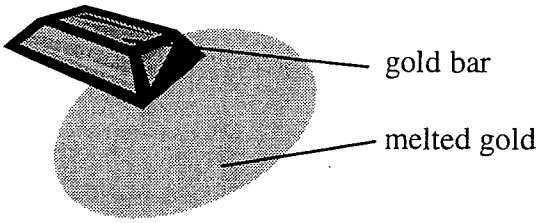


Given the following information, determine the order the liquids should be in the density tower (show your work) and label the diagram above:

- Each glass contains 20 mL of liquid.
- An empty glass weighs 15 grams.
- The glass containing Liquid A weighs 20 grams.
- The glass containing Liquid B weighs 17 grams.
- The glass containing Liquid C weighs 25 grams.

Calculations:

13. Draw the particles in the diagram below.



a. What two states of matter are seen in the above diagram?

_____

_____

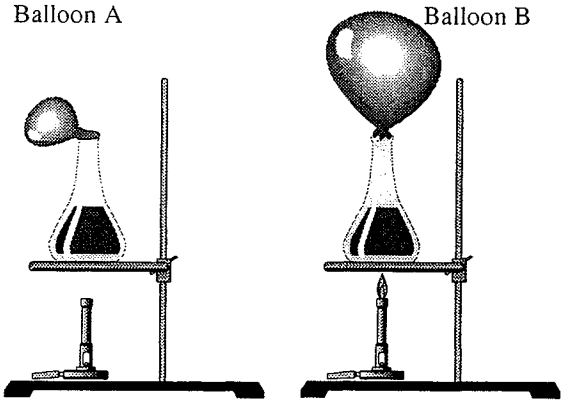
b. What type of energy was added to cause the change of state to occur?

_____

c. Which is less dense, the gold bar or the melted gold?

_____

14. Draw the particles in Balloon B and describe the density of the air in Balloon B in comparison to Balloon A.



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Pressure

15. Explain why a balloon may be placed on a closely packed bed of nails and still remain intact (not burst), but if it is placed on one nail it would burst.

16. After having several potatoes burst in the oven, a cooking student decided to poke holes into each potato prior to baking. Using the terms *temperature* and *pressure*, explain why the potatoes without holes tended to burst.

Hydraulics versus Pneumatics

17. An engineer is designing a machine to lift heavy pipes that will be used for new sewer and water services in northern communities. Winter roads (frozen lakes and marshes) are the least expensive method of hauling equipment to these isolated communities. Workers often work in –30°C conditions. Should the engineer design a pneumatic or hydraulic system to lift loads at these sites? Explain your reasoning.

More Fluids Review Questions.

① How can you test the viscosity of a fluid?

② What are 3 factors that affect the flow rate of a liquid? (Remember the milkshakes).

③ Why will carbon dioxide gas escape quickly from a bottle/can of pop when you shake it?

④ What is the ~~relation b~~ relationship between..

a) Pressure and force.

b) Pressure and Area.

⑤ What is hydraulics?

⑥ What is pneumatics?

⑦ Give an example of a hydraulic system in your body. what are the pipelines and the pump?

⑧ Why do ears "pop" as you reach higher altitudes?

⑨ What instrument is used to measure air pressure?

⑩ List 6 devices that use either hydraulics or pneumatics.

1.
2.
3.
4.
5.
6.

Fill in the following chart . . .

Hydraulic Systems	vs.	Pneumatic Systems