Ch. 7 Fluids Review

1. What are fluids? Give three different examples of fluids.

Fluids are materials that have no fixed shape and are free to flow. Examples include water, air, and blood.

2. Most solids cannot flow. Use the particle theory to explain why solids are not considered to be fluids.

Granulated sugar appears to flow because you can pour it from one container to another. However, each small crystal of sugar is still solid: it has a definite shape and size. The particles in it are arranged in a specific, definite orientation and cannot slide past one another. Therefore, these solids are not fluids.

3. List four types of fluids found in the human body and describe one function of each.

Oxygen releases energy from food.

Saliva lubricates food for swallowing and begins chemical digestion.

Urine eliminates dissolved wastes from the body.

Stomach acids aid in the chemical digestion of food.

4. Make a t-chart to compare differences between laminar and turbulent flow. Provide examples for both.

Laminar flow	**Turbulent flow**
smooth, uniform fluid flow	uneven, unpredictable fluid flow
fluid flows in one direction	fluid flows in many directions
example: water flowing slowly through a hose	example: water flowing over a waterfall

5.Define flow rate. What units are used to measure flow rate?

Flow rate is a measure of the volume of fluid that flows past a certain point in a given amount of time. The units used to describe flow rate are units of volume per unit time, such as L/min or mL/s.

6.Use the particle theory to explain why 10 mL of liquid cannot fill a 20 mL container.

The particles in a liquid can slide past one another, but they do not have enough energy to overcome all of the forces of attraction between them. Therefore, the volume of a sample of liquid is fixed. The particles in 10 mL of liquid cannot move farther apart to fill 20 mL of space because the attractive forces between them keep them close together.

7.List the five main statements of the particle theory.

-All matter is made of tiny particles.

-Particles have empty spaces between them.

-Particles are moving randomly all the time.

-Particles move faster when they are heated.

-Particles attract one another.

8.Is the science that studies wind patterns around wings on aircraft called aerodynamics or hydrodynamics? Name two other applications related to this field of study.

The study of wind patterns around wings on aircraft is part of the science of aerodynamics. Other applications of aerodynamics include home heating and air conditioning and air flow around golf balls and baseballs.

9.The words “cohesion” and “adhesion” look very similar. Use the meanings of the words to show why it makes sense that these words should look alike. What might the parts “co,” “ad,” and “hesion” refer to?

Cohesion and adhesion have similar meanings in that they both describe the attractions of the particles in a substance for other particles. They probably look alike because they have similar meanings and share similar roots. Cohesion refers to attractions between particles of the same substance, so the prefix “co-” probably means “similar” or “together.” Adhesion refers to the attractions between particles of different substances, so the prefix “ad-” might mean “apart” or “different.” The root “-hesion” probably refers to attractions or “stickiness” of particles.

10.“The greater the viscosity of a fluid, the slower the flow rate.” Do you agree or disagree? Support your answer based on your work with fluids in this unit.

I agree with the statement. The fluids that we studied in this chapter that had high viscosities, such as honey and syrup, took much longer to flow past a given point than fluids with lower viscosities, such as water and cooking oil.

11.Describe three ways in which fluid flow is important in the food industry.

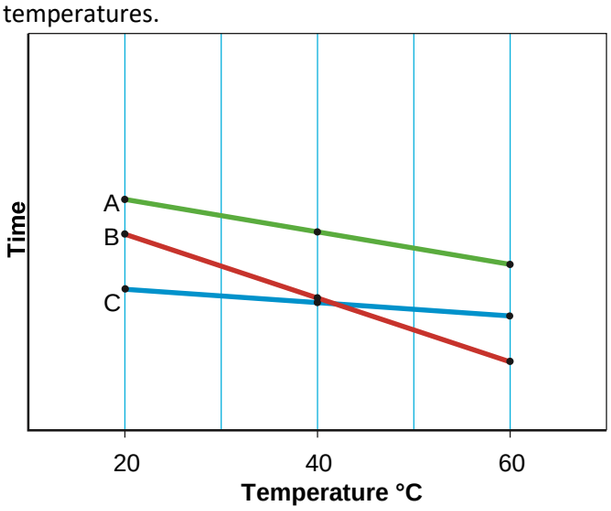
- Margarine and shortening are made by bubbling hydrogen gas through liquid oils.
- Fluids are mixed in many recipes - Ethylene gas is used to control the ripening of fruit.

12.Describe one way that streamlining plays a role in your daily activities.

My bicycle helmet is smooth and curved. That helps reduce the air drag on me when I ride my bicycle.

13.Does warming a viscous fluid generally increase or decrease its flow rate? Use the particle theory to explain why this might be so. Warming a viscous fluid generally increases the flow rate because adding thermal energy increases the energy and motion of the particles. This extra energy allows the particles to overcome some of the attractive forces between them. The reduced attractive forces allow the fluid to flow more quickly.

14. Look at the graph in Figure 2. It shows the length of time three fluids took to flow through a funnel at different temperatures.



(a) Which fluid is most viscous? Justify your answer.

Fluid A is the most viscous fluid because it takes the greatest amount of time to flow through the funnel, regardless of the temperature.

(b) Which fluid is most affected by changing temperature? Justify your answer.

Fluid B is most affected by changing temperature. The time required for fluid B to flow through the funnel was much higher at 20 °C than it was at 60 °C. The other two fluids did not show as large a change in flow rate with temperature.

15.Bicycle and car racers often stay very close to the person in front of them. Using concept of fluid flow, explain why this strategy is useful.

The racer at the front of the group experiences the greatest drag because the air in front of the racer must flow over and around the racer. This is generally turbulent flow, and it produces a large amount of drag. The racer’s body or car creates an eddy behind it, where the flow is much slower and drag is much lower. If a racer that is farther back can stay in this eddy, the drag on that racer will be less, and the racer will use less energy to maintain speed.