

PHYS 1200 Physics of Everyday Experience

Review questions and exercises for Lecture 15 (F-4)

1. Why do the roofs of homes often get blown off in a tornado?
2. How do streamlines help to visualize fluid flow?
3. What provides the lift force that allows planes to fly?
4. What is viscosity?
5. If corn syrup is heated it flows more easily. What does this indicate about viscosity?
6. How can a small obstruction in an artery lead to a large reduction in blood flow?
7. What effect explains why a steel paper clip can rest on the surface of water?
8. Why do bubbles formed on the surface of a liquid tend to merge together?

Answers:

1. The high speed wind blowing over a roof lowers the air pressure. The air under the roof is at normal pressure, and the higher pressure on the inside can lift the roof off of the walls of the house.
2. The spacing between streamlines is an indication of the speed of the flow. Streamlines that are far apart are associated with low flow speeds, whereas closely spaced streamlines indicate high flows.
3. The wings of a plane are designed to cause the air flow to be higher on the top of the wing. According to Bernoulli, where the speed is higher the pressure is lower. Thus the pressure above the wing is lower than the pressure below it and there is a net upward force (lift) on the wing.
4. Viscosity is a property of liquids that measures its tendency to resist flow. "Thick" liquids, like syrup, have a higher viscosity than thin liquids like water.
5. This observation indicates that the viscosity of a liquid depends on its temperature in such a manner that the viscosity decreases with temperature.
6. According to Poiseuille's law the flow rate of a liquid through a pipe varies as the fourth power of its diameter. Thus a small decrease in the diameter can produce a large reduction in the flow rate.
7. Surface tension.
8. Bubbles tend to merge together due to surface tension.