12-05 Physics Homework

1. Making an airplane wing larger enables it to produce more lift due to an increase in the wing's surface area. According to Bernoulli's principle and the concept of air pressure, as air flows over the wing, it creates a pressure difference between the upper and lower surfaces.
2. When you squeeze a plastic water-filled bottle, the pressure change in the water is greatest at the point being squeezed. This is due to Pascal's principle, which states that a change in pressure at any point in a fluid is transmitted equally and undiminished in all directions throughout the fluid.
3. Bernoulli's principle can be used to explain why a car passing a truck tends to be pushed toward the truck. As the car moves alongside the truck, the air between the car and the truck is compressed. This increases the air pressure, and according to Bernoulli's principle, the air pressure between the car and the truck becomes greater than the pressure on the outer sides. This pressure difference results in a net force pushing the car toward the truck.
4. A sheet of paper rises when you blow across the top of the paper due to the Bernoulli principle. As you blow air over the top of the paper, the air speed increases, causing a decrease in air pressure. The higher air pressure below the sheet of paper then pushes the paper upward due to the pressure difference created by the faster-moving air above the paper.
5. The statement is wrong. In a hydraulic system, while the increase in pressure is the same throughout the system, the increase in force is not the same. The force applied to the smaller piston is transmitted through the hydraulic fluid and, due to Pascal's principle, results in an increase in force on the larger piston.
6. Using the formula $\frac{F_1}{A_1} = \frac{F_2}{A_2}$, where F_1 is the force on the small piston, A_1 is the area of the small piston, F_2 is the force on the large piston, and A_2 is the area of the large piston:
   Given:
   $A_1 = 0.01m^2$,
   $F_1 = 250N$,
   $A_2 = 0.05m^2$.
   Using the formula
   $\frac{F_1}{A_1} = \frac{F_2}{A_2}$,
   $\frac{250N}{0.01m^2} = \frac{F_2}{0.05m^2}$,
   $F_2 = \frac{250N \cdot 0.05m^2}{0.01m^2}$

$F_2 = 1250N$

Therefore, the force on the large piston is $1250N$.