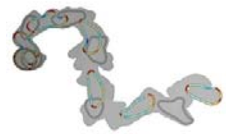
Physics 131- Fundamentals of Physics for Biologists I



Professor: Wolfgang Losert wlosert@umd.edu

11/02/2012

- Quiz 6 review
- Archimedes Principle
- Buoyancy

Distinguished Scholar-Teacher Lecture : Robert M. Briber

Soft Materials & Polymers: The Materials Science of Squishy Stuff

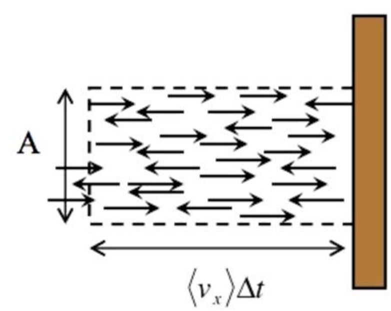
Wed, Nov 14, 4:00 p.m. Room 1101 Biosciences Research Building

This lecture will discuss the science behind the unusual properties of polymers, from commercial plastics to biomolecules. It is designed to be entertaining to a general audience of non-scientists and will incorporate demonstrations.

Quiz return

Avg: 7

A	C	C
C	C	B
C	C	B
C	C	A
C	C	D
C	C	B
A	C	B
C	B	C
responses		
C	C	C



$$F = \left(\frac{2mv_x}{\Delta t}\right)\left(\tfrac{1}{2} nAv_x \Delta t\right) = nmv_x^2 A$$

$$p = \frac{F}{A} = nmv_x^2$$

$$pV = Nk_B T$$

2

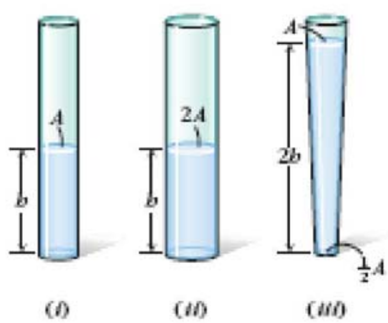
More on simple liquids!

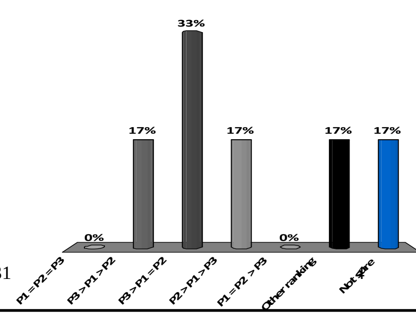
- Pressure
- Archimedes Principle
- Buoyancy
- Surface tension

11/3/2012 Physics 131 3

Consider the containers at right. Which of the following correctly compares the *pressure* (*P*) of the water at the bottoms of the containers?

1. $P_1 = P_2 = P_3$
2. $P_3 > P_1 > P_2$
3. $P_3 > P_1 = P_2$
4. $P_2 > P_1 > P_3$
5. $P_1 = P_2 > P_3$
6. Other ranking
7. Not sure

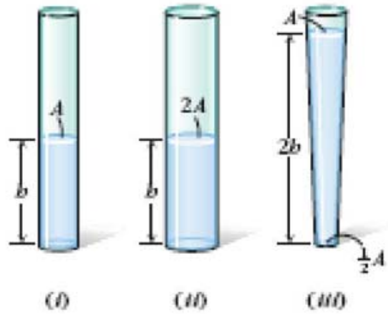


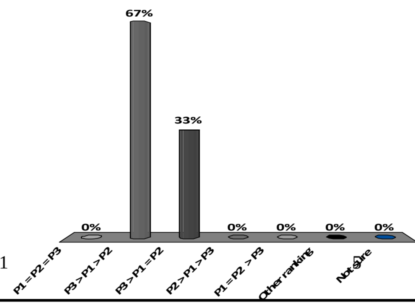


11/3/2012 Physics 131

Consider the containers at right. Which of the following correctly compares the *pressure* (*P*) of the water at the bottoms of the containers?

1. $P_1 = P_2 = P_3$
2. $P_3 > P_1 > P_2$
3. $P_3 > P_1 = P_2$
4. $P_2 > P_1 > P_3$
5. $P_1 = P_2 > P_3$
6. Other ranking
7. Not sure

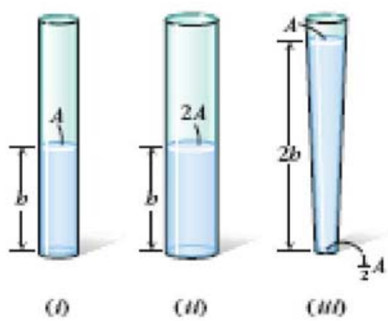


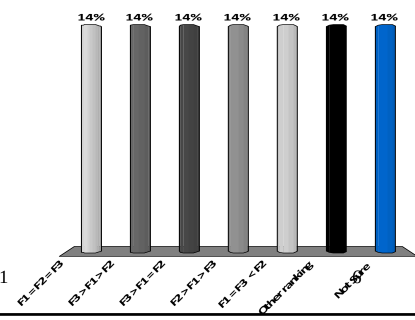


11/3/2012 Physics 131

Consider the containers at right. Which of the following correctly compares the *Force* (*F*) of the water at the bottoms of the containers?

1. $F_1 = F_2 = F_3$
2. $F_3 > F_1 > F_2$
3. $F_3 > F_1 = F_2$
4. $F_2 > F_1 > F_3$
5. $F_1 = F_3 < F_2$
6. Other ranking
7. Not Sure

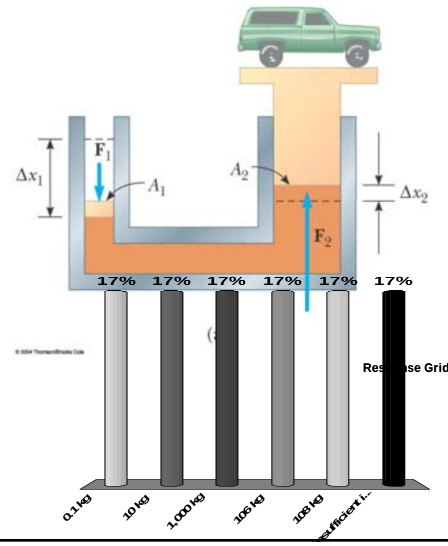


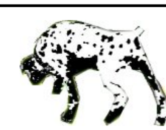


11/3/2012 Physics 131

A container is filled with oil and fitted on both ends with pistons. The area of the left piston is (0.1 inch)^2 ; that of the right piston (10inch)^2. What weight must I place on the piston to balance the weight of a 1 ton (1000 kg) car?

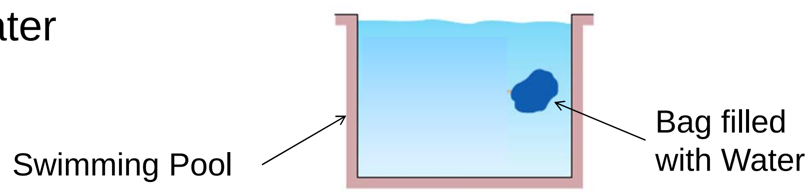
1. 0.1 kg
2. 10 kg
3. 1,000 kg
4. 10^6 kg
5. 10^8 kg
6. insufficient information





Making sense of Buoyant Forces

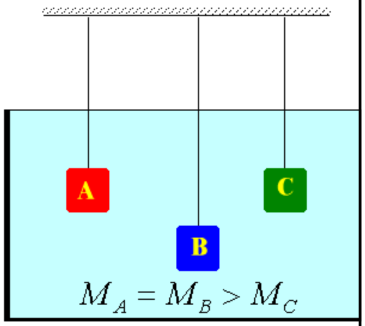
- Draw system schema for the system below and then a free body diagram for the bag of water



- Replace the bag a water with a rock of equal volume in the system schema and free body diagram
  – What changed?

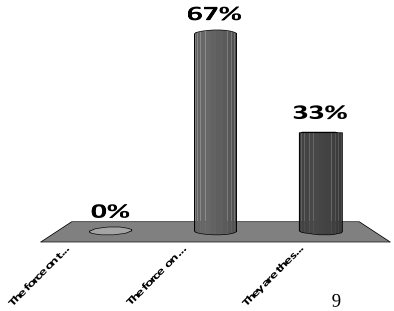
8

Three cubes of equal volume are hung on strings. A and B have the same mass and block C has less. The blocks are lowered into a fish tank and they hang at rest as shown.



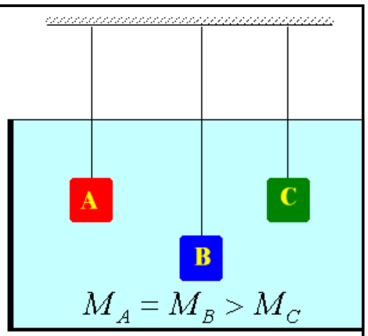
How does the force exerted by the water on the <u>top</u> surface of cube A compare to the force exerted by the water on the top surface of cube B?

1. The force on the top surface of A is bigger
2. The force on the top surface of B is bigger
3. They are the same.



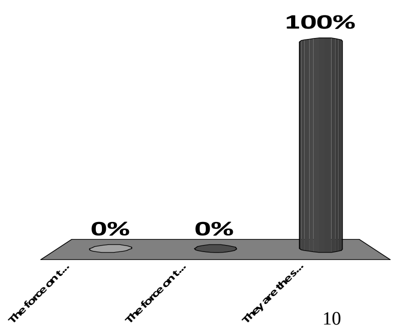
11/3/2012 Physics 131 9

Three cubes of equal volume are hung on strings. A and B have the same mass and block C has less. The blocks are lowered into a fish tank and they hang at rest as shown.



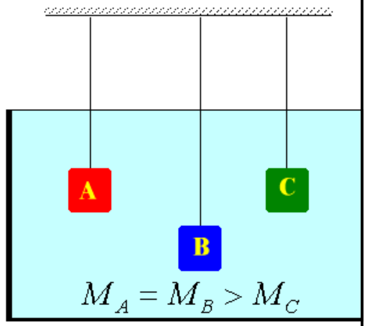
How does the force exerted by the water on the <u>top</u> surface of cube A compare to the force exerted by the water on the top surface of cube C?

1. The force on the top surface of A is bigger
2. The force on the top surface of C is bigger
3. They are the same.



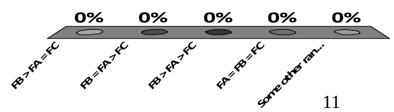
11/3/2012 Physics 131 10

Three cubes of equal volume are hung on strings. A and B have the same mass and block C has less. The blocks are lowered into a fish tank and they hang at rest as shown.



How do the buoyant forces exerted by the water on the three cubes rank?

1. $F_B > F_A = F_C$
2. $F_B = F_A > F_C$
3. $F_B > F_A > F_C$
4. $F_A = F_B = F_C$
5. Some other ranking



11/3/2012 Physics 131 11

If I heat an enclosed volume of gas so that its Kelvin temperature doubles, what happens to the average speed of the molecules in the gas?

1. It more than doubles.
2. It doubles.
3. It increases by between 50% and 100%.
4. It increases but by less than 50%.
5. It stays the same
6. It decreases.

10/26/12 Physics 131 12