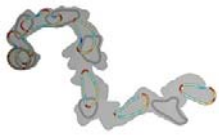
Physics 131- Fundamentals of Physics for Biologists I



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11/07/2012

- Quiz 7
- Fluid Flow

Quiz

1	2.1	2.2	3
A	B	A	B
C	B	B	B
C	B	B	B
C	B	B	A
A	B	A	B
E	C	C	B
D	B	AB	B
D	B	AB	B
C	B	A	C
responses			
C	B	AB	B

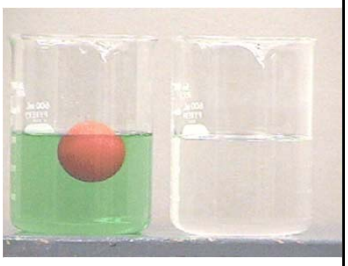
What to do if you are confused

- Before exam:
  - Come to office hours
    - » my extra hours today 5.15pm-6pm in AV Williams rm 3341
    - » Course Center: Kim – Wed 3-5, Redish Thu 3-5, Losert Thu 5-6.30)
  - Review HW, Quizzes, recitation materials, Notes on the HW
- Before and during exam:
  - Think about the problem in terms of foothold principles (examples?)
  - Sketch system schema, equations, graphs, free body diagrams or whatever else helps you
  - Check dimensions
  - Check math

More on simple liquids!

- Fluid Flow

A ball floats in a beaker of water. The ball sinks in a beaker of mineral spirits. The mineral spirit will float above the water when poured slowly on top of water. If the ball is floating on the water 2/3 of the way under the water, what will happen to the ball when mineral spirits is slowly poured on top of the water?

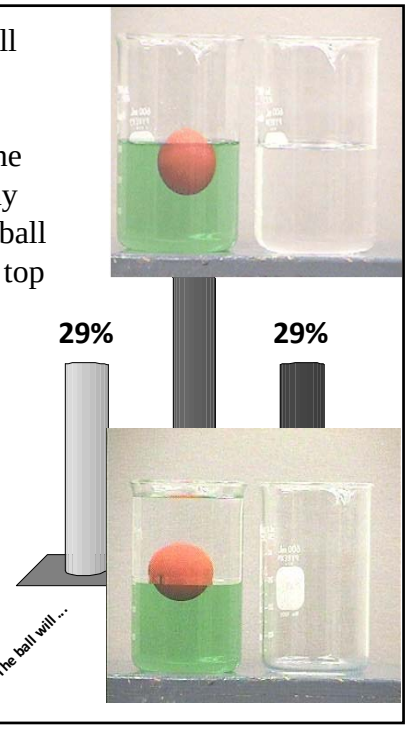


What changed?

A ball floats in a beaker of water. The ball sinks in a beaker of mineral spirits. The mineral spirit will float above the water when poured slowly on top of water. If the ball is floating on the water 2/3 of the way under the water, what will happen to the ball when mineral spirits is slowly poured on top of the water?

Relative to the top of the liquid,

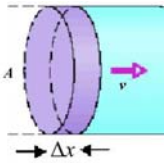
1. The ball will go down.
2. The ball will go up.
3. The ball will stay at the same level.



Foothold ideas: Matter Current (incompressible)

- Q = Current = (volume crossing a surface)/s **[Q] = L^3/T**

$$\vec{Q} = \frac{\left(A\Delta\vec{x}\right)}{\Delta t} = \frac{\left(A\vec{v}\Delta t\right)}{\Delta t} = A\vec{v}$$

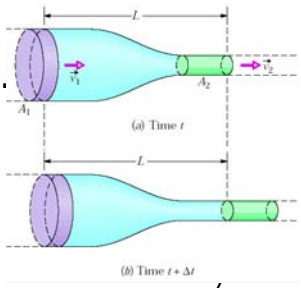


- Conservation of matter: "What goes in must come out."

$$\Delta V_{in} = \Delta V_{out}$$

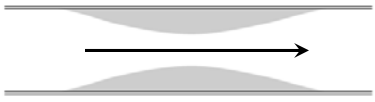
$$A_1\left(v_1\Delta t\right) = A_2\left(v_2\Delta t\right)$$

$$Q = Av = \text{ constant}$$

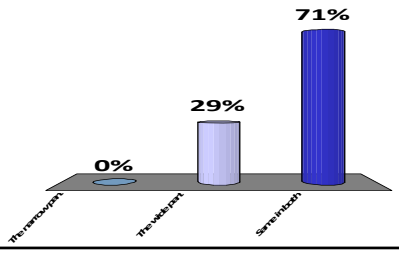


11/5/12 Physics 131

Blood flows through a coronary artery that is partially blocked by deposits along the artery wall. Through which part of the artery is the flux (volume of blood per unit time) largest?

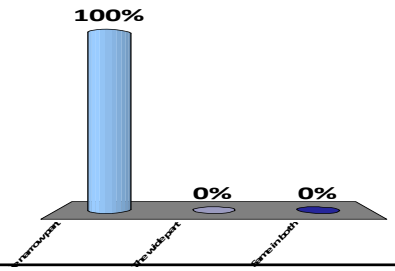


1. The narrow part
2. The wide part
3. Same in both



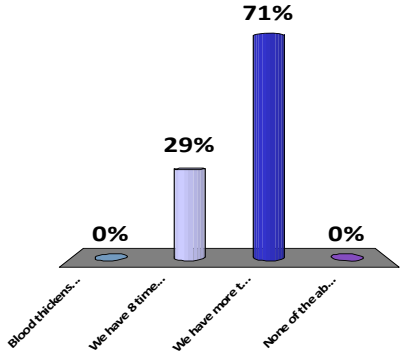
Blood flows through a coronary artery that is partially blocked by deposits along the artery wall. Through which part of the artery is the speed of the blood the largest?

1. **The narrow part**
2. **The wide part**
3. **Same in both**



The arteries in the human body are almost tree shaped. Blood flow is four times slower in arteries that are half the diameter. How could this happen

1. Blood thickens in smaller arteries
2. We have 8 times more of the thinner arteries
3. We have more than 8 times more of the thinner arteries
4. None of the above



Applying System Schema to flow in a pipe

Implication: Pressure drop

- If we have a fluid moving at a constant rate and there is drag, N2 tells us there must be another force to balance the drag.
- The internal pressure in the fluid must drop in the direction of the flow to balance drag.