AP 2 Fluids PRACTICE MC questions

1. A cork has weight mg and density 25% of water density. A string is tied around the cork and attached to the bottom of a water-filled container. The cork is totally immersed. Express in terms of the cork weight mg, the tension in the string
A) 0
B) mg
C) 2mg
D) 3mg
E) 4mg

2. Which of the following is the best statement of Pascals Law?
A) pressure on a confined liquid is transmitted equally in all directions
B) a numerical arrangement where each number is the sum of the two numbers above
C) two electrons cannot occupy the same quantum state at the same time
D) the volume of a gas is directly related to its temperature
E) the farther away a galaxy is the faster it is receding

7. A hydraulic press allows large masses to be lifted with small forces as a result of which principle?
A) Pascal's
B) Bernoulli's
C) Archimedes'
D) Huygens'
E) Newton's

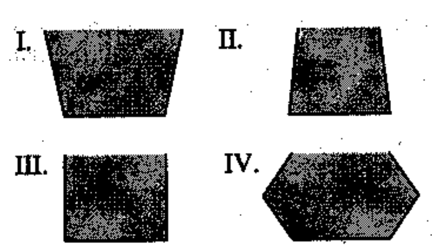
9. As a rock sinks deeper and deeper into water of constant density, what happens to the buoyant force on it?
A) It increases.
B) It remains constant.
C) It decreases.
D) It may increase or decrease, depending on the shape of the rock.

18. Which of the following could be a correct unit for pressure?

$$(A)\ \frac{kg}{m^2} \qquad (B)\ \frac{kg}{m\cdot s} \qquad (C)\ \frac{kg}{s^2} \qquad (D)\ \frac{kg}{m\cdot s^2} \qquad (E)\ \frac{m\cdot s}{kg}$$

20. A cube of unknown material and uniform density floats in a container of water with 60% of its volume submerged. If this same cube were placed in a container of oil with density 800 kg/m^3, what portion of the cube's volume would be submerged while floating?
(A) 33% (B) 50% (C) 58% (D) 67% (E) 75%

24. Each of the beakers shown is filled to the same depth h with liquid of density ρ. The area A of the flat bottom is the same for each beaker. Which of the following ranks the beakers according to the net downward force exerted by the liquid on the flat bottom, from greatest to least force?

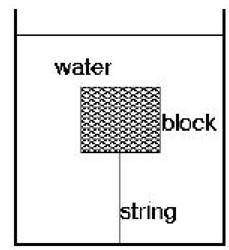


(A) I, III, II, IV
(B) I, IV, III, II
(C) II, III, IV, I
(D) IV, III, I, II
(E) None of the above, the force on each is the same.

39. The buoyant force on an object is equal to the weight of the water displaced by a submerged object. This is a principle attributed to
(a) Torricelli (b) Pascal (c) Galileo (d) Archimedes (e) Bernoulli

45. A vertical force of 30 N is applied uniformly to a flat button with a radius of 1 cm that is lying on a table. Which of the following is the best order of magnitude estimate for the pressure applied to the button?
(A) 10 Pa
(B) 10^2 Pa
(C) 10^3 Pa
(D) 10^4 Pa
(E) 10^5 Pa

4. A block is connected to a light string attached to the bottom of a large container of water. The tension in the string is 3.0 N. The gravitational force from the earth on the block is 5.0 N. What is the block's volume?
(A) $2.0\times10^{-4}\ m^3$
(B) $3.0\times10^{-4}\ m^3$
(C) $5.0\times10^{-4}\ m^3$
(D) $8.0\times10^{-4}\ m^3$
(E) $1.0\times10^{-3}\ m^3$



5. One cubic centimeter of iron (density ~7.8 g/cm^3) and 1 cubic centimeter of aluminum (density ~2.7 g/cm^3) are dropped into a pool. Which has the largest buoyant force on it?
(a) iron (b) aluminum (c) both are the same. (d) neither has a buoyant force on it.

6. Find the approximate minimum mass needed for a spherical ball with a 40 cm radius to sink in a liquid of density $1.4\text{x}10^3$ kg/m^3
(a) 37.5 kg (b) 375 kg (c) 3750 kg (d) 37500 kg (e) 375000 kg

7. A block of mass m, density ρ_B , and volume V is completely submerged in a liquid of density ρ_L. The density of the block is greater than the density of the liquid. The block
(a) floats, because $\rho_B > \rho_L$
(b) experiences a buoyant force equal to ρ_B gV.
(c) experiences a buoyant force equal to ρ_L gV.
(d) experiences a buoyant force equal to m_B g
(e) does not experience any buoyant force, because $\rho_B > \rho_L$.

9. A ball that can float on water has mass 5.00 kg and volume 2.50 x 10^{-2} m^3. What is the magnitude of the downward force that must be applied to the ball to hold it motionless and completely submerged in freshwater of density 1.00 x 10^3 kg/m^3?
(A) 20.0 N
(B) 25.0 N
(C) 30.0 N
(D) 200 N
(E) 250 N

#3 (2003-B6)
A diver descends from a salvage ship to the ocean floor at a depth of 35 m below the surface. The density of ocean water is 1.025×10^3 kg/m^3.

(a) Calculate the gauge pressure on the diver on the ocean floor.

(b) Calculate the absolute pressure on the diver on the ocean floor.

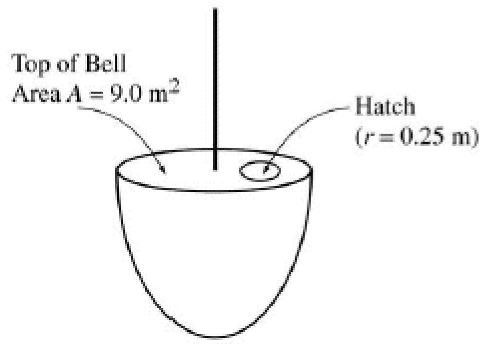
The diver finds a rectangular aluminum plate having dimensions 1.0 m x 2.0 m x 0.03 m. A hoisting cable is lowered from the ship and the diver connects it to the plate. The density of aluminum is 2.7×10^3 kg/m^3. Ignore the effects of viscosity.

(c) Calculate the tension in the cable if it lifts the plate upward at a slow, constant velocity.

(d) Will the tension in the hoisting cable increase, decrease, or remain the same if the plate accelerates upward at 0.05 m/s^2?

____ increase ____ decrease ____ remain the same

Explain your reasoning.



#5 (B2004-B2)

The experimental diving bell shown above is lowered from rest at the ocean's surface and reaches a maximum depth of 80 m. Initially it accelerates downward at a rate of 0.10 m/s^2 until it reaches a speed of 2.0 m/s, which then remains constant. During the descent, the pressure inside the bell remains constant at 1 atmosphere. The top of the bell has a cross-sectional area A = 9.0 m^2. The density of seawater is 1025 kg/m^3.

(a) Calculate the total time it takes the bell to reach the maximum depth of 80 m.

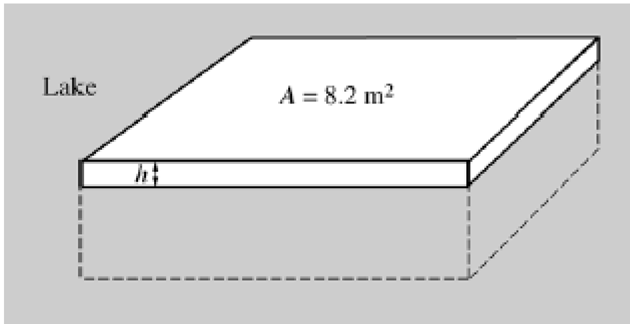
(b) Calculate the weight of the water on the top of the bell when it is at the maximum depth.

(c) Calculate the absolute pressure on the top of the bell at the maximum depth.

On the top of the bell there is a circular hatch of radius r = 0.25 m.
(d) Calculate the minimum force necessary to lift open the hatch of the bell at the maximum depth.

(e) What could you do to reduce the force necessary to open the hatch at this depth? Justify your answer.

#6 (2005-B5)



Note: Figure not drawn to scale.

A large rectangular raft (density 650 kg/m^3) is floating on a lake. The surface area of the top of the raft is 8.2 m^2 and its volume is 1.80 m^3. The density of the lake water is 1000 kg/m^3.

(a) Calculate the height *h* of the portion of the raft that is above the surrounding water.

(b) Calculate the magnitude of the buoyant force on the raft and state its direction.

(c) If the average mass of a person is 75 kg, calculate the maximum number of people that can be on the raft without the top of the raft sinking below the surface of the water. (Assume that the people are evenly distributed on the raft.)