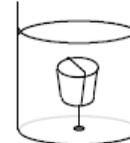
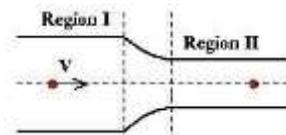


AP Physics Multiple Choice Practice – Fluid Mechanics

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)  $4mg$

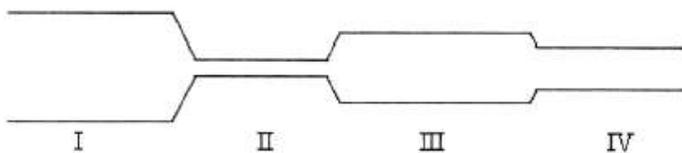


2. A piece of an ideal fluid is marked as it moves along a horizontal streamline through a pipe, as shown in the figure. In Region I, the speed of the fluid on the streamline is  $V$ . The cylindrical, horizontal pipe narrows so that the radius of the pipe in Region II is half of what it was in Region I. What is the speed of the marked fluid when it is in Region II?



- (A)  $4V$     (B)  $2V$     (C)  $V$     (D)  $V/2$     (E)  $V/4$
3. When submerged under water, the apparent mass of one cubic meter of pure gold is 18300 kg. What would be its mass in air?
- A) 16300 kg    B) 17300 kg    C) 18300 kg    D) 19300 kg    E) 20300 kg
4. An ideal fluid flows through a long horizontal circular pipe. In one region of the pipe, it has radius  $R$ . The pipe then widens to radius  $2R$ . What is the ratio of the fluids speed in the region of radius  $R$  to the speed of the fluid in region with radius  $2R$
- A)  $1/4$     B)  $1/2$     C) 1    D) 2    E) 4

5. A fluid is forced through a pipe of changing cross section as shown. In which section would the pressure of the fluid be a minimum



- A) I    B) II    C) III    D) IV    E) all section have the same pressure.

6. Three fishing bobbers all float on top of water. They have the following relationships:

-A,B: same mass, same density, different shapes

-B,C: same size, same shape,

mass & density  $C <$  mass & density B

Three identical weights are tied to each bob, and each is pulled completely beneath the water. Which bob will displace the greatest amount of water

- A) A    B) B    C) C    D) A and B    E) All displace the same amount of water.
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    F) Taylor's
8. A 500 N weight sits on the small piston of a hydraulic machine. The small piston has an area of  $2 \text{ cm}^2$ . If the large piston has an area of  $40 \text{ cm}^2$ , how much weight can the large piston support?
- A) 25 N    B) 500 N    C) 10000 N    D) 40000 N
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.
10.  $50 \text{ cm}^3$  of wood is floating on water, and  $50 \text{ cm}^3$  of iron is totally submerged. Which has the greater buoyant force on it?
- A) The wood.  
B) The iron.  
C) Both have the same buoyant force.  
D) Cannot be determined without knowing their densities.

## FREE-RESPONSE SECTION:

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  $1.025 \times 10^3 \text{ kg/m}^3$ .

- (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  $2.7 \times 10^3 \text{ kg/m}^3$ . 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  $0.05 \text{ m/s}^2$ ?

\_\_\_\_ increase \_\_\_\_ decrease \_\_\_\_ remain the same

Explain your reasoning.