1 Two substances A with a density 2000 kg/m³ and B with a density 3000 kg/m³ are selected for an experiment. If the experiment requires equal masses of each liquid, what is the ratio of substance A volume to substance B volume (V_A/V_B)?

A 1/2

B 1/3

C 2/3

D 3/2

E 3/1

2 The density of a substance is ρ, the volume is V, and the mass is m. If the volume is tripled without changing the density, what is the mass?

○ A m/3

○ B m

○ C 3m

○ D 6m

○ E 9m

3 A perpendicular force is applied to a certain area and produces a pressure P. If the same force is applied to a twice bigger area, the new pressure on the surface is:

○ A 2P

○ B 4P

○ C P

○ D P/2

○ E P/4

4 There are two round tables in the physics classroom: one with the radius of 1 m the other with a radius of 2m. What is the relationship between the two forces applied on the tabletops by the atmospheric pressure (F_1/F_2)?
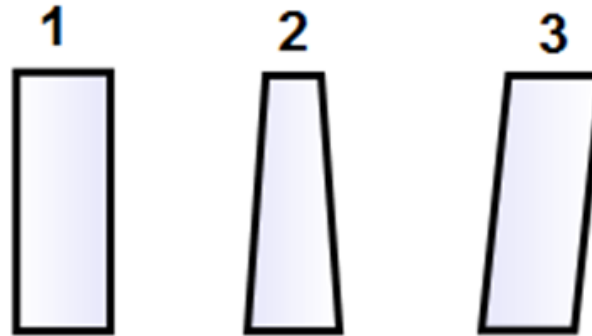
○ A 1/2

○ B 1/4

○ C 2/1

○ D 4/1

○ E 1/6

5 Three containers are used in a chemistry lab. All containers have the same bottom area and the same height. A chemistry student fills each of the containers with the same liquid to the maximum volume. Which of the following is true about the pressure on the bottom in each container?

A $P_1 > P_2 > P_3$

B $P_1 < P_2 < P_3$

C $P_1 < P_2 > P_3$

D $P_1 > P_2 < P_3$

E $P_1 = P_2 = P_3$

6 What is the gauge pressure at the bottom of a pool 3m deep?

○ A 30 Pa

○ B 300 Pa

○ C 3000 Pa

○ D 30,000 Pa

○ E 300,000 Pa

7 Which of the following scientists invented a mercury barometer?

○ A Blaise Pascal

○ B Evangelist Torricelli

○ C Amedeo Avogadro

○ D Robert Brown

○ E James Joule

8 A car driver measures a tire pressure of 220 kPa. What is the
   absolute pressure in the tire?

○ A 321 kPa

○ B 119 kPa

○ C 0 kPa

○ D 101 kPa

○ E 220 kPa

9 In a hydraulic lift the small piston has an area of 2 cm² and large piston has an area of 80 cm². What is the mechanical advantage of the hydraulic lift?

A 40

B 4

C 2

D 1

E 20
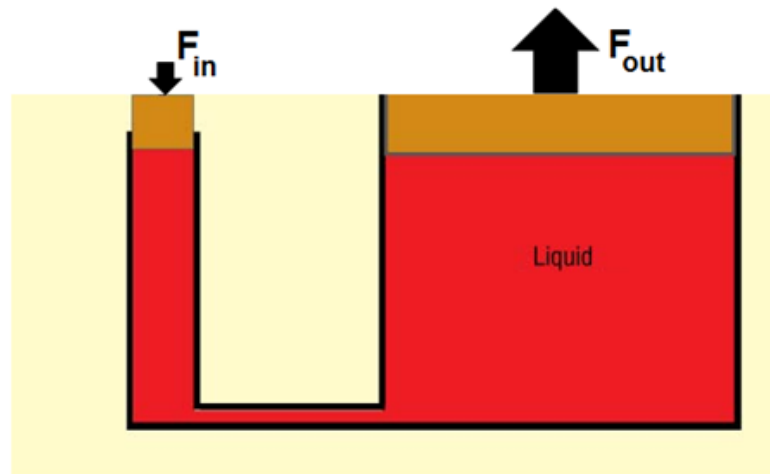
10 A hydraulic lift is used to lift a car. The small piston has a radius of 5 cm and the large piston has a radius of 50 cm. If a driver applies a force of 88 N to the small piston, what is the weight of the car the large piston can support?

A 880 N

B 88 N

C 8800 N

D 8.8 N

E 88000 N
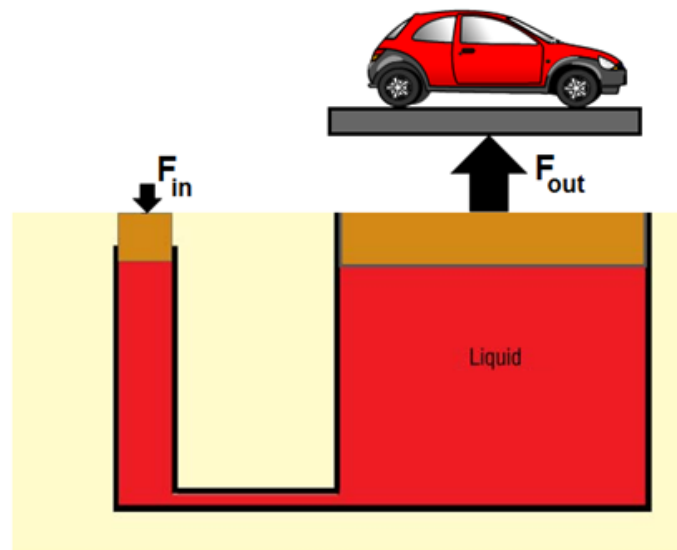
11 Three blocks of equal volume are completely submerged into water. The blocks made of different materials: aluminum, iron and lead. Which of the following is the correct statement about the buoyant force on each block? ($\rho_{aluminum}$ = 2700 kg/m³, ρ_{iron} = 7800 kg/m³, ρ_{lead} = 11300 kg/m³)

A $F_{aluminum} > F_{iron} > F_{lead}$

B $F_{aluminum} < F_{iron} < F_{lead}$

C $F_{aluminum} < F_{iron} > F_{lead}$

D $F_{aluminum} = F_{iron} = F_{lead}$

E $F_{aluminum} > F_{iron} < F_{lead}$

12 A piece of iron has a weight of 3.5 N when it is in air and 2.0 N when it is submerged into water. What is the buoyant force on the piece of iron?

A 3.5 N

B 2.0 N

C 1.5 N

D 1.0 N

E 0.5 N

13 Physics students use a spring scale to measure the weight of a piece of lead. The experiment was performed two times one in air the other in water. If the volume of lead is 0.0005 m³, what is the difference between two readings on the scale?

A 0.5 N

B 5.0 N

C 50 N

D 500 N

E 0 N

14 A wooden block with a weight of 7.5 N is placed on water. When the block floats on the surface of water it is partially submerged in water. What is the weight of the displaced water?

○ A 5.0 N

○ B 5.5 N

○ C 6.0 N

○ D 7.0 N

○ E 7.5 N

15 An object with a density of 800 kg/m^3 floats on water. What portion
    of the object is submerged?

○ A 1/16

○ B 1/8

○ C 1/4

○ D 2/5

○ E 4/5

16 A wooden block with a weight of 9 N is placed on water. When the block floats on the surface of water it is partially submerged in water. What is the volume of the displaced water?

○ A 5×10^{-4} m^3

○ B 4×10^{-4} m^3

○ C 3×10^{-4} m^3

○ D 6×10^{-4} m^3

○ E 9×10^{-4} m^3

17 Water flows at a constant speed of 16 m/s through narrow section of the pipe. What is the speed of water in the section of the pipe where its radius is twice of the initial radius?

A 16 m/s

B 12 m/s

C 8 m/s

D 4 m/s

E 2 m/s

18 Venturi tubes have three sections with different radii. Which of the
    following is true about manometer readings?

A $P_1 > P_2 > P_3$

B $P_1 < P_2 < P_3$

C $P_2 < P_1 < P_3$

D $P_1 < P_2 > P_3$

E $P_3 = P_2 = P_1$
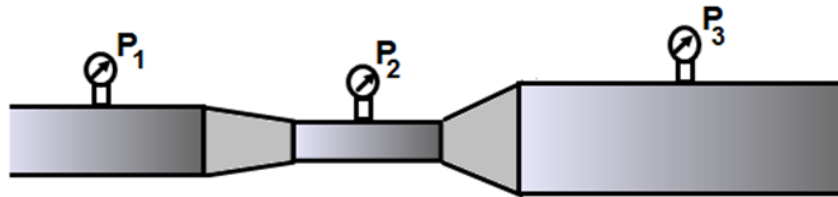
19 Water flows through a horizontal pipe at a speed of 5 m/s and
    pressure 5×10^5 Pa. The pipe narrows and the water speed goes up
    to a 25 m/s. What is the pressure in the narrow section of the pipe?

⃝ A 2×10^5 Pa

⃝ B 4×10^5 Pa

⃝ C 8×10^5 Pa

⃝ D 8.25×10^5 Pa

⃝ E 11.5×10^5 Pa

20 An open bottle is filled with a liquid which is flowing out trough a spigot located at the distance 0.5m below the surface of the liquid. What is the velocity of the liquid leaving the bottle?

A 0.7 m/s

B 2.2 m/s

C 3.13 m/s

D 9.8 m/s

E 19.6 m/s