

A Level • OCR • Physics

 9 mins 9 questions

Multiple Choice Questions

Density & Pressure

Density / Pressure / Archimedes' Principle

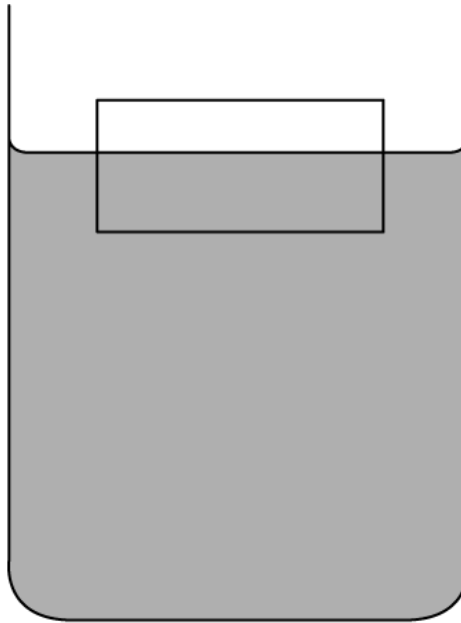
Medium (5 questions)	/5
Hard (4 questions)	/4
Total Marks	/9

Scan here to return to the course
or visit [savemyexams.com](https://www.savemyexams.com)



Medium Questions

- 1 The diagram below shows an object partially submerged in water.



The object is stationary in the water.

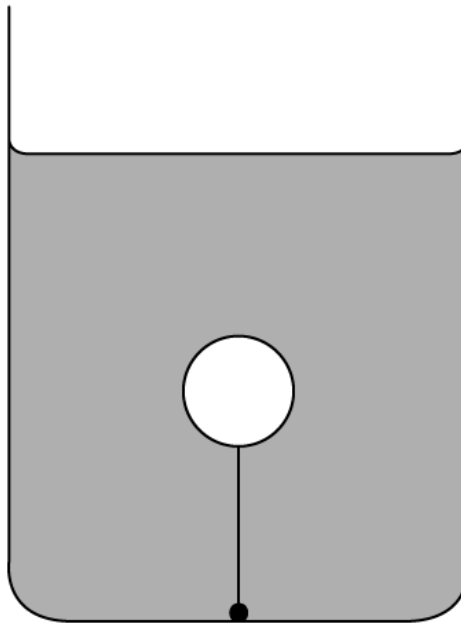
Which of the following statement(s) about the magnitude of the upthrust acting on the object is true?

1. It is equal to the weight of the object.
2. It is equal to the weight of the part of the object submerged in the water.
3. It is equal to the weight of the water displaced by the object.

- A.** Only 1 and 3
B. Only 2 and 3
C. Only 1
D. Only 3

(1 mark)

- 2 A wooden sphere is attached to a string which is fixed to the bottom of a beaker as shown.



The string is taut and the sphere is stationary.

The volume of the sphere is $6.3 \times 10^{-5} \text{ m}^3$ and its mass is 0.026 kg.

The density of water is 1000 kg m^{-3} .

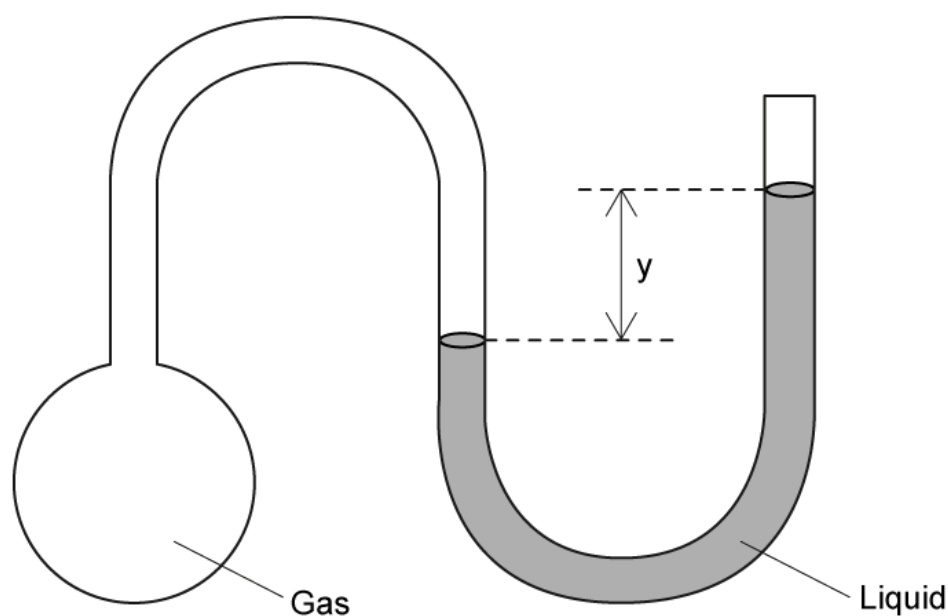
Determine the tension in the string.

- A. 0.36 N
- B. 0.59 N
- C. 0.62 N
- D. 0.87 N

(1 mark)

- 3 The diagram shows a U-tube partially filled with a liquid, with one end connected to a

vessel containing a gas and the other end open to the atmosphere.



The U-tube is used to measure the pressure of the gas.

The density of the liquid is ρ and the distance between the levels of the liquid on each side of the tube is y .

Atmospheric pressure is 1×10^5 Pa.

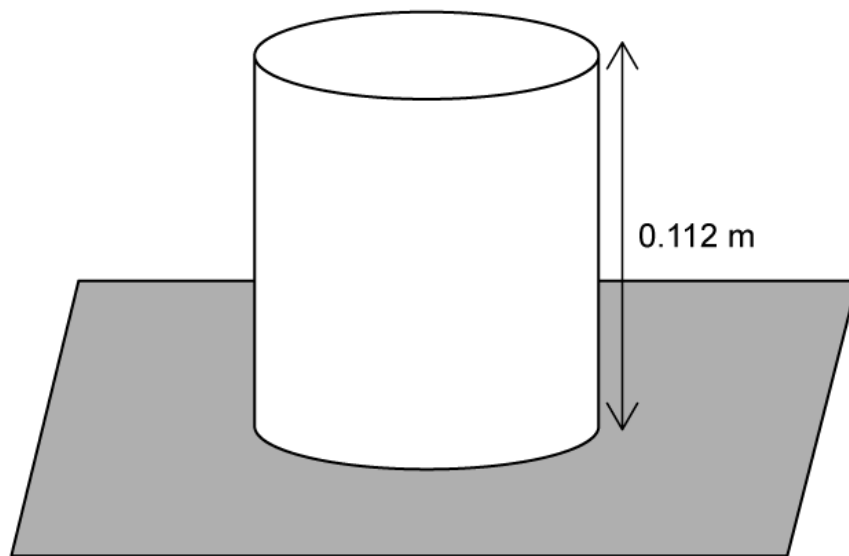
What is a correct expression for the pressure of the gas?

- A. $\frac{1}{2}\rho gy - (1 \times 10^5)$
- B. $\frac{1}{2}\rho gy + (1 \times 10^5)$
- C. $\rho gy - (1 \times 10^5)$
- D. $\rho gy + (1 \times 10^5)$

(1 mark)

4 The diagram below shows a cylindrical metal block at rest on a smooth horizontal

surface.



The block has a height of 0.112 m, a cross-sectional area of $36.3 \times 10^{-4} \text{ m}^2$ and a density of $2.74 \times 10^3 \text{ kg m}^{-3}$.

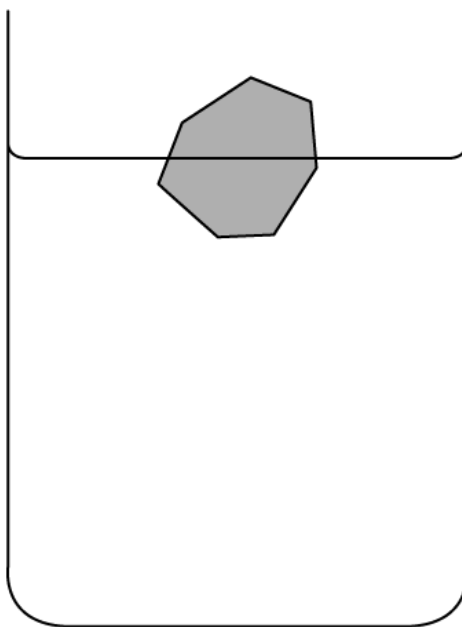
What is the magnitude of the pressure exerted by the block on the surface?

- A.** 310 Pa
- B.** 3.0 kPa
- C.** 1.9 GPa
- D.** 18 GPa

(1 mark)

- 5** An object of unknown material is placed in a beaker of water. The object floats, partially

submerged in the water as shown.



The volume of the object is $1.2 \times 10^{-5} \text{ m}^3$.

The mass of the object is 7.3 g.

The density of water is 1000 kg m^{-3} .

The upthrust, F , on an object submerged in a fluid is given by the equation $F = \rho g V$, where ρ is the density of the fluid and V is the volume of fluid displaced by the object.

What percentage of the object's volume is submerged in the water?

- A.** 56%
- B.** 61%
- C.** 66%
- D.** 71%

(1 mark)

Hard Questions

- 1 A 9 karat gold bar is made up of 37.5% gold and 62.5% copper by volume. The total volume of the gold bar is $3.02 \times 10^{-6} \text{ m}^3$.

What is the total mass of the gold bar?

$$\rho_{\text{gold}} = 1.93 \times 10^4 \text{ kg m}^{-3}$$

$$\rho_{\text{copper}} = 8.96 \times 10^3 \text{ kg m}^{-3}$$

- A. 85.3 g
- B. 38.8 g
- C. 21.8 kg
- D. 16.9 kg

(1 mark)

- 2 Sphere **X** has radius r and mass m_X . Sphere **Y** has mass m_Y and three times the radius of Sphere **X**. Both spheres are made up of the same material.

What is the value of the ratio $\frac{m_X}{m_Y}$?

- A. $\frac{1}{27}$
- B. $\frac{1}{9}$
- C. 3
- D. 27

(1 mark)

- 3** A submarine starts to descend from the surface of the sea at a constant acceleration of 0.25 m s^{-2} .

What is the total pressure on the submarine when it reaches 9 m s^{-1} ?

Density of seawater = $1.03 \times 10^3 \text{ kg m}^{-3}$

Atmospheric pressure = 101 kPa

- A.** 283 kPa
- B.** 3370 kPa
- C.** 1640 kPa
- D.** 1740 kPa

(1 mark)

- 4** A block of volume 81 cm^3 is floating in water and is completely submerged.

Given that the density of water is $1.0 \times 10^3 \text{ kg m}^{-3}$, what is the weight of the water displaced by the block?

- A.** 790 N
- B.** 81 N
- C.** 0.79 N
- D.** 0.081 N

(1 mark)