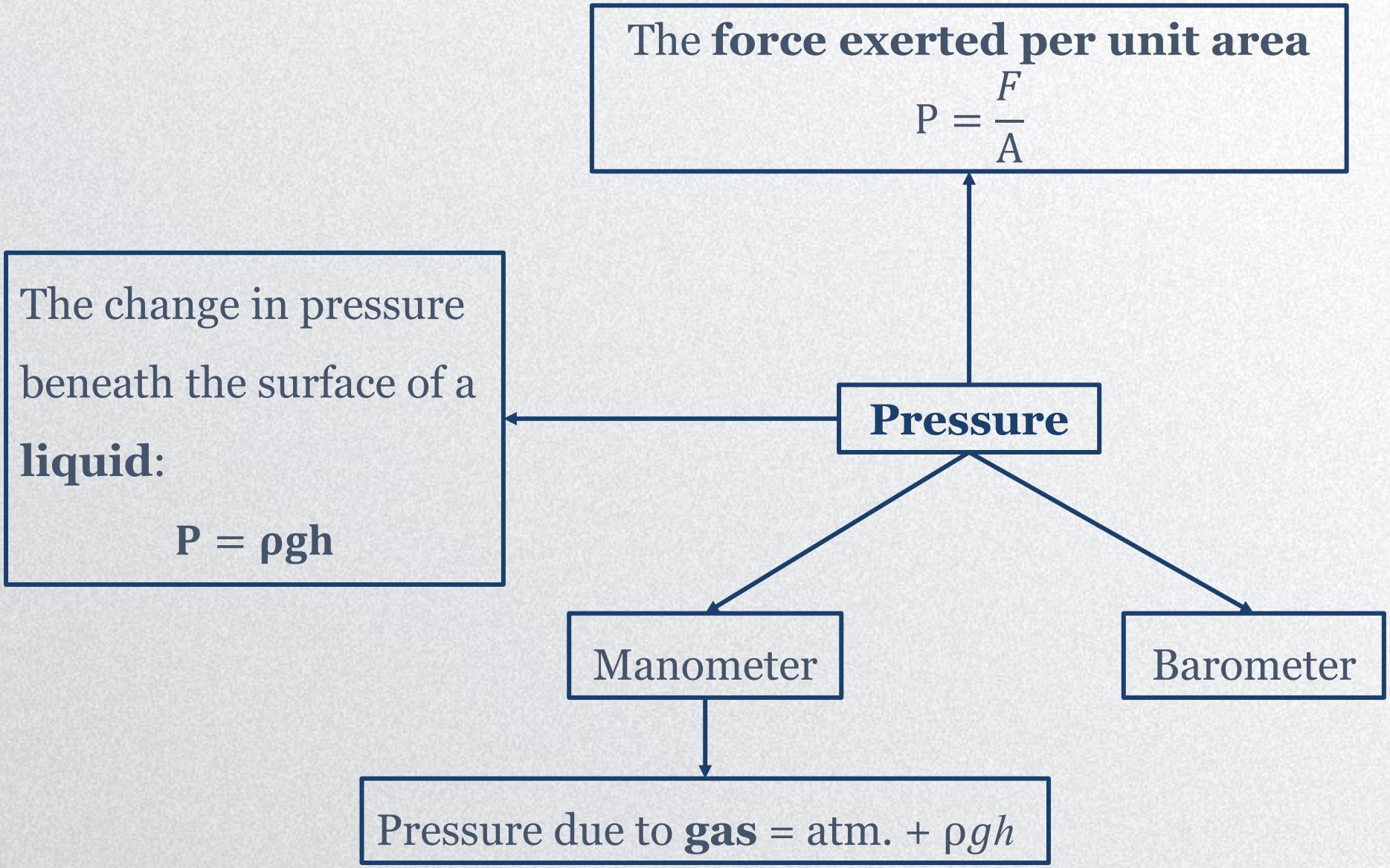
Pressure


The **force exerted per unit area**
$P = \frac{F}{A}$
The change in pressure beneath the surface of a **liquid**:
P = ρgh
Pressure
Manometer
Barometer
Pressure due to **gas** = atm. + ρgh

Pressure

- Pressure is the force exerted per unit area:

$$Pressure\left(\frac{N}{m^2}\right) = \frac{force\ (\mathrm{N})}{area\ (m^2)}$$

$$\boldsymbol{P = \frac{F}{A}}$$

- Pressure is a measure of the force being applied to the surface of something. It relates how much force is being applied onto an object to the area that it is applied over.
- Pressure is measured in *pascals (Pa) or kilopascals (kPa).* $\boldsymbol{1\ Pa = 1\ N/m^2}$

Pressure

- In **gasses and liquids at rest**, the pressure at any point acts equally in all directions.
- In gasses and liquids, the pressure increases with depth.
  - The pressure is higher at the bottom of the sea than at the surface
  - The pressure is lower high up in atmosphere than close to the Earth.
- The change in pressure beneath the surface of a liquid:

$$\mathbf{P = \rho g h}$$

where

P = pressure beneath liquid surface (Pa)

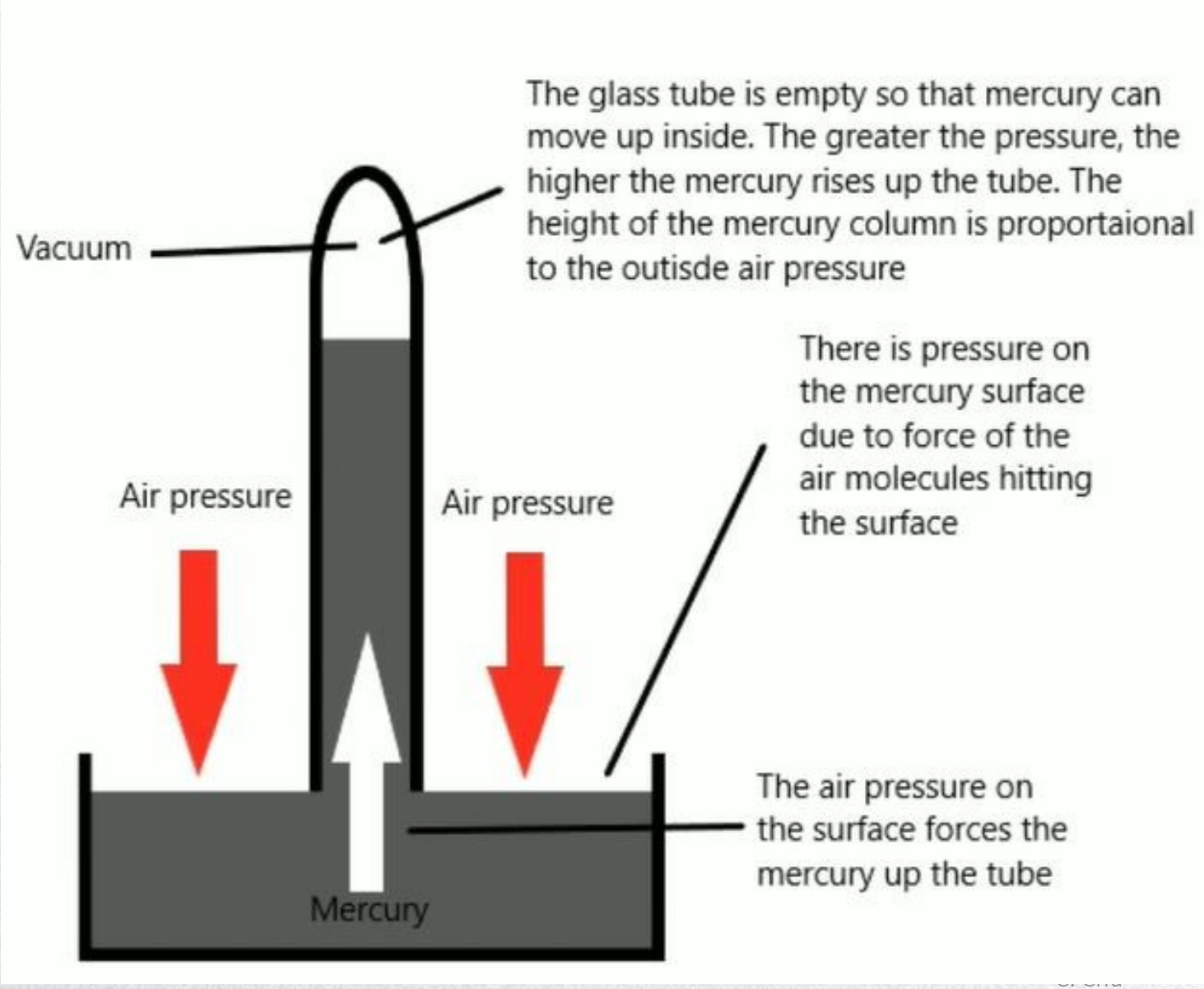
ρ = density (kg/m^3)

g = acceleration due to gravity (m/s^2)

h = depth (m)

Mercury Barometer

A barometer is an instrument measuring **atmospheric pressure**, used especially in forecasting the weather and determining altitude.

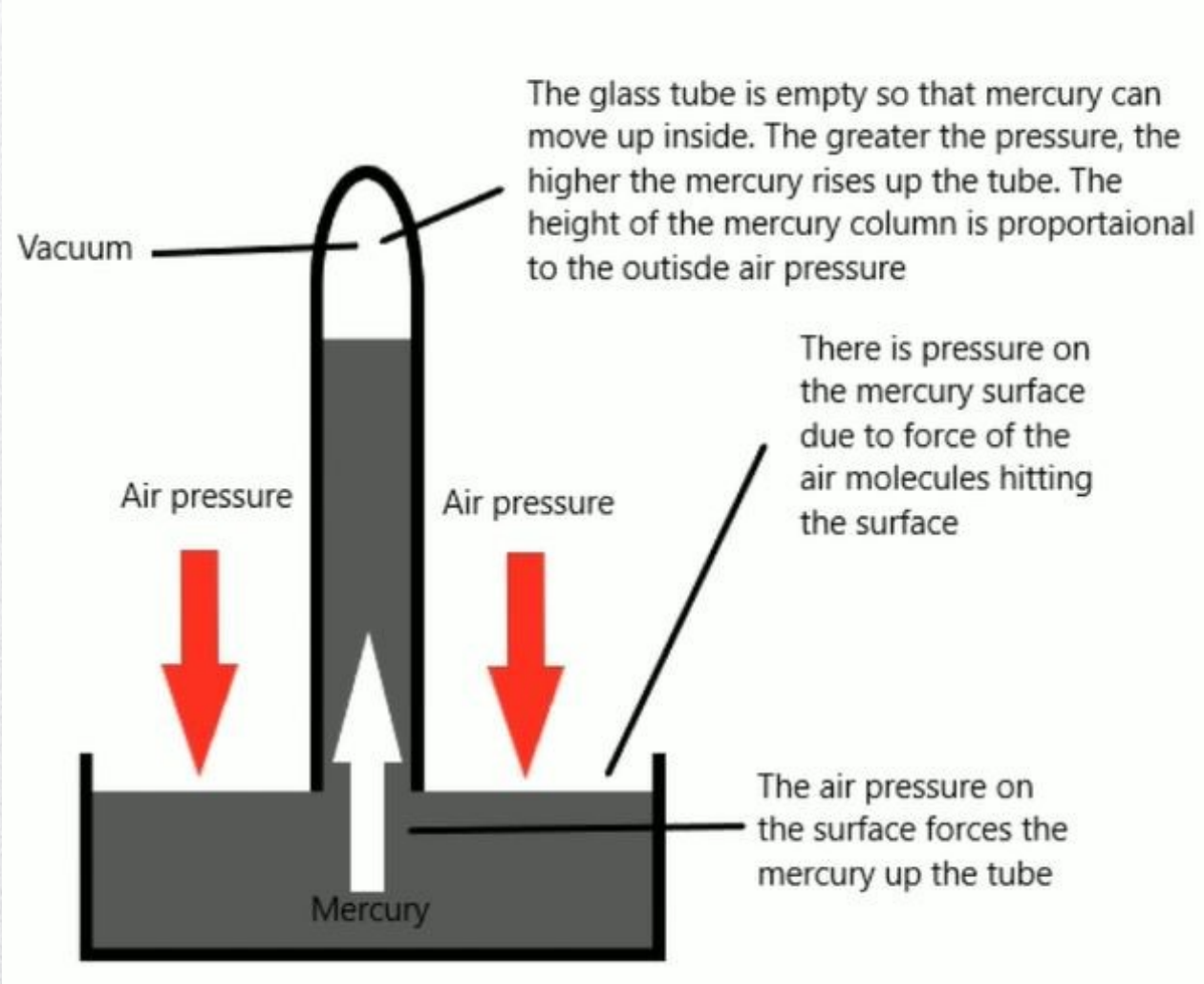


Mercury Barometer

1 atm. of pressure = 101.3 kPa

= 1.01 × 10^5 Pa

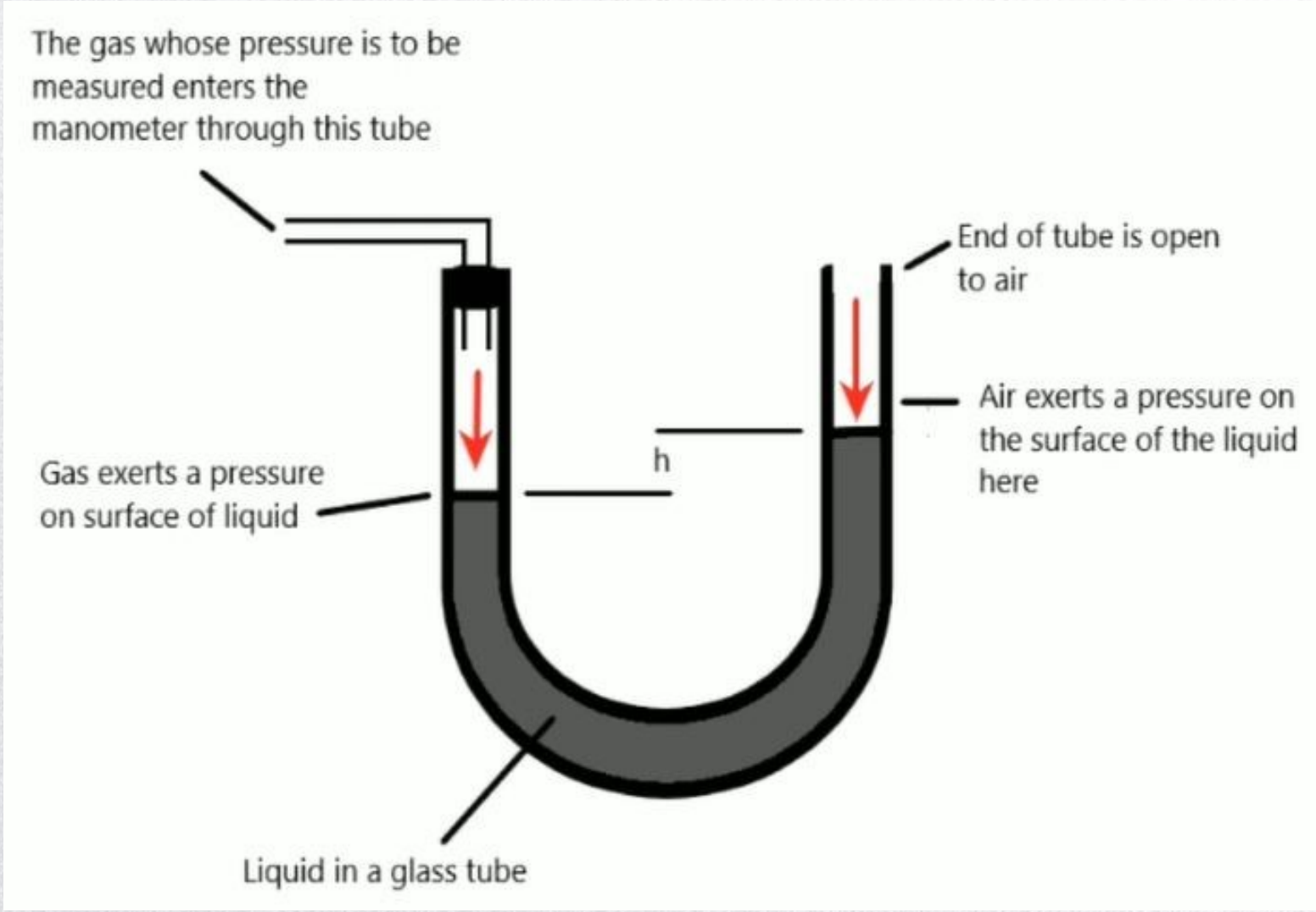
= 760 mmHg



Manometer

A manometer is a device **to measure pressures.**

A common simple manometer consists of a U-shaped tube of glass filled with some liquid.



Pressure

- *Pressure due to gas = atm. + ρgh*

where

atm. = atmospheric pressure (Pa)

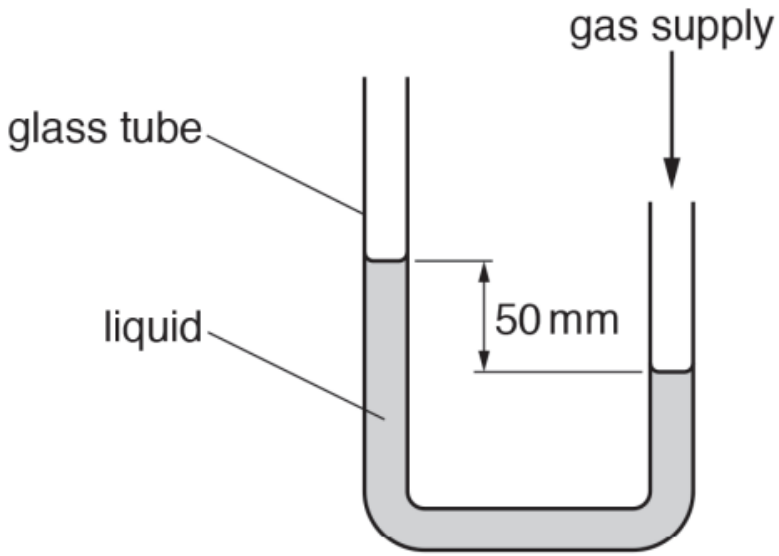
ρ = density of liquid (kg/m^3)

g = acceleration due to gravity ($10\ m/s^2$)

h = difference in height of two liquid surfaces (m)

Pressure

The diagram shows a device that measures the pressure of a gas.

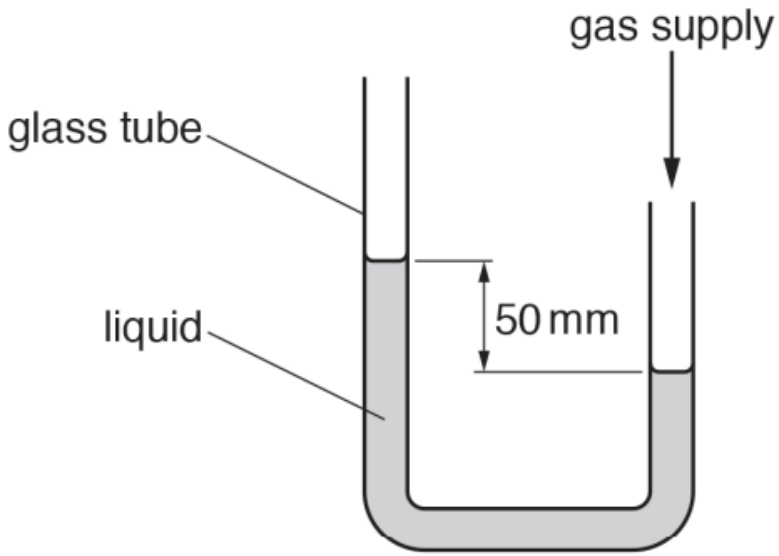


(a) State the name of the device.

..... [1]

Pressure

The diagram shows a device that measures the pressure of a gas.



(a) State the name of the device.

manometer

..... [1]

Pressure

(b) The pressure of the gas is 400 Pa greater than atmospheric pressure.

Calculate the density of the liquid.

density = ... [2]

[Total: 3]

Pressure

(b) The pressure of the gas is 400 Pa greater than atmospheric pressure.

Calculate the density of the liquid.

$P = \rho gh$ in any form **OR**
$(\rho =)\ P / gh$ (1)

$(\rho = 400 / (10 \times 0.05) =)$
$800\ \text{kg/m}^3$ (1)

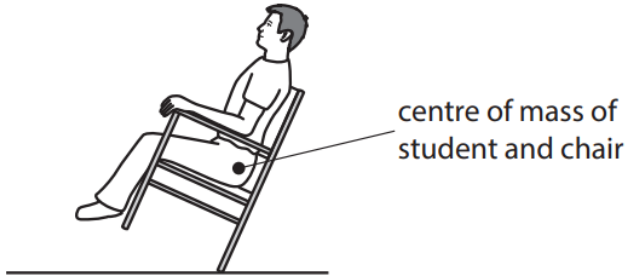
density = ... [2]

[Total: 3]

Pressure

A student is sitting on a chair as shown in the figure.

The student then tips his chair back to the position shown in the figure below.



State and explain how the pressure exerted by the chair on the floor in the second figure compares with the pressure exerted by the chair in the first figure.

statement .....

explanation .....

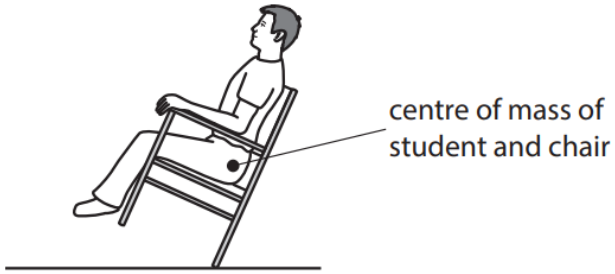
.....

..... [3]

Pressure

A student is sitting on a chair as shown in the figure.

The student then tips his chair back to the position shown in the figure below.



State and explain how the pressure exerted by the chair on the floor in the second figure compares with the pressure exerted by the chair in the first figure.

statement Pressure is greater in the second figure .....

explanation Force/weight is the same, but smaller contact area in the second figure. .....

..... [3]

pressure greater in second figure **OR** reverse argument	**B1**
force/weight is the same	**B1**

smaller (contact/surface) area	**B1**