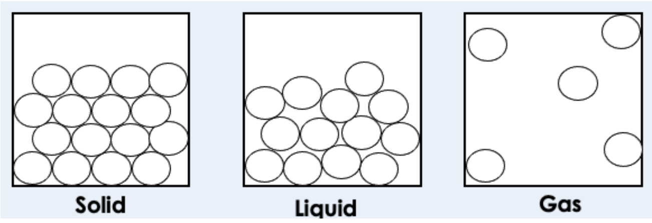
Particles and Density

1. **Particle diagrams** can be used to represent the arrangement and movement of particles in solids, liquids and gases.

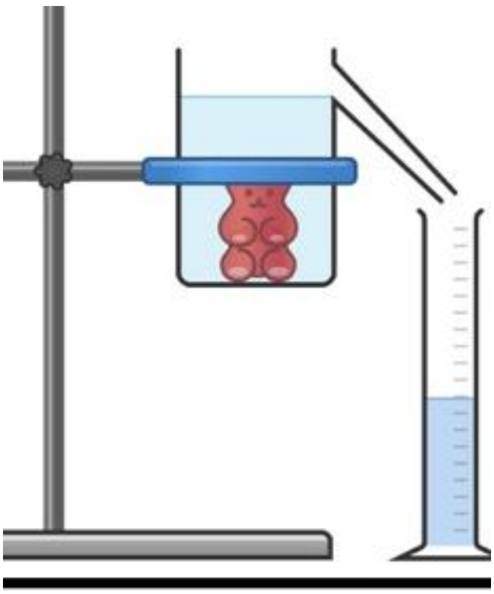


2. Solids are the most dense state of matter as the particles are held most closely together due to the **forces of attraction**.
3. **Density** is the **mass per unit volume**.
4. Density can be calculated using the equation:

   Density = mass/volume

   $\rho = m/V$

   with density, ρ, in kilograms per metre cubed, kg/m^3; mass, m, in kilograms, kg; volume, V, in metres cubed, m^3
5. The density of a **regular** shaped solid can be calculated by measuring its **mass** and **volume**, then using the equation.
6. The density of an **irregular** solid or liquid can be determined using its **mass** and **displacement** of liquid.



Gas Pressure

7. A **fluid** is a substance with **no fixed shape** - a liquid or a gas
8. Gas pressure is caused by **collisions** of particles with the walls of a container
9. Pressure is measured in Pascals (Pa)
10. Changing the temperature of a gas at constant volume changes the pressure exerted by the gas
11. Particles at **higher temperatures**, have higher thermal energy and move more quickly, so they have a **higher pressure**

Physics Only: Pressure

12. In a **sealed container**, with the same number of particles at constant temperature, **decreasing** the **volume** of a gas **increases** the **pressure** of the gas
13. The pressure of the gas is **inversely proportional** to its volume. This is because when the volume is decreased, the gas particles will collide more frequently with the walls of the container. More collisions mean more force, so the pressure increases
14. ***Work*** *is the* ***transfer*** *of* ***energy*** *by a* ***force****.*
15. *Doing work on a gas increases the internal energy of the gas and can cause an increase in the temperature of the gas.*
16. *Increasing the volume in which a gas is contained, at constant temperature, can lead to a decrease in pressure.*
17. $p_1V_1=p_2V_2$*, where* p_1 *and* V_1 *are the initial pressure and volume values, and* p_2 *and* V_2 *are the pressure and volume values after change*
18. ***Fluid particles*** *exert a* ***force*** *on any* ***surface*** *they collide with. This force is always at* ***right angles*** *to the* ***surface***
19. *Pressure exerted on a solid is calculated using the equation:*

    pressure= force/area

20. ***Liquids*** *are* ***incompressible*** *so can be used to transmit forces through hydraulic systems*
21. *The pressure remains constant in the system so if the area increases, the* ***force*** *is* ***multiplied****, which is how heavy objects can be lifted or controlled*
22. *The* ***deeper*** *you go in* ***water*** *the* ***greater*** *the* ***pressure*** *becomes, because the greater the weight of water above you*
23. *The pressure due to a* ***column*** *of* ***liquid*** *can be calculated using the equation:*

    pressure = height of the column × density of the liquid × gravitational field strength

    $$p = h\rho g$$

24. *pressure, p, in Pascals, Pa; height of the column, h, in metres, m; density, ρ, in kilograms per metre cubed, kg/m^3; gravitational field strength, g, in newtons per kilogram, N/kg*
25. *In a liquid, pressure at a point increases with the height of the column of liquid above that point and with the density of the liquid because there are more particles exerting a downward force*
26. *A partially (or totally) submerged object experiences a* ***greater pressure*** *on the* ***bottom*** *surface than on the* ***top*** *surface. This creates a* ***resultant force upwards****. This force is called the upthrust*
27. *The atmosphere is a thin layer (relative to the size of the Earth) of air round the Earth. The* ***atmosphere*** *gets* ***less dense*** *with increasing* ***altitude***
28. *Air molecules colliding with a surface create atmospheric pressure*
29. *The number of air molecules (and so the weight of air) above a surface decreases as the height of the surface above ground level increases. So as* ***height increases*** *there is always less air above a surface than there is at a lower height. So* ***atmospheric pressure decreases*** *with an increase in height*