

# WJEC England GCSE Physics

## 2 - Particle Model of Matter

### Flashcards

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What is the definition of density? State the relevant equation with units.



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- The mass per unit volume of a material
- $\rho = m/v$
- Density ( $\text{kg/m}^3$ ), Mass (kg), Volume ( $\text{m}^3$ )



State the different states of matter in order of smallest to largest density of atoms.



State the different states of matter in order of least to most density of atoms.

- Least dense: Gas
- Liquid
- Most dense: Solid



What is always conserved when a substance undergoes a change of state?



What is always conserved when a substance undergoes a change of state?

Mass



Describe the motion of molecules in a gas.





Describe the motion of molecules in a gas.

They are in constant random motion.



What factor affects the average kinetic energy of gas molecules?



What factor affects the average kinetic energy of gas molecules?

- The temperature of the substance.
- The higher the temperature, the higher the **average** kinetic energy of the molecules.



What effect does increasing temperature have on the pressure of a gas (when held at constant volume)?



What effect does increasing temperature have on the pressure of a gas (when held at constant volume)?

Pressure of the gas will increase as its temperature increases.



Why does pressure increase as temperature increases, at a constant volume?



## Why does pressure increase as temperature increases, at a constant volume?

- Kinetic energy of molecules increases.
- Collisions between molecules becomes more frequent.
- Greater rate of change of momentum.
- Greater force and therefore pressure.



If gas A is at a low pressure, and gas B is at a high pressure, what can be said about the rate of collisions in each gas?





If gas A is at a low pressure, and gas B is at a high pressure, what can be said about the rate of collisions in each gas?

- There are more collisions per second in gas A than in gas B.
- The rate of collisions is higher in A.



Describe the force that the pressure of a gas exerts on the walls of its container.



Describe the force that the pressure of a gas exerts on the walls of its container.

- The net force acts at right-angles to the container's surface.
- The force increases as pressure increases.



Explain how increasing the volume of a gas results in a decrease of pressure.



Explain how increasing the volume of a gas results in a decrease of pressure.

- Molecules become more spread out and so time between collisions increases.
- This is a reduced rate of collisions.
- Rate of change of momentum decreases, and so force exerted on container decreases, resulting in a lower pressure.



What can be said about the product of pressure and volume for a fixed mass of gas at a constant temperature?



What can be said about the product of pressure and volume for a fixed mass of gas at a constant temperature?

It is constant.

$$p V = \text{constant}$$



What is the unit used for pressure?





# What is the unit used for pressure?

Pascal (Pa).



What increases when you do work on a gas?



# What increases when you do work on a gas?

- The internal energy of the gas
- This can also lead to an increase of temperature



Why does the temperature of air inside a bike pump increase when it is pumped?



Why does the temperature of air inside a bike pump increase when it is pumped?

- Work is done on a gas when it is compressed.
- Doing work on a gas increases its internal energy, and so also the average kinetic energy of the molecules.
- Temperature increases with an increase of average kinetic energy.



# What is sublimation?



## What is sublimation?

- When a substance transitions from a solid phase straight to a gas phase.
- It does not pass through liquid phase.



Describe the particle arrangement of a solid.





Describe the particle arrangement of a solid.

- Particles are closely packed together in a uniform pattern.
- Particles can vibrate but are fixed in position by strong bonds.



Describe the particle arrangement of a liquid.



Describe the particle arrangement of a liquid.

- Relatively tightly packed together.
- Particles can vibrate and move small distances relative to one another.



Describe the particle arrangement of a gas.



Describe the particle arrangement of a gas.

- Particles are free to move as they wish and have negligible bonds between each other.
- They have more kinetic energy than solids and liquids.

