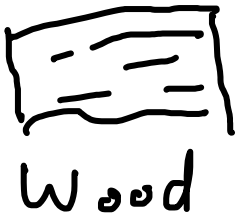
compare the properties of solids, liquids and gases

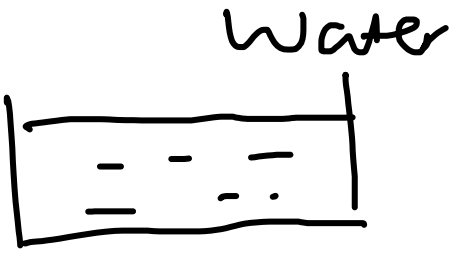
Solids, Liquids and Gases

Dr K M Hock

Solids : fixed shapes, volumes



Liquids: flows, shapes not fixed, volume fixed.



Gas: shapes not fixed, volume not fixed

can compress

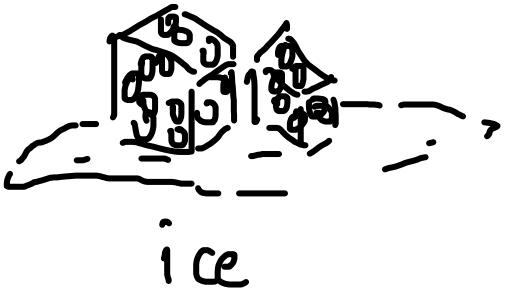
describe qualitatively the molecular structure of solids, liquids and gases, relating their properties to the forces and distances between molecules and to the motion of the molecules

Molecular Structures

Dr K M Hock

Solids: fixed shapes, volumes

- Made up of very small molecules ~ 1 nm in size, close together

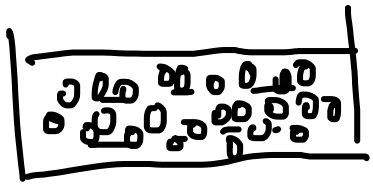


- Attract each other strongly, so molecules cannot move

- Fixed shape

Liquid: Flows, shapes not fixed, volume fixed.

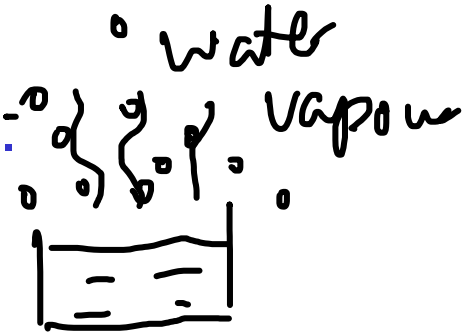
Molecules have enough energy to partly overcome some attraction to move around --> can flow



Gas: Shapes not fixed, volume not fixed.

Molecules - enough energy to overcome attraction completely:

- far apart
- gas volume not fixed



infer from Brownian motion experiments the evidence for the movement of molecules

Brownian Motion

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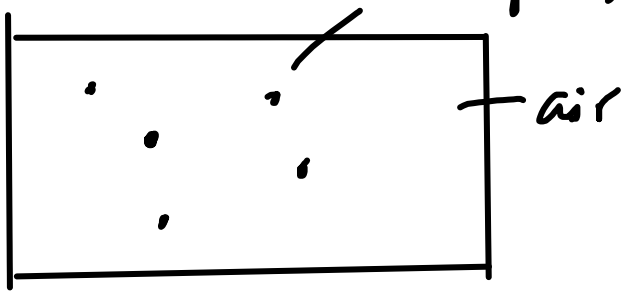
e.g.



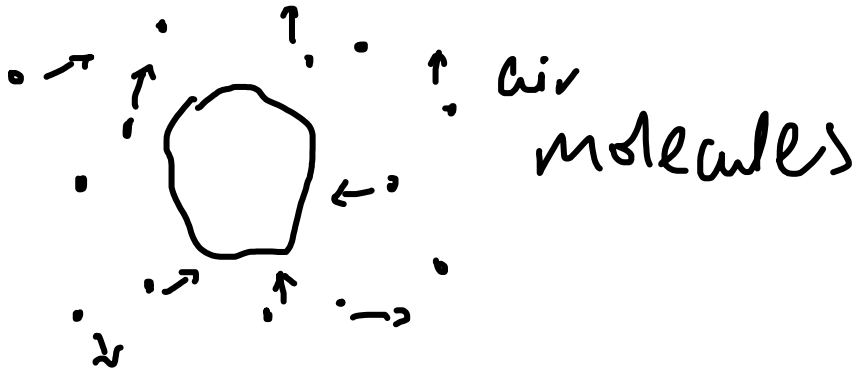
but no wind.

Why?

Einstein - because air made up of very small molecules

→ randomly hitting smoke particles

Greatly magnified smoke particle



Brownian motion - evidence for existence of molecules

describe the relationship between the motion of molecules and temperature

Molecules and Temperature

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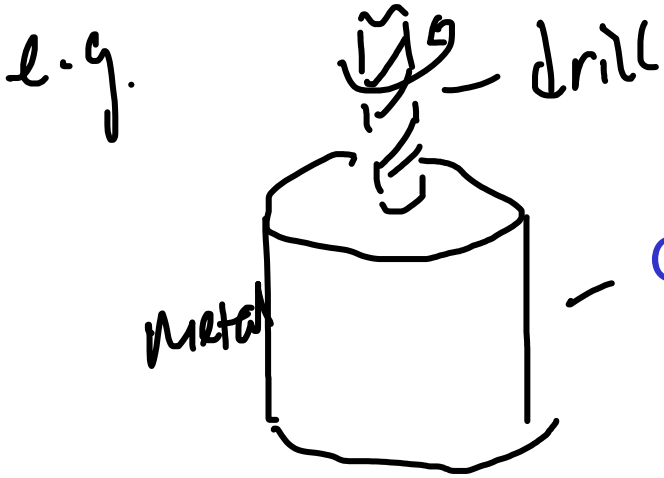
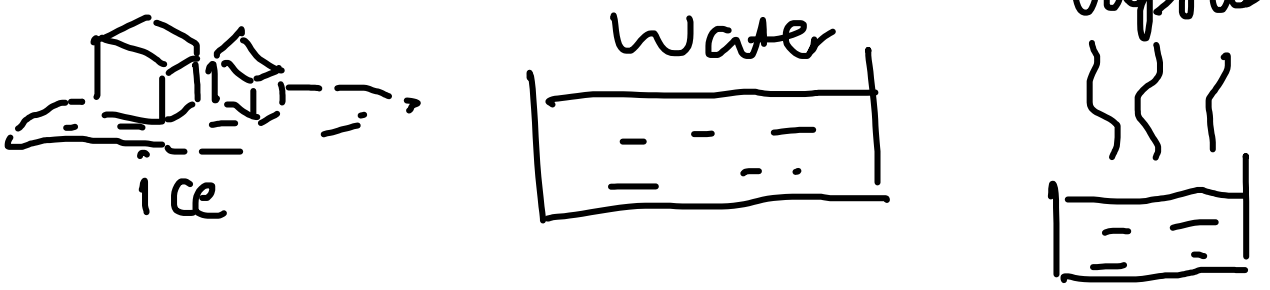


Temperature is related to motion.

Actually, in all

solid liquid gas



Molecules vibrate - move faster

as temperature ↑

describe the relationship between the motion of molecules and temperature

Pressure

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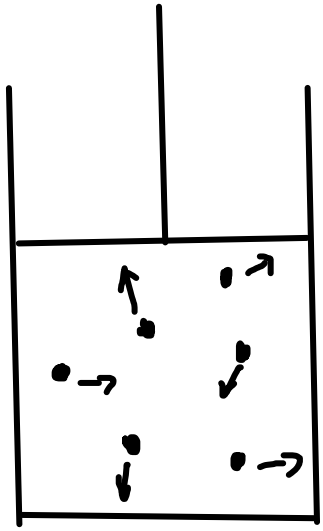
e.g.



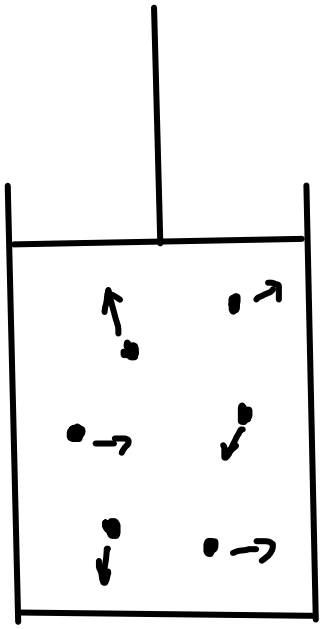
gas molecules hit

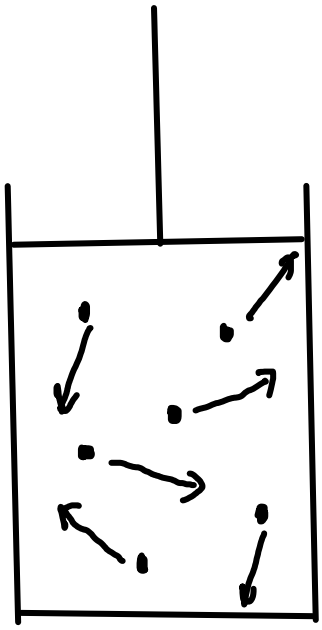
wall ---> pressure

e.g. bigger volume

---> fewer molecules
hit the same area on wall

---> lower pressure





e.g. higher temperature

--> faster molecules

--> hit wall harder

--> higher pressure

recall and explain the following relationships using the kinetic model

Kinetic Model

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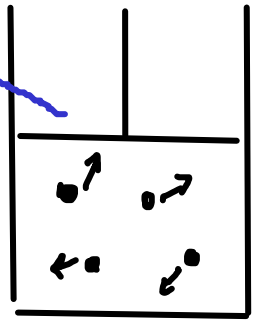
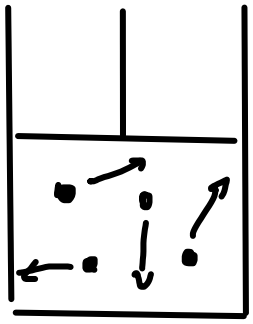
Constant volume

$T \uparrow \quad p \uparrow$

fixed





bigger force

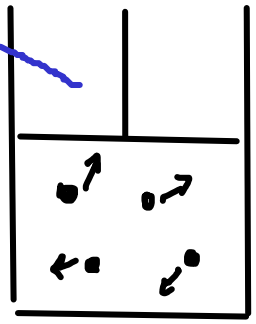
↓

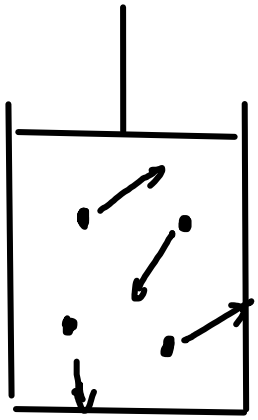
same wall area

Constant pressure

$T \uparrow \quad V \uparrow$

not fixed





bigger force

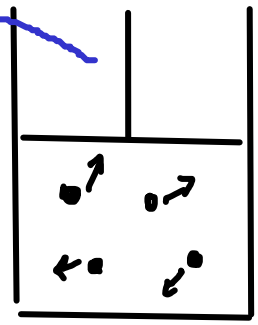
↓

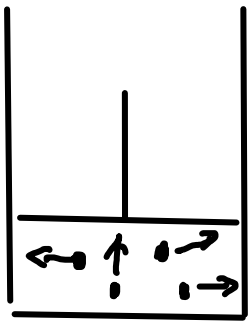
bigger wall area

Constant temperature

$V \downarrow \quad p \uparrow$

not fixed





same force

↓

smaller wall area