

IP Science (SCGS)

Kinetic Particle Theory

Kinetic Particle Theory:

→ All matter is made of particles that are in constant random motion.

Brownian Motion

→ The constant random motion that all particles have.

* Matter = tiny particles (atoms, molecules, ions)

Particles ⇒ have kinetic energy

⇒ in constant random motion



* Diff. physical states (solid, liquid, gas)

⇒ diff. amount of space in between particles

⇒ different motions for different physical states.

Behaviour of matter in its

DIFFERENT STATES

→ How particles behave when in different physical states.

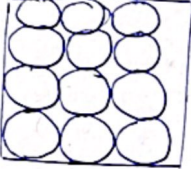
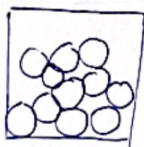
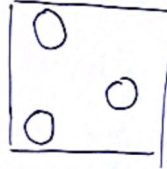
Diff. ~~change~~ factors:

→ Attractive force between particles

→ Arrangement of particles

→ Motion of particles

→ Space between particles

Factor	Solid	Liquid	Gas
Attractive force between particles	→ Very strong	→ strong	→ weak
Space between particles	→ Very little/no space between (very closely packed together)	→ Some space (closely packed together)	→ Lots of space (loosely packed / far apart)
Arrangement of particles	→ Orderly manner 	→ disorderly manner (sliding past one another) 	→ disorderly Move randomly & quickly in all directions 

Expansion & Contraction (Temperatures)

Expansion

① When — is heated, the particles **GAIN HEAT**, causing them to **GAIN ENERGY**. ② This makes the particles **MOVE FASTER**, ~~pushing~~ **AND FURTHER**, ③ **growing FURTHER APART** from each other to **take up more space**.

* Object retains constant mass during expanding.

Contraction

① When — is cooled, its particles **LOSE HEAT**, causing them to **LOSE ENERGY** and ~~MOVE SLOWER and less~~ **MOVE SLOWER and LESS**, coming **closer to one another**.

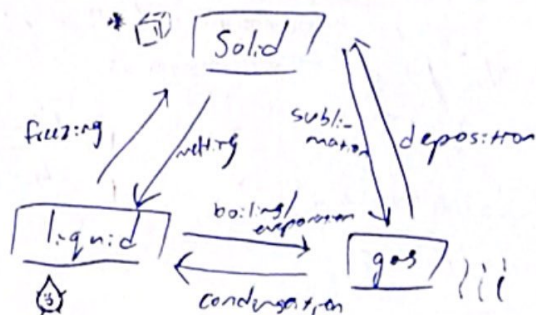
* Object ~~and~~ mass is constant.

Changes in Physical states of matter

GAIN HEAT (solid $\rightarrow$ liquid $\rightarrow$ gas)

Melting:

- ① Gain energy when heated
- ② Vibrate more vigorously
- ③ Attractive force ~~weakens~~
- ④ Goes from <insert arrangement & movement of solid> to <insert arrangement & movement of liquid>



* Temp. remains constant during melting
 $\rightarrow$ No change in KE
(heat used to break bonds, not read)

Boiling:

- ① Gain energy when heated
- ② ~~vibrate~~ ^{Move} more vigorously
- ③ Gain enough energy to weaken/overcome strong attractive force
- ④ Goes from <insert arrangement & movement of liquid> to <insert arrangement & movement of gas>



LOSE HEAT (gas $\rightarrow$ liquid $\rightarrow$ solid)

Condensation:

- ① Lose energy when cooling
- ② Move/less vigorously
- ③ Lose enough energy to allow strong attractive forces to form $\Rightarrow$ closely packed together
- ④ goes from <ALM of gas> to <ALM of liquid>



Freezing:

- ① Lose energy
- ② Move/less vigorously (morph into vibration)
- ③ lose energy $\Rightarrow$ strong attractive force
- ④ goes from <ALM of liquid> to <ALM of ~~liquid~~ solid>

