🧠 What is Matter?

Matter is anything that occupies space and has mass.
Sab kuch jo tum dekh sakte ho, choo sakte ho — chahe wo kitab ho, hawa ho, pani ho ya khana — sab matter ke roop hain.

🟩 Definition:
Matter → Anything that has mass and occupies space.

Examples:
Chair, air, clouds, smoke, water, dust — sab matter hain.
But emotions (like love, anger) ya smell khud matter nahi hote — unka source hota hai (e.g. perfume is matter, smell is not).

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🔬 Activity 1.1 – Is Matter Made of Particles?

Step-by-step:

- Lo ek glass mein paani (about 100 mL).
- Usme ek chamach namak ya cheeni daalo.
- Chammach se hilao.
- Observe karo — kya water level badh gaya?

Observation:
Water level almost same rehta hai, cheeni ghul jaati hai.

Inference:
Salt/sugar ke particles paani ke molecules ke beech ke space mein ghus jaate hain.
👉 So, matter is made up of tiny particles and they have space between them.

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🔬 Activity 1.2 – How Small Are These Particles?

- Lo ek glass mein paani (100 mL).
- Usme ek chamach potassium permanganate ($KMnO_4$) daalo — purple solution ban jaayega.
- 10 mL leke dusre glass mein 90 mL paani daalo → dilute karo.
- Aise hi 5–6 baar repeat karo — har baar same method.

Observation:
Purple rang har baar dilute hota jaata hai, lekin colour fir bhi dikhai deta hai.

Inference:
$KMnO_4$ ke particles itne chhote hote hain ki ek glass se 5–6 glasses colour kar lete hain.

👉 So, matter ke particles bahut chhote hote hain.

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💡 Characteristics of Particles of Matter:

🔹 1. Particles Have Space Between Them

→ Activity 1.1 proves this (salt fits in water).

🔹 2. Particles Are Continuously Moving

Activity 1.3:

Agar tumhe kisi kone mein agarbatti ki khushboo aati hai, iska matlab hai particles hawa mein move kar rahe hain (diffusion).

Activity 1.4:

Ek glass mein paani bharo, usme blue ink daalo — dheere dheere poore paani mein fail jaayega.

Activity 1.5:

Garam paani mein ink zyada jaldi failti hai compared to thande paani mein.

Conclusion:

Particles continuously move and higher temperature = faster movement.

🟩 Diffusion → Process of mixing due to motion of particles.

🔹 3. Particles Attract Each Other

Activity 1.6–1.8:

- Iron rod ko todna mushkil hota hai
- Chalk ko aasani se tod sakte ho
- Rubber band stretch hoti hai, phir wapas aa jaati hai

Conclusion:

Solids mein attraction strong hota hai, liquids mein moderate, gases mein weakest.

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💧 Three States of Matter:

1. Solid → Fixed shape & volume (e.g., ice, wood)
2. Liquid → Fixed volume but no shape (e.g., water, milk)
3. Gas → No fixed shape or volume (e.g., oxygen, air)

🟩 Note: Sponge compress hota hai kyunki usme air-filled pores hote hain, but it's still a solid.

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🧊 Change of State of Matter

🔬 Activity 1.9 – Ice to Water to Steam

- Ek beaker mein ice daalo
- Use stove ya spirit lamp pe garam karo
- Ek thermometer lagao
- Dekho: ice melt hoti hai (0°C), fir water boils hota hai (100°C)

Observation:

- Ice → Water at 0°C (melting point)
- Water → Steam at 100°C (boiling point)
- But temp constant rehta hai jab state change ho raha hota hai

🟩 **Latent Heat** – Heat absorbed during change of state without change in temperature.

🟦 Latent Heat of Fusion – Heat needed to convert 1 kg solid to liquid at melting point
🟦 Latent Heat of Vaporisation – Heat needed to convert 1 kg liquid to gas at boiling point

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🧪 Sublimation:

🟦 Sublimation → Solid directly changes to gas

Examples: Camphor, ammonium chloride, dry ice
🟦 Deposition → Gas directly to solid (reverse process)

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⚙️ Change by Pressure:

- Gas → Liquid by increasing pressure and decreasing temperature
- LPG, CNG are gases compressed into liquid form in cylinders

🟦 Dry Ice: Solid carbon dioxide — changes directly into gas at room pressure

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🌬️ Evaporation and Cooling:

🟦 Evaporation → Conversion of liquid to vapour below boiling point

Affected by:

- Surface area ↑ → evaporation ↑
- Temperature ↑ → evaporation ↑
- Wind speed ↑ → evaporation ↑
- Humidity ↓ → evaporation ↑

🟩 Evaporation causes cooling → Because particles take heat from surroundings to escape

Examples:

- Acetone on palm feels cool
- Water sprinkled on floor feels cool
- Sweating keeps body temperature under control

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📌 Summary Table:

State	Shape	Volume	Compressible	Flow	Interparticle Force	Diffusion
Solid	Fixed	Fixed	No	No	Strong	Very slow
Liquid	No	Fixed	Slightly	Yes	Moderate	Moderate
Gas	No	No	Yes	Yes	Weak	Fast

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📚 Important Terms:

Term	Meaning
Matter	Anything with mass and volume
Diffusion	Mixing due to particle movement
Sublimation	Solid to gas change directly
Latent Heat	Hidden heat used in state change
Melting Point	Solid → Liquid temp (0°C for ice)
Boiling Point	Liquid → Gas temp (100°C for water)
Evaporation	Slow vaporisation from surface
Dry Ice	Solid CO_2