⚖️ Topic: Conservation of Energy

✅ A - Aim

To understand the **Law of Conservation of Energy** and how energy is neither created nor destroyed, only transformed from one form to another.

💡 C - Concept

- The total energy of an **isolated system remains constant**.
- Energy can **change forms** (e.g., potential to kinetic, chemical to thermal) but the total energy stays the same.

⚙️ H - How it works

- When a ball falls, **potential energy** is converted to **kinetic energy**.
- In machines, energy might transform into **heat, sound, or motion** – but no energy is lost, only changed in form.
- Ideal systems have **no loss**; real systems may have **friction, resistance**, etc., but total energy is conserved.

🧮 E - Equations/Formulas

1. **Total Energy (Ideal System)**:
   $E=KE+PE=constant$E = KE + PE = \text{constant}E=KE+PE=constant
2. **Mechanical Energy Conservation**:
   $KE1+PE1=KE2+PE2$KE_1 + PE_1 = KE_2 + PE_2KE1+PE1=KE2+PE2
3. **Units**:
   - Energy: **Joule (J)**

🔢 S - Steps to solve problems

1. Identify all **initial and final energy forms** (usually KE and PE).

2. Apply **conservation equation**:
   KEinitial+PEinitial=KEfinal+PEfinalKE_{initial} + PE_{initial} = KE_{final} + PE_{final}KEinitial+PEinitial=KEfinal+PEfinal

3. Plug in known values and solve.

4. Ensure **units are consistent**.

5. Interpret results in terms of energy transformation.

📘 E - Example

Q: A 1 kg object is dropped from a height of 20 m. What is its speed just before hitting the ground (ignore air resistance)?
Sol:

- Initial: PE=mgh=1×9.8×20=196 JPE = mgh = 1 \times 9.8 \times 20 = 196 \, JPE=mgh=1×9.8×20=196J, KE=0KE = 0KE=0

- Final: PE=0PE = 0PE=0, all energy is converted to KE

- KE=12mv2=196KE = \frac{1}{2}mv^2 = 196KE=21mv2=196
  ⇒ v2=2×1961=392v^2 = \frac{2 \times 196}{1} = 392v2=12×196=392
  ⇒ v=392≈19.8 m/sv = \sqrt{392} ≈ 19.8 \, m/sv=392≈19.8m/s