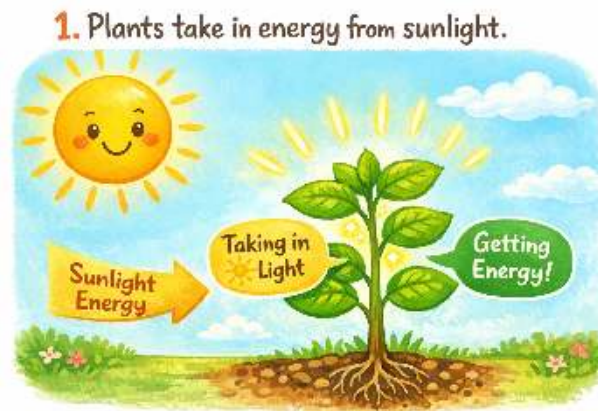


Science 10 - Physics

Energy and Chemical Reactions



Vocab	What it means
Photosynthesis	The process plants use to make their own food using energy from sunlight
Cellular respiration	Break down sugar with oxygen to get energy

Easy explanation

- Every energy reaction changes energy. These changes are important for life on Earth.
- In photosynthesis, green plants take in energy from sunlight.
- Plants keep the energy inside the sugar they make.
- Animals eat plants and use the energy in them. This energy helps animals grow and move.

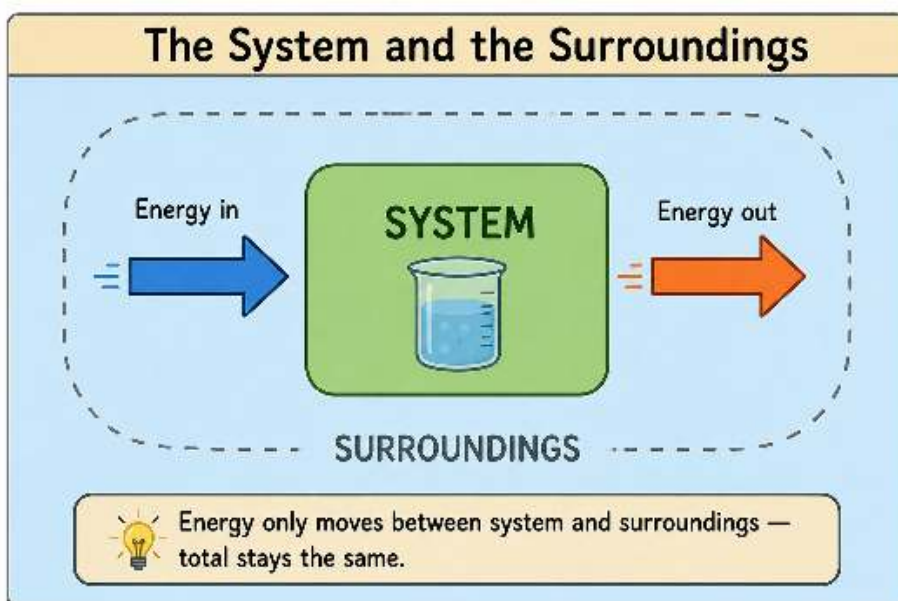
The System and the Surroundings



Easy explanation

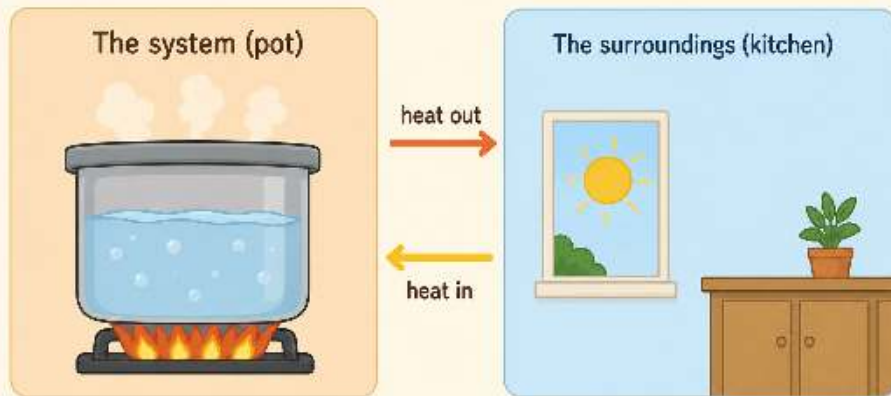
- The system is the stuff that reacts. Everything else around it is the surroundings.
- Energy cannot be made or destroyed. If energy leaves the system, it goes to the surroundings. If energy enters the system, it comes from the surroundings.

The System and the Surroundings



- For example, in a chemical reaction, the pot is the system. Everything outside the pot, like the kitchen, is the surroundings.
- Inside the pot, the food changes because of heat. This is like a chemical reaction.
- Heat can move from the pot to the surroundings or from the surroundings into the pot.

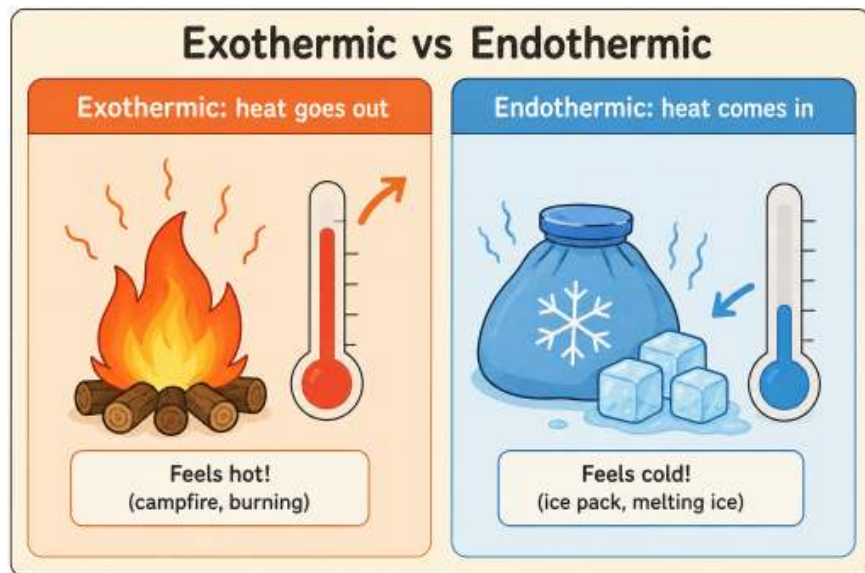
Energy just moves, it never disappears!



Total energy: always the same amount

(Example: Energy never disappears)

Exothermic and Endothermic Reactions



Vocab

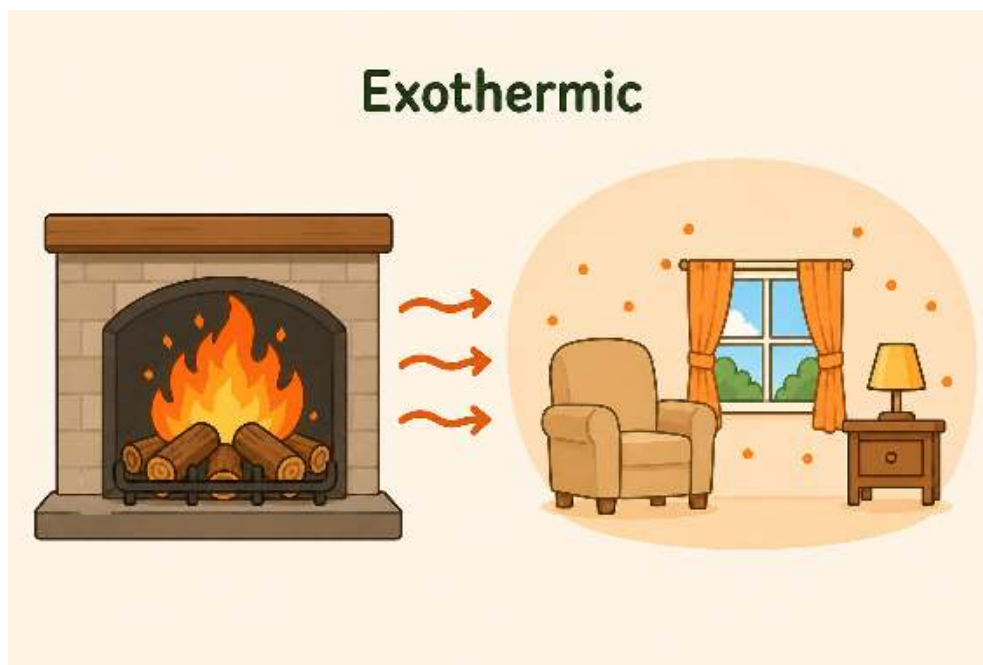
Vocab	What it means
Exothermic	A reaction that gives out heat (Makes everything nearby hot)
Endothermic	A reaction that takes in heat (Makes everything nearby cold)

Exothermic Reaction

- The reaction gives off heat. It makes the surroundings warm.
- Example: fire, hand warmers.

Examples

1. In a fireplace, wood burns
2. When wood burns, it releases heat into the room
3. Because heat goes into the surroundings, It is Exothermic



Exothermic : wood burning

Wood burns, heat leaves into the room, and the room warms up,

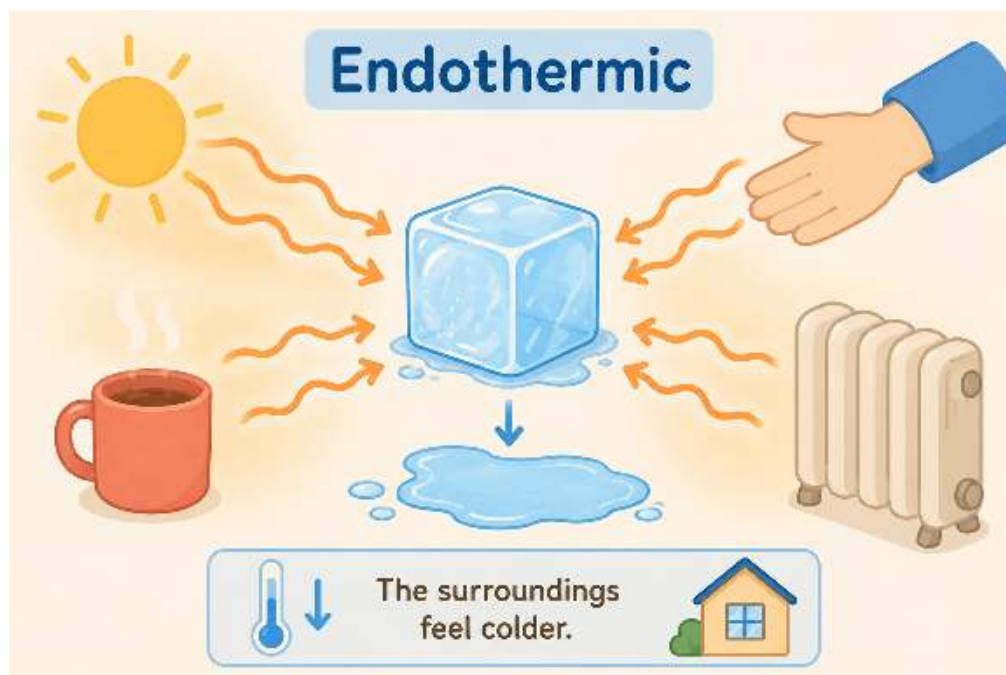
→ it's exothermic

Endothermic Reaction

- The reaction takes in heat. It makes the surroundings cold.
- Example: melting ice, cold packs.

E.G.

1. Ice needs heat to melt
2. It takes in heat from the air, your hand, or anything warm around it.
3. Because the ice absorbs heat, it melts and becomes water.
4. This is why the surroundings feel colder.

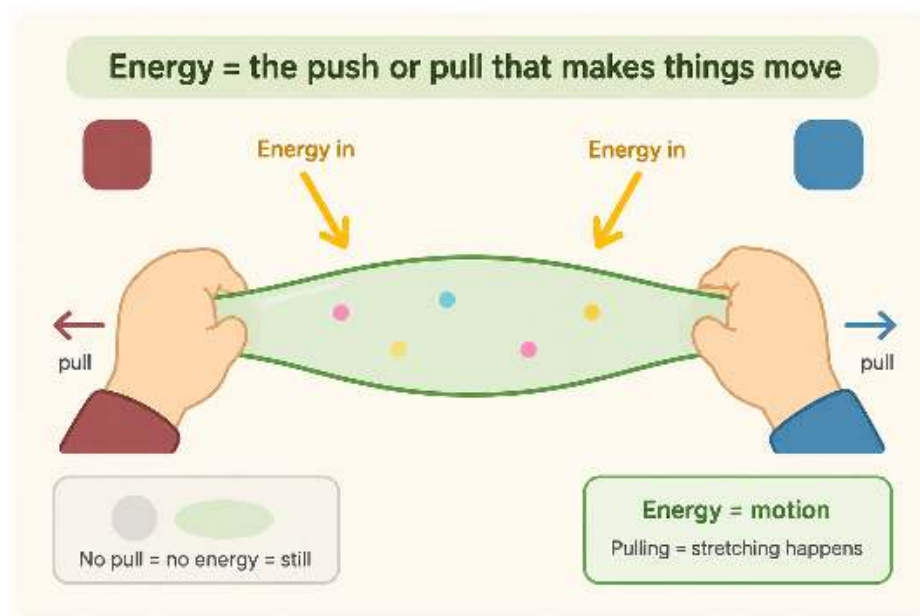


What is Energy? / Perpetual Motion Machine

Vocab	What it means
Perpetual	Forever or Never stopping
Perpetual Motion Machine	A machine that moves forever, with no extra energy

What is Energy?

- Energy makes things move.
- When you pull the slime, you give it energy. The slime stretches because of that energy. If you stop pulling, no more energy goes in and the slime stops moving.



Perpetual Motion Machine

- A forever-moving machine is impossible! You always need more energy.

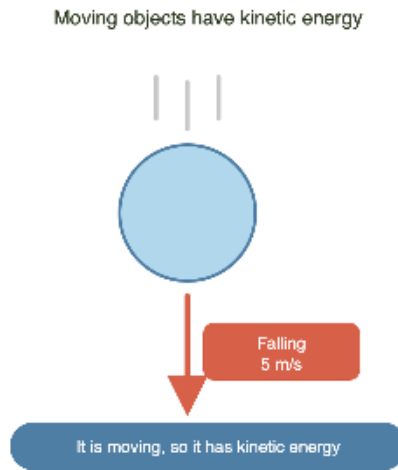
Example

- Slime can change shape, melt, or become hard.
- But the slime is still the same material, and the amount stays the same.
- Even if you cut it, it is just the same slime in smaller pieces.

Easy explanation

- Energy makes things change.
- Energy can move or change into another form.
- A perpetual motion machine is a machine that runs forever without new energy, but this is impossible.

Types of Kinetic Energy



Concept

- There are different kinds of kinetic energy (Energy an object has when it moves).

Example

Type	Example	Visual
Mechanical	a runner moving	 MECHANICAL ENERGY
Thermal	hot tea has fast-moving particles	 THERMAL ENERGY
Radiant	sunlight	 RADIANT ENERGY
Electrical	electrons moving in a wire	 ELECTRICAL ENERGY
Sound	vibrations in air	 SOUND ENERGY

Sled & Energy Loss



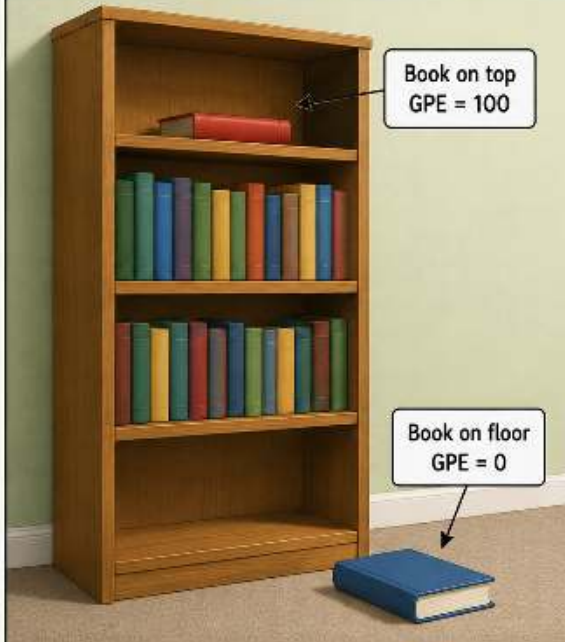
*Key idea : Friction is a force that slows the sled down.

It creates heat, which is energy we can't use again.

Vocab	What it means
Gravitational Potential Energy	Stored energy an object has because it's high up.
Kinetic energy	Energy an object has because it's moving
Friction	A force that slows things down when two surfaces rub together.

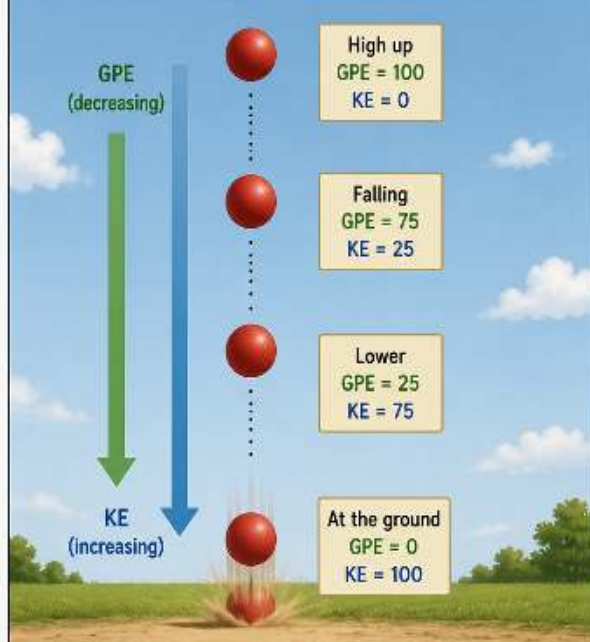
Gravitational Potential Energy and Kinetic Energy

GRAVITATIONAL POTENTIAL ENERGY



The higher an object is, the more GPE it has.

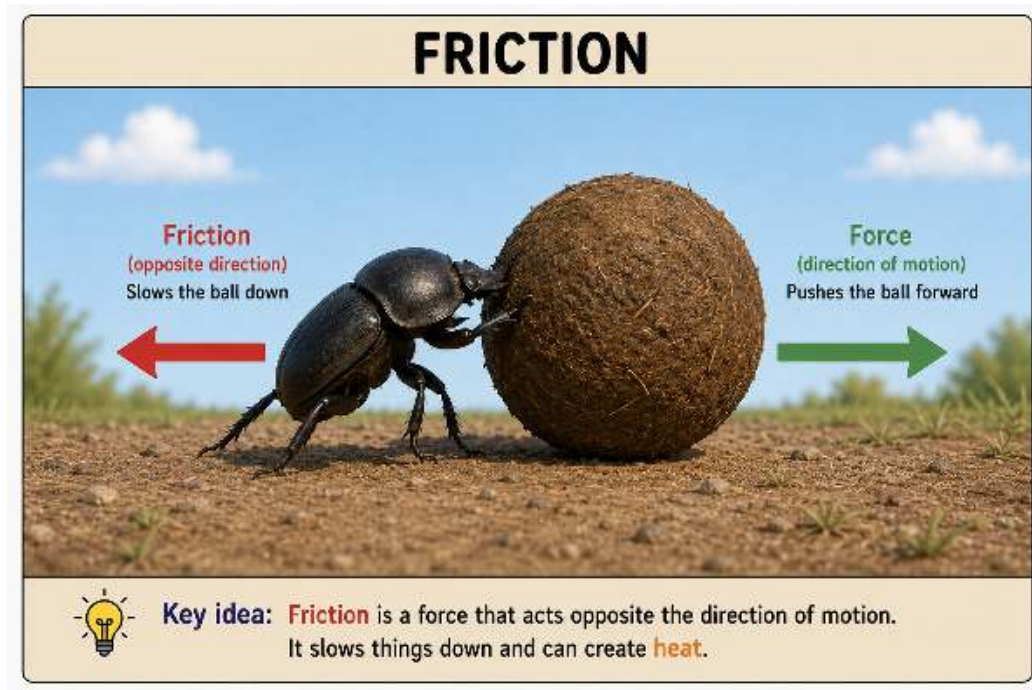
KINETIC ENERGY



As the object falls, GPE decreases and KE increases.

What is Friction?

- Friction is a force that slows things down when two surfaces rub together.

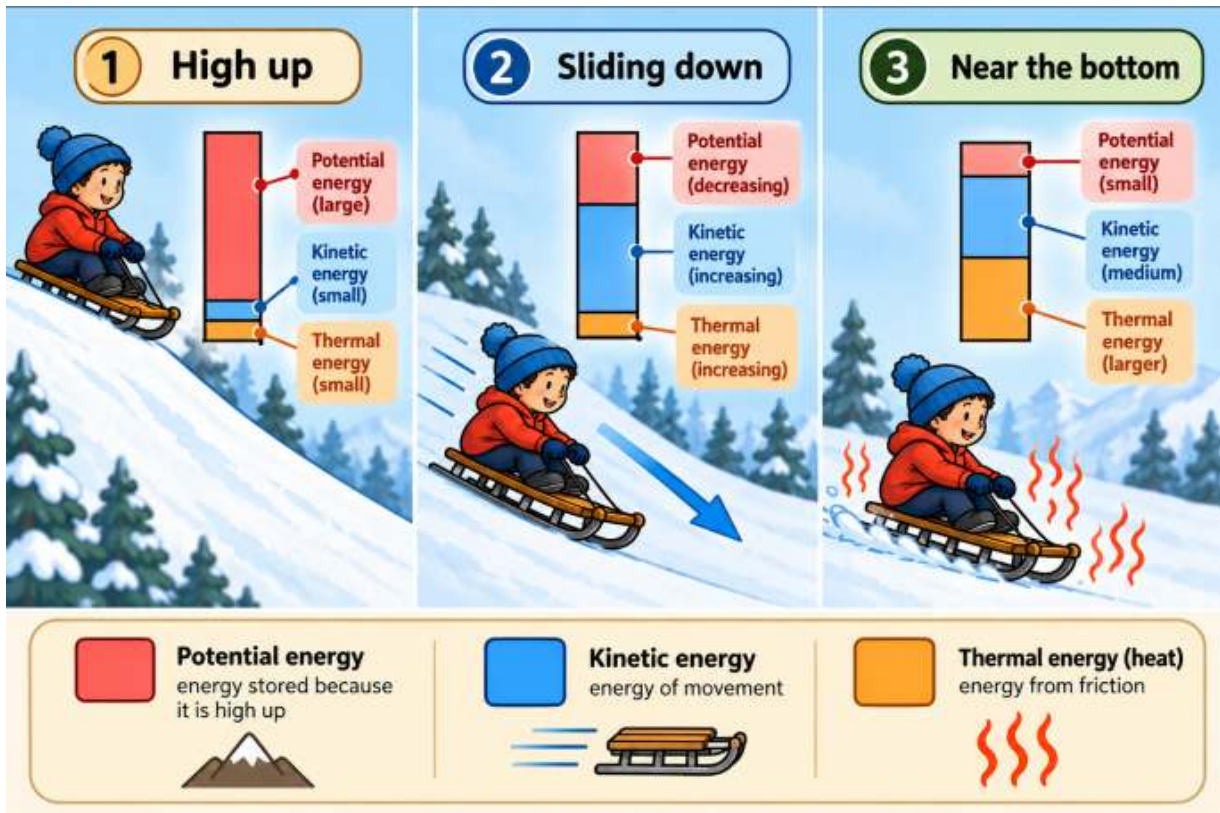


Easy Explanation

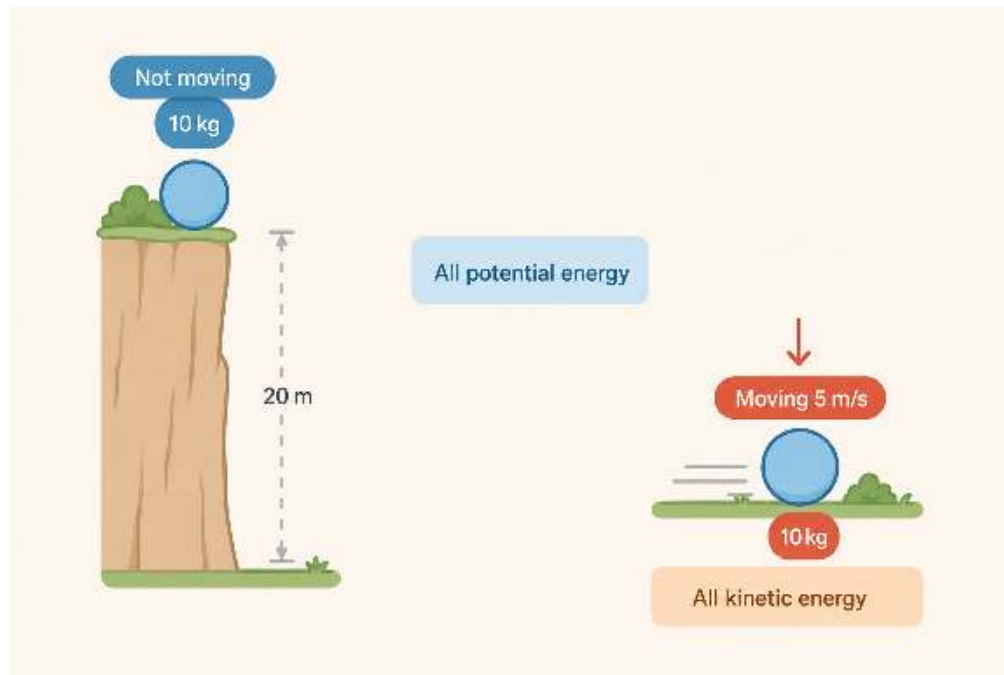
- **GPE:** Energy stored because of height.
- **Kinetic Energy:** Energy of moving objects.
- **Friction:** A force that slows things down.

Example

- A sled has more energy when it is high up. Friction slows the sled and creates heat. Some energy changes into heat.



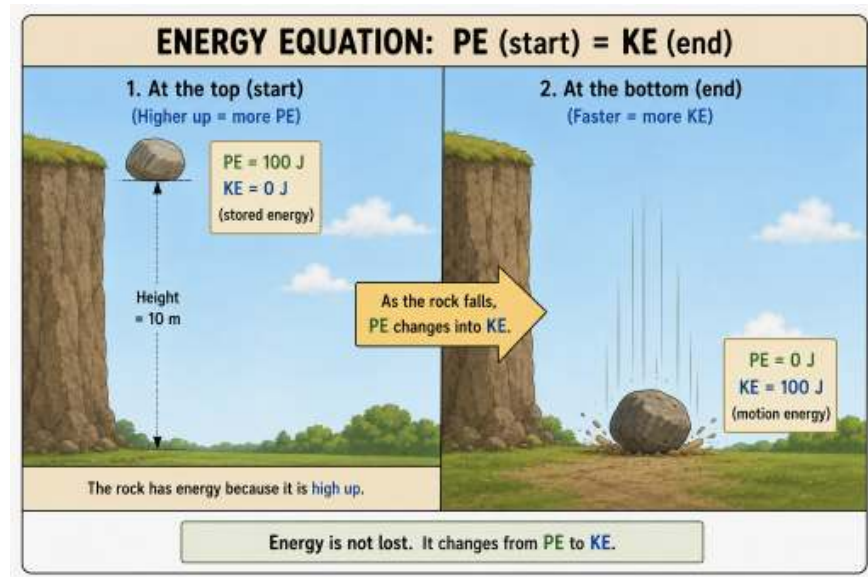
Energy Equations



	Potential energy (GPE)	Kinetic energy
What it is	Stored energy	Energy of movement
When you have it	When something is high up, not moving	When something is moving
Depends on	Mass, height	Mass, speed
Easy rule	Higher up = more PE	Faster = more KE
Example	A rock on top of a cliff	A rock falling down

*Easy rule: Higher up = more PE, Faster = more KE

Energy Equation : PE (start) = KE (end)



Explain

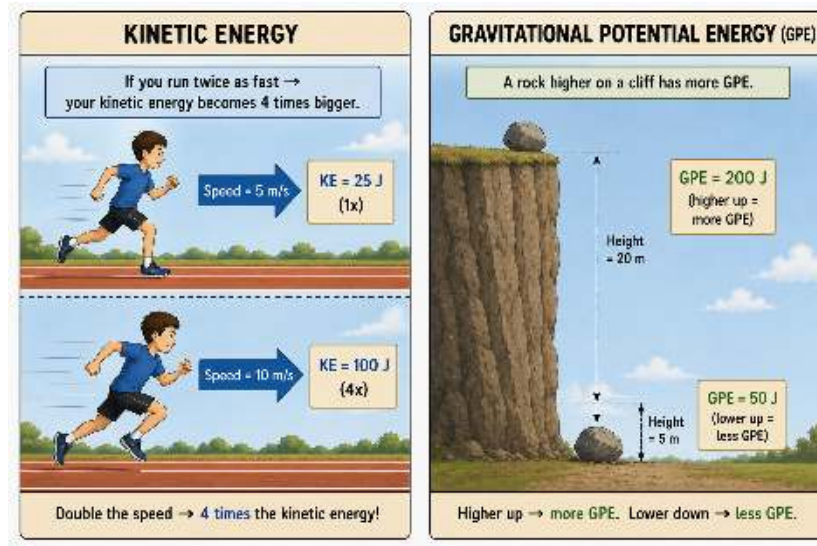
- As the rock falls, its PE changes into KE. This means the starting PE and the final KE are equal

Concept

- Kinetic energy depends on mass and speed.
- Gravitational potential energy depends on mass, gravity, and height.

Examples

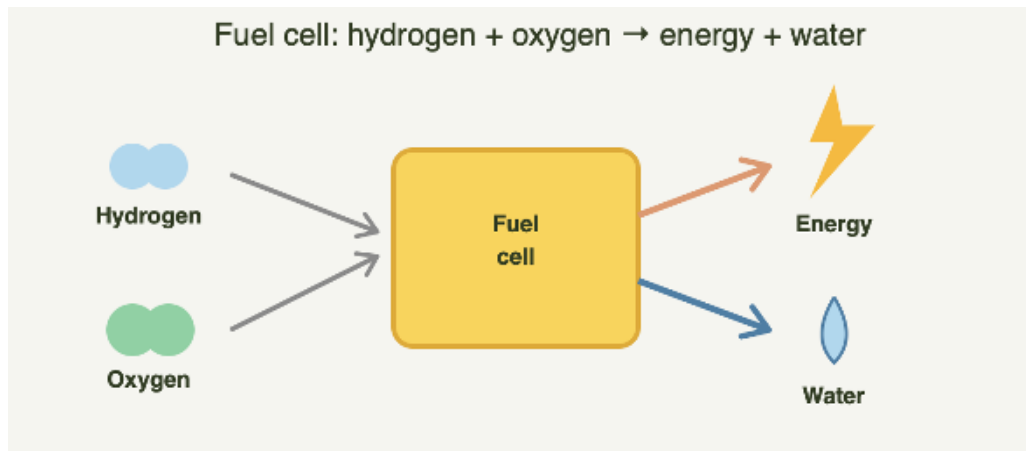
- If you run twice as fast → your kinetic energy becomes 4 times bigger.
- A rock higher on a cliff has more GPE.



Why it matters

- These equations help us predict motion and energy changes.

Fuel Cells



Vocab

Vocab	What it means
Fuel cell	A device that makes energy from hydrogen and oxygen
Chemical energy	Energy stored inside a substance(like hydrogen gas)
Electrical energy	Energy that can power things,like a car.
Cleanenergy	Energy that makes no pollution— fuel cells only make water

Concept

- Fuel cells change chemical energy $\rightarrow$ electrical energy using hydrogen and oxygen.

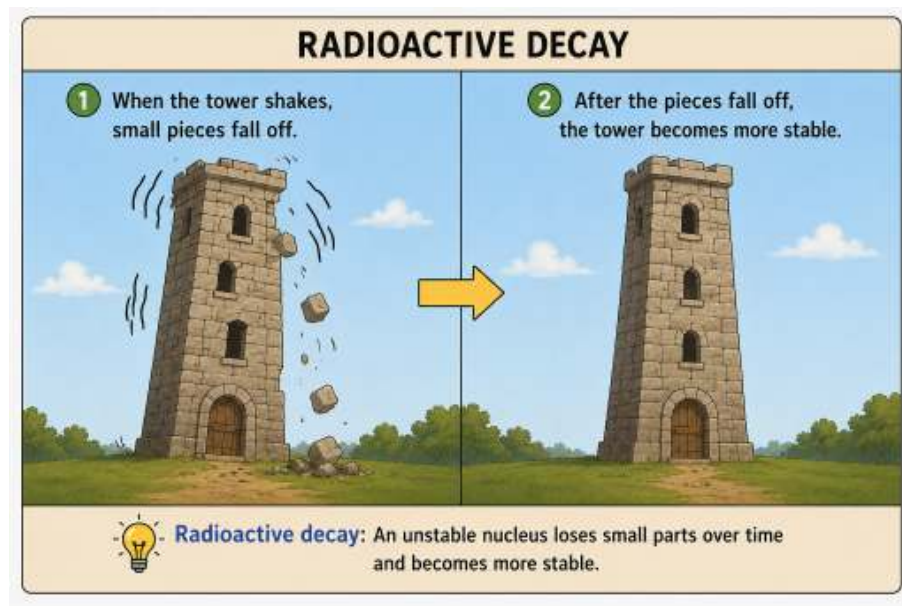
Example

- Hydrogen + oxygen $\rightarrow$ water + energy
- This energy can power a car.

Why it matters

- Normal cars burn gas. This makes smoke and dirty air.
- Fuel cells don't burn anything. They only make water.
- So fuel cells are clean — they don't pollute the air..

Radioactive Decay (Alpha, Beta, Gamma)



Vocab

Vocab	What it means
Neutron	A piece inside the nucleus with no charge
Proton	A piece inside the nucleus with positive charge (+)
Electron	A tiny, fast piece that moves around the nucleus (-)
Atom	The whole tiny piece that makes up everything
nucleus	The center of the atom, made of protons and neutrons
Particle	A general word for any small piece of matter.

Concept

- Unstable atoms release energy to become stable.

Examples

Types	What happens	What comes out
Alpha decay	The nucleus shoots out a big, heavy particle	A heavy particle (2 protons + 2 neutrons)
Beta decay	A neutron changes into a proton	A fast electron
Gamma decay	The nucleus releases extra energy	Light (no particle, just energy)

1. When the tower shakes, small pieces fall off

2. After the pieces fall off, the tower becomes more stable

Why it matters

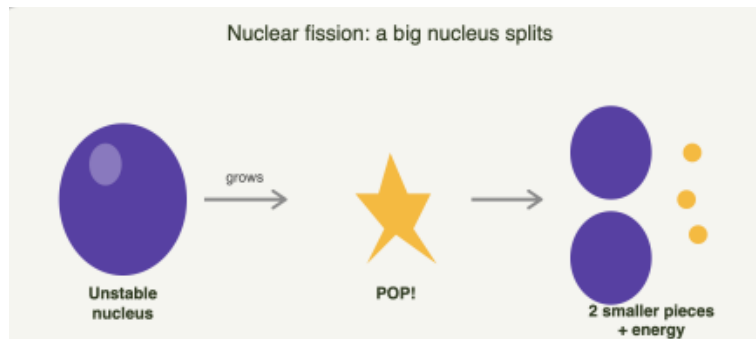
- **Why it matters:** We use decay to make electricity in power plants and to find sickness in hospitals (X-rays, scans)

Differences between **Nuclear Fission** & **Nuclear fusion**

Fission vs Fusion

	Fission	Fusion
What happens	A big nucleus splits into 2 smaller ones.	Small nuclei join into 1 bigger one.
Where it happens	Power plants on Earth.	Inside stars, like the Sun

Nuclear Fission

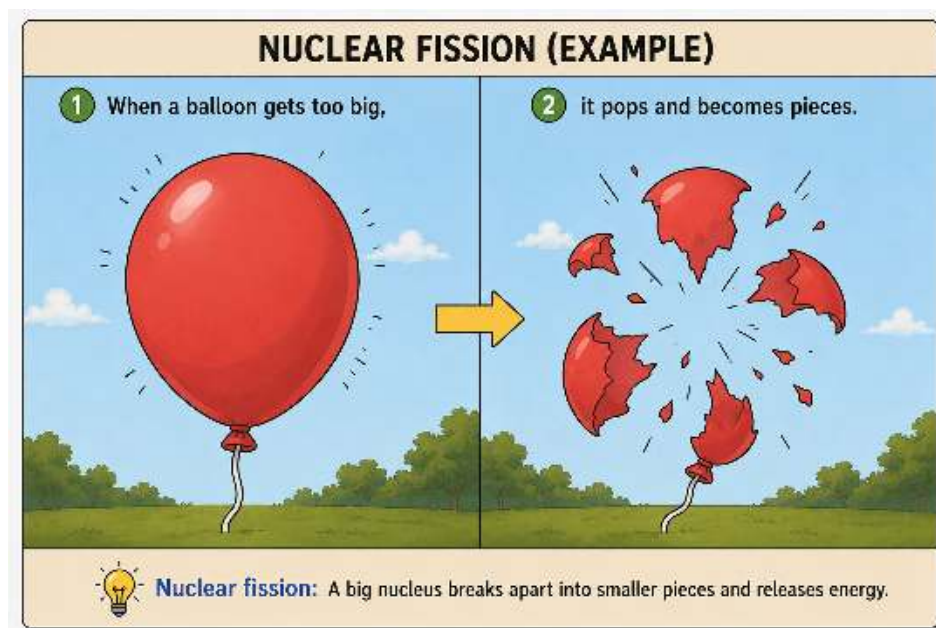


Vocab

Vocab	What it means
nuclei	Nuclei means more than one nucleus

Example

- When a balloon gets too big, it pops and becomes pieces

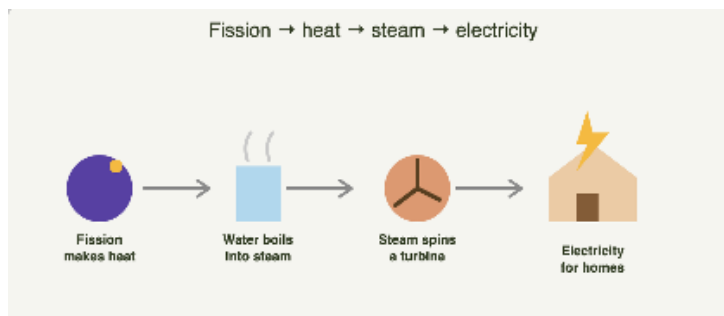


Concept

- A big nucleus splits into smaller nuclei → releases lots of energy.

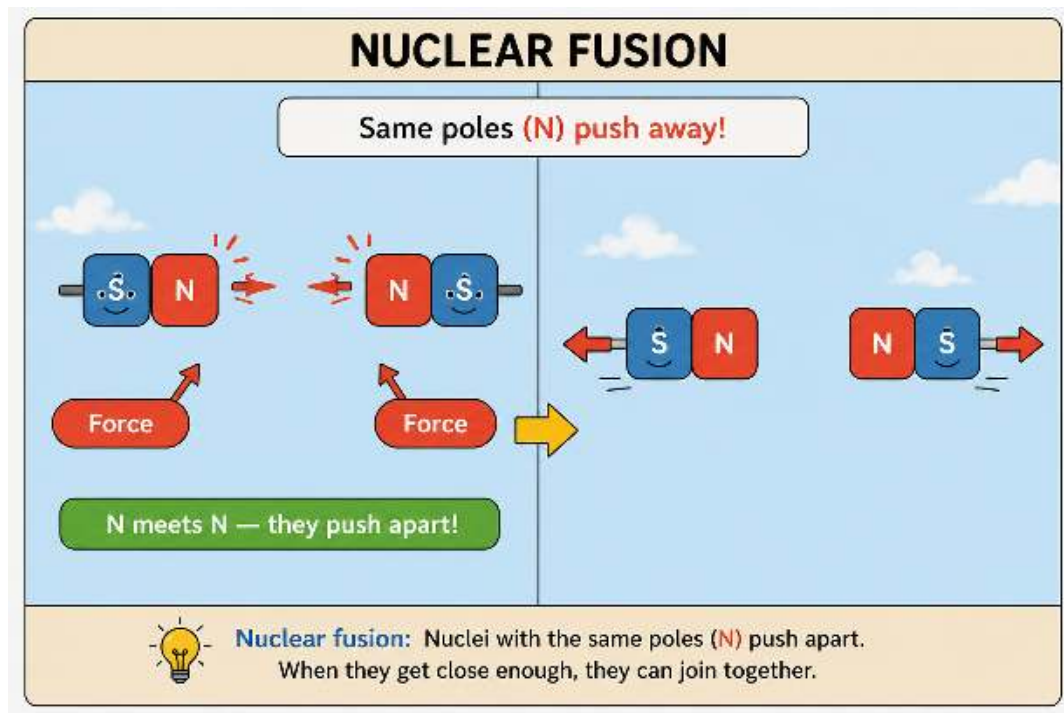
Why it matters

- Nuclear power plants use fission to make heat. The heat boils water into steam. The steam spins a turbine and makes electricity, enough to power whole cities!



Fission	Heat	Steam	Electricity
Fission makes heat	Water boils into steam	Steam spins a turbine	Electricity for homes

Nuclear Fusion

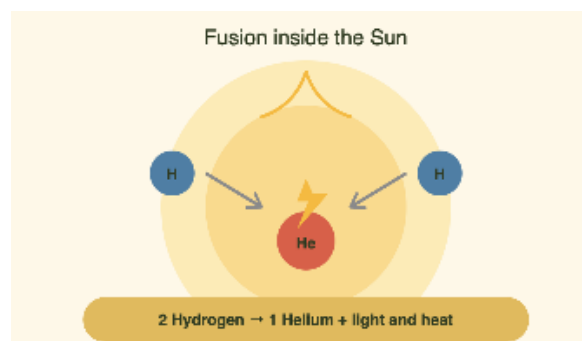


Concept

- Nuclei push each other away, like magnets with the same pole.
- Extreme heat and pressure force them to join — this is fusion, and it releases energy.

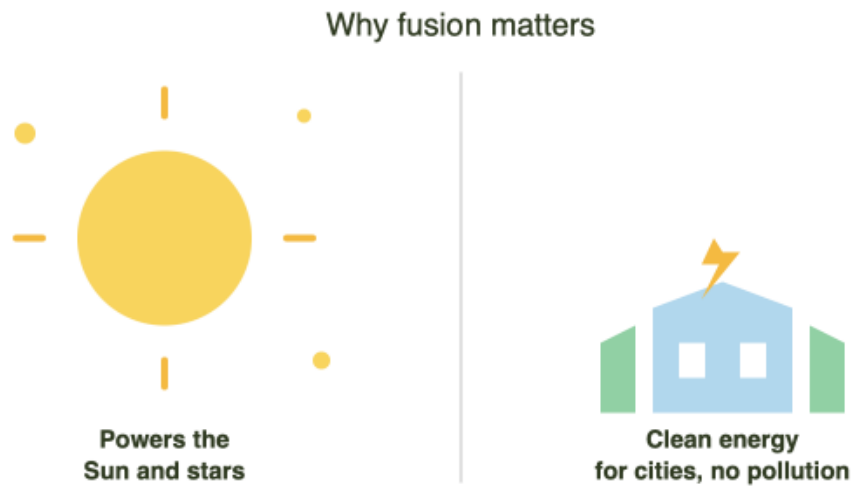
Example

- Hydrogen atoms fuse inside the Sun.

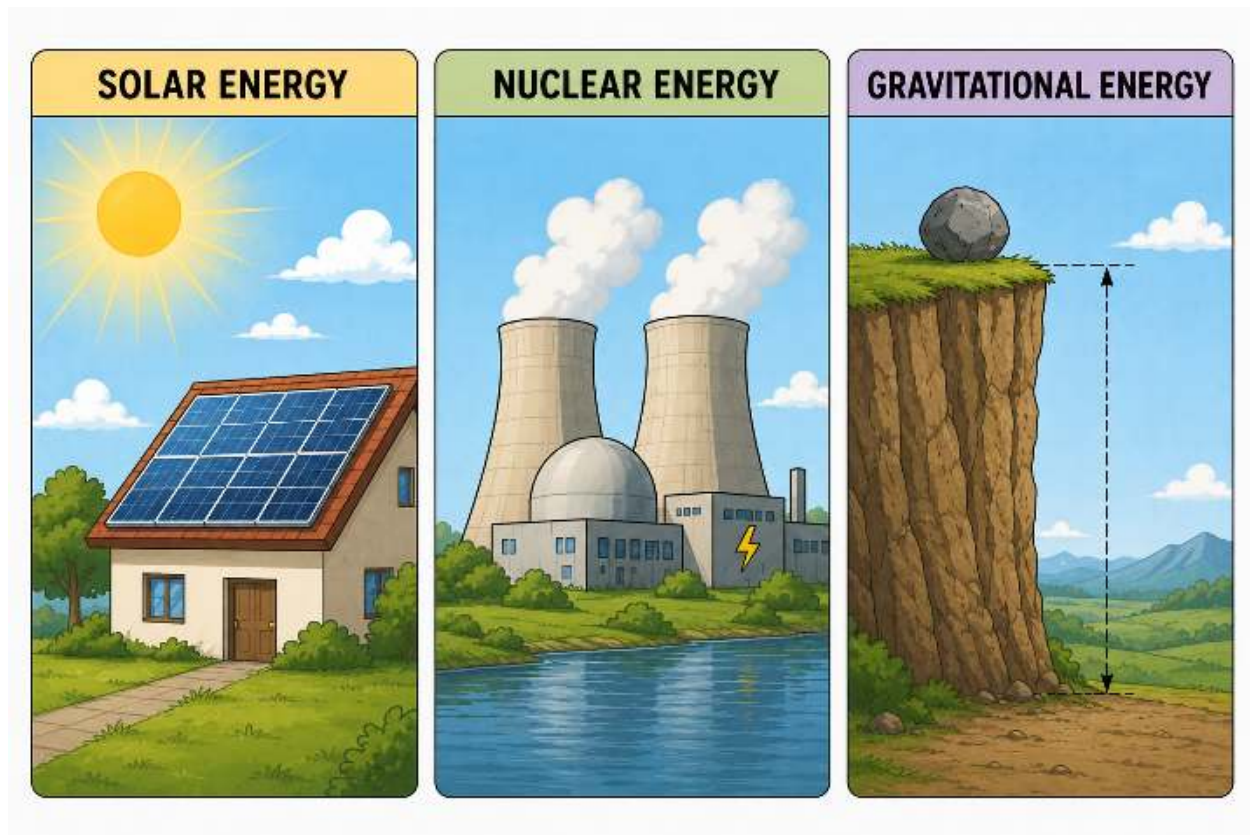


Why it matters

- Fusion is what makes stars shine, including our Sun.
- Scientists are also trying to use fusion on Earth.
- If it works, it could give us clean energy with no pollution and almost unlimited fuel.



Solar, Nuclear, Gravitational Energy



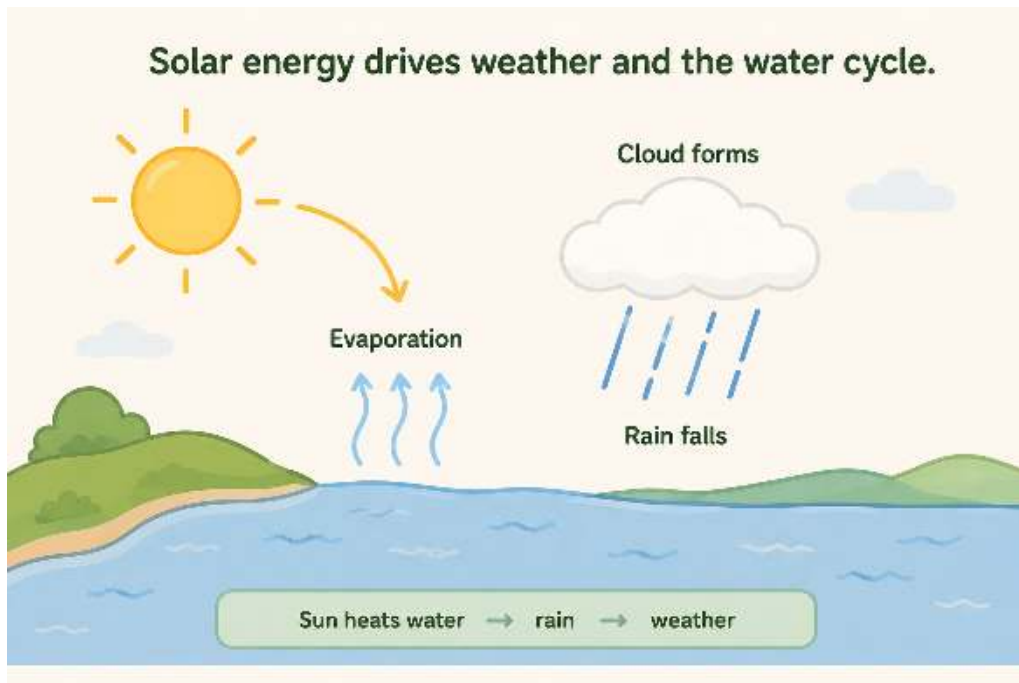
Concept

Earth gets energy from:

- Solar energy
- Nuclear energy inside Earth
- Gravitational energy from the Moon

Example

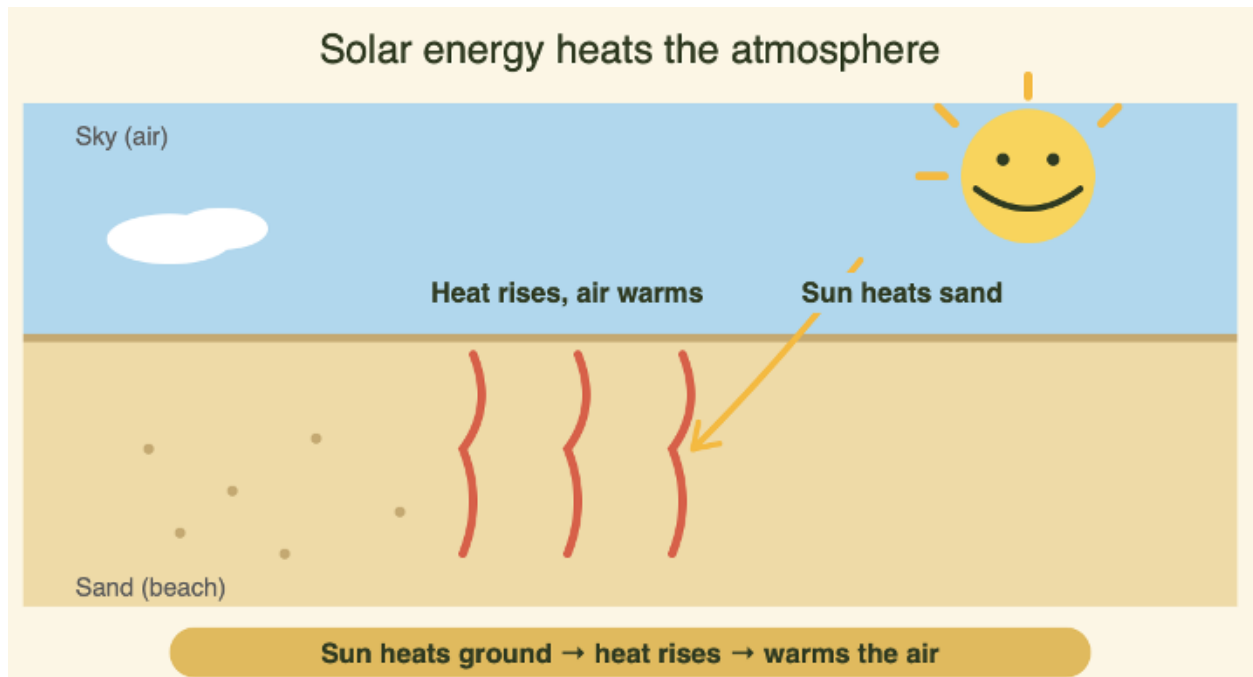
- Solar energy drives weather and the water cycle.



Why it matters

- Solar energy is the biggest source — 5000× more than Earth's nuclear energy.

Heating Earth's Atmosphere



*Sun heats ground → heat rises → warms the air

Concept

- Sunlight reaches Earth as radiation.
- Land and water absorb it → turn it into heat.

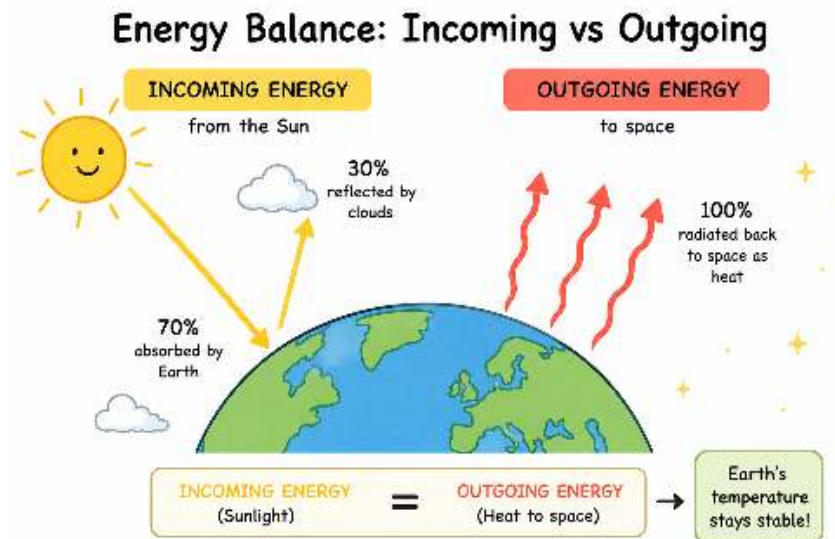
Example

- Warm ground heats the air above it.

Why it matters

- This process keeps Earth warm enough for life.

Energy Balance (Incoming vs Outgoing)



Vocab	What it means
Radiates	Radiate means to send out light, heat, or energy in all directions.

Concept

- Earth receives sunlight and sends heat back into space.
- Over time, incoming = outgoing.

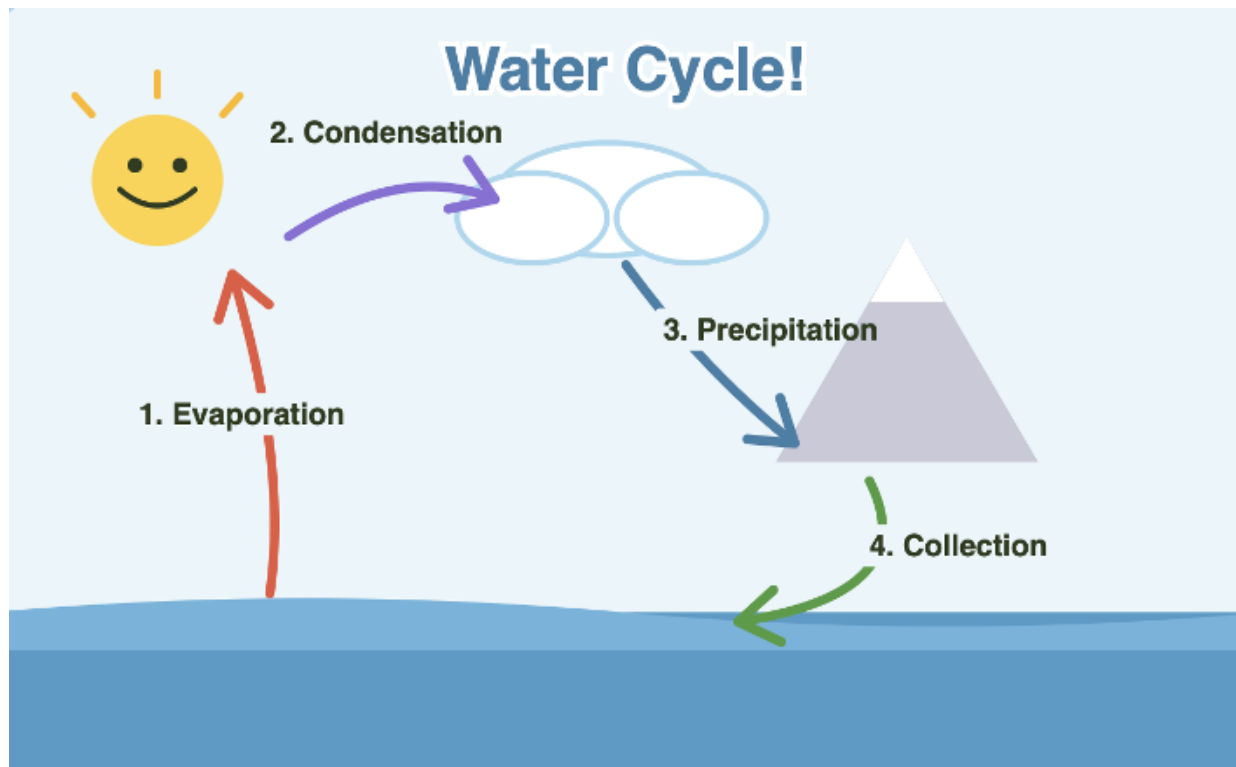
Example

- Clouds reflect some sunlight; Earth absorbs some; Earth radiates heat back.

Why it matters

- This balance controls Earth's temperature.

Water Cycle & Energy



Vocab

Vocab	What it means
Evaporation  A diagram illustrating the process of evaporation. It shows a bright yellow sun in a blue sky with a few white clouds. Below the sky is a body of blue water. Five wavy white lines represent water vapor rising from the surface of the water into the air. A yellow label with the word 'Evaporation' is positioned at the top of the diagram.	Water heats up and turns into a gas, rising into the air
Condensation  A diagram illustrating the process of condensation. It shows a large, fluffy white cloud in a blue sky. Below the cloud, five wavy white lines represent water vapor rising from a landscape of green hills and trees. A yellow label with the word 'Condensation' is positioned at the top of the diagram.	Water gas cools down and turns into clouds
Precipitation  A diagram illustrating the process of precipitation. It shows a large, fluffy white cloud in a blue sky. Below the cloud, many short, slanted lines represent rain falling onto a landscape of green hills and a body of blue water. A yellow label with the word 'Precipitation' is positioned at the top of the diagram.	Water falls from clouds as rain, snow, or hail

Collection



Water gathers in oceans, lakes, and rivers

Concept

- Water moves through evaporation, condensation, precipitation, and runs-off.
- Energy moves with the water.

Example

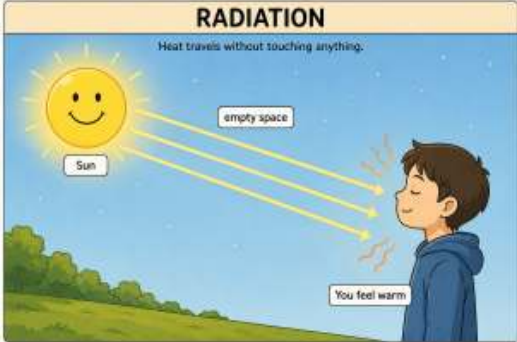
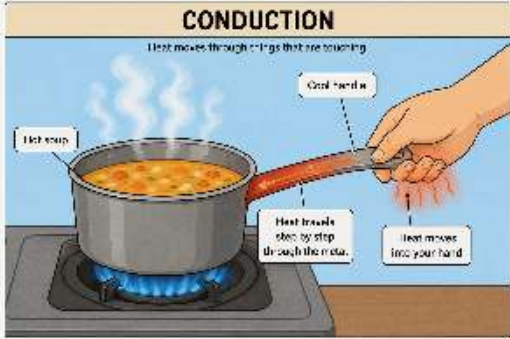
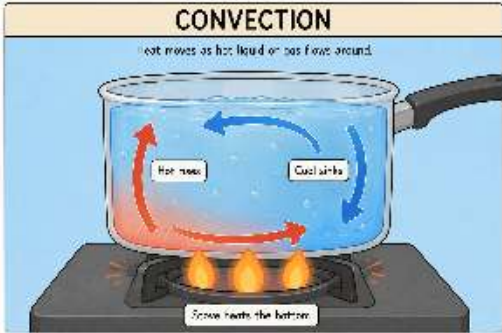
- The sun heats water → evaporation → carries heat into the air.

Why it matters

- The water cycle helps control Earth's temperature.

Radiation, Conduction, Convection

Three ways heat moves:

Type	Description
Radiation 	Heat travels through empty space. Nothing needs to be touched.
Conduction 	Heat moves between things that are touching.
Convection 	Heat moves as hot liquid or gas flows around.

Example:

Types	Example
Radiation	A lamp's heat reaches your skin, with no touching.
Conduction	Your phone gets hot. You feel the heat with your hand.
Convection	Ramen boils. Hot water moves up, cool water moves down.



Why it matters

- These processes warm Earth's atmosphere.

Human Use of Energy (Timeline)



Concept

- Humans have used energy in many ways throughout history.

Examples

 Fire cooks food	 Wood fire melts metal
 Coal powers the train	 Battery makes electricity

Why it matters

- Energy use brings benefits but also pollution and risks.

Nuclear Waste & Indigenous Perspectives



Vocab	Definition
NWMO	- A Canadian organization - Its job is to store nuclear waste safely underground. - They work together with Indigenous Elders and youth, so Indigenous knowledge helps guide the decisions.

Easy explanation

- In some places, companies want to store nuclear waste on land that belongs to Indigenous communities.
- Before this happens, they must ask and listen to the Indigenous people who live there.

Why it matters

- Energy decisions affect land, people, and future generations