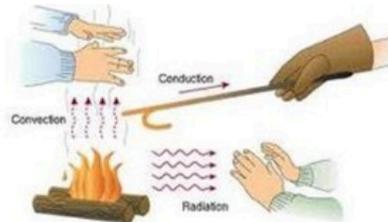
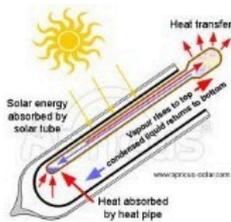


Work, Energy, and Power

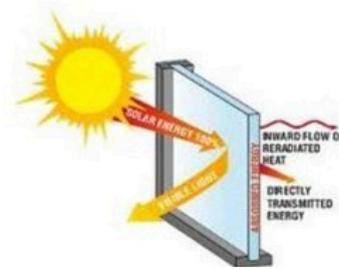
Understanding energy in our world.

Big Idea

Energy is the ability to do work. It cannot be created or destroyed only moved, transformed, or transferred. Understanding energy helps us design fairer, cleaner, and more sustainable systems.



Energy Transfer



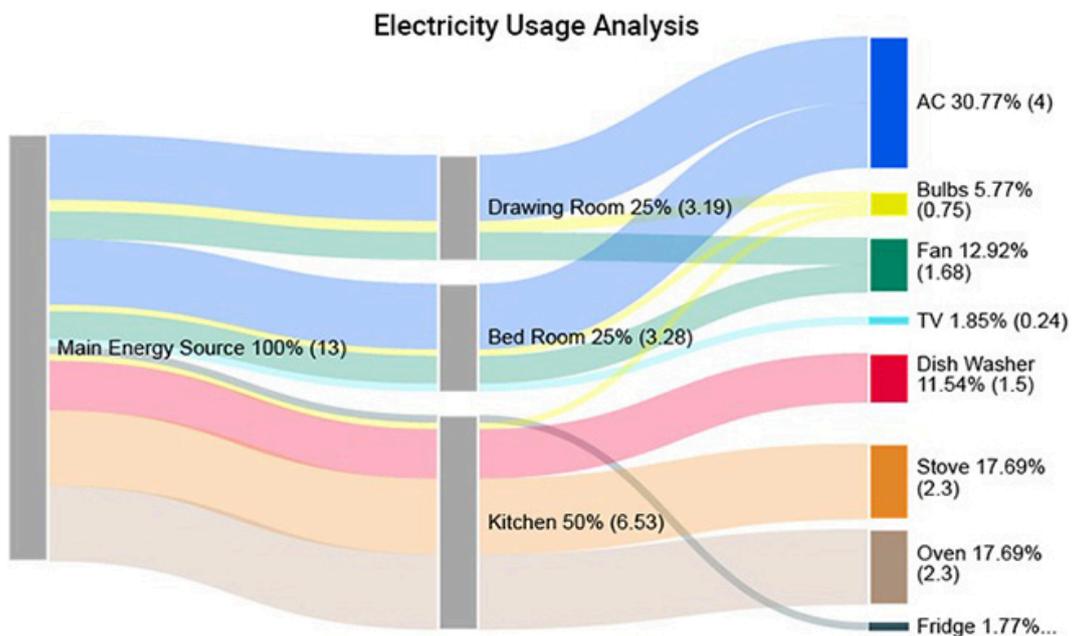
Real-Life Connection

From charging your phone to pedalling a bicycle or heating your home, every action involves energy changes. How we use energy shapes our planet's future.



Key Concepts

Energy flows through systems, changing form but never disappearing. All processes lose some energy to the environment as heat. Efficiency matters—wasting less energy leads to sustainable living.



IB Key Concept: Energy transfers help us understand how natural and human-made systems work.

Core Physics Summary

Work, Energy, and Power:

Work is done when a force moves an object:

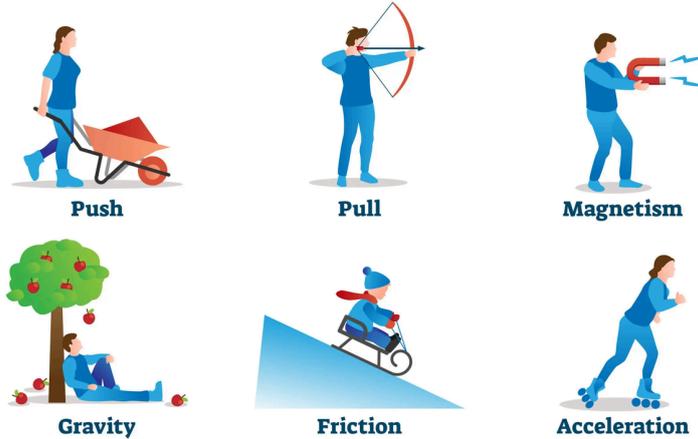
W: work (J)

F: force (N)

s: distance moved (m).

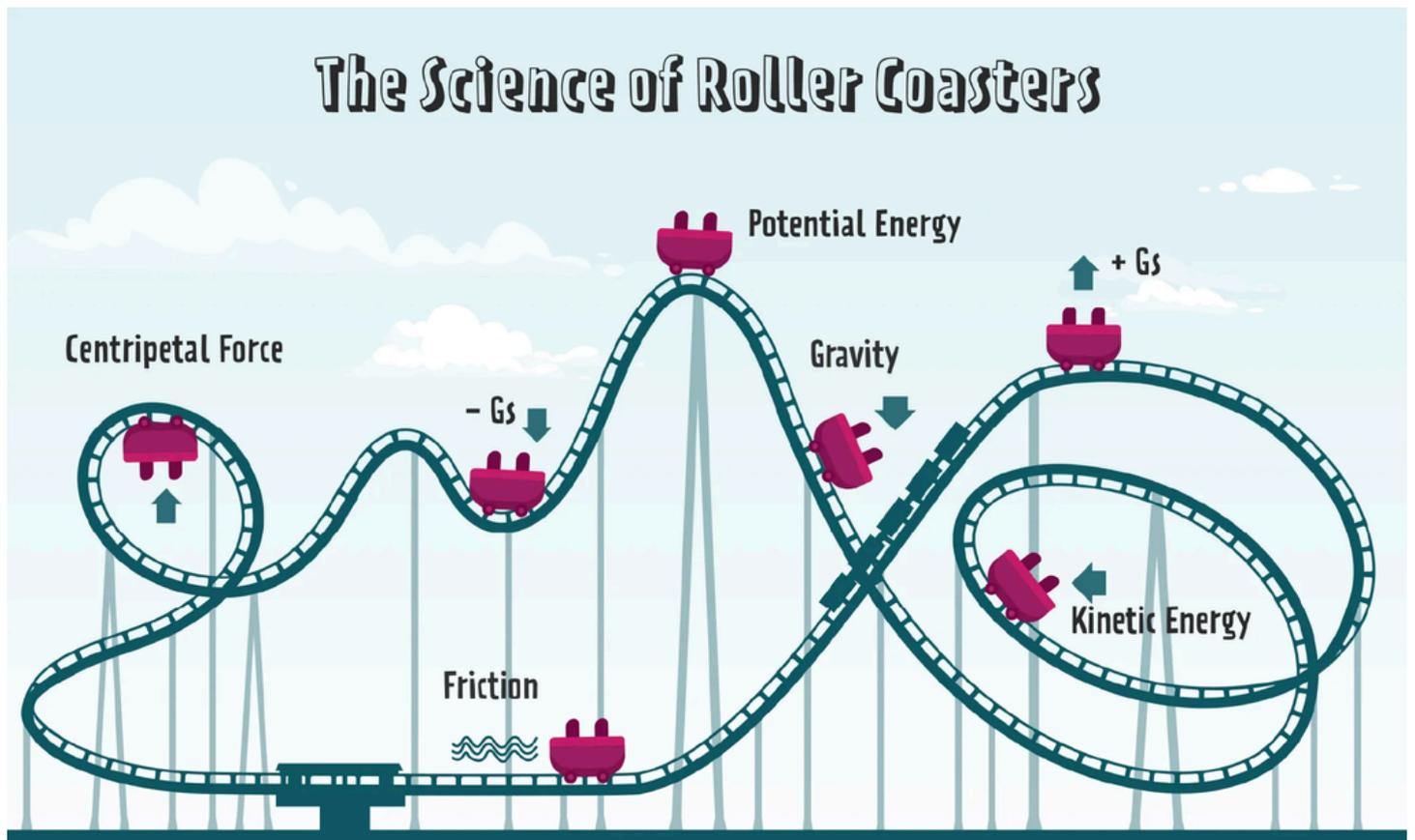
Power: how fast work is done(watts)

FORCE AND MOTION



Kinetic & Potential Energy:

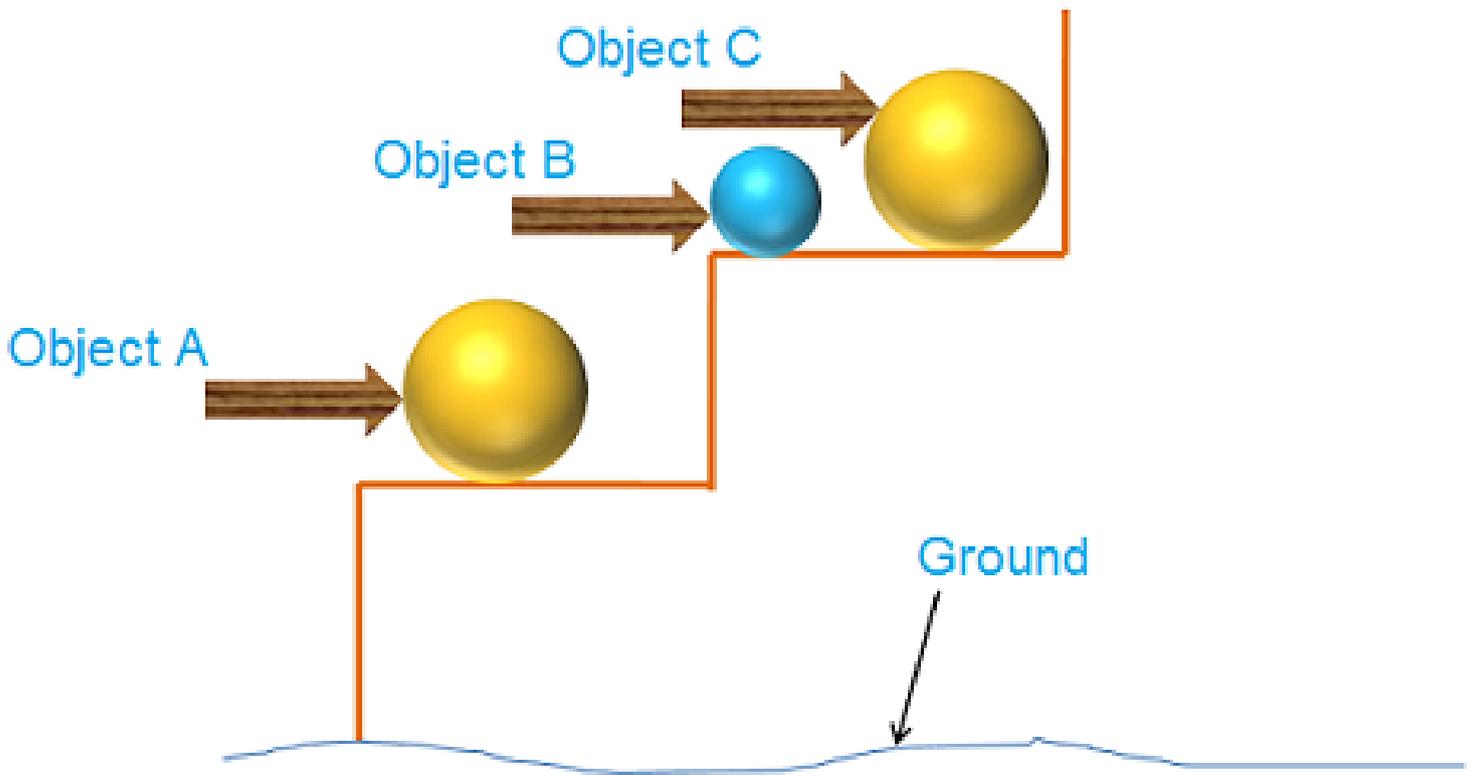
Energy often transfers between these forms—for example, a roller coaster converts $E_p \rightarrow E_k$ as it drops.



Conservation of Energy

Energy cannot be created or destroyed.

Total energy in = Total energy out.(Some energy becomes "waste" as heat or sound.)



Efficiency & Sankey Diagrams:

Efficiency = (Useful energy out / Total energy in) × 100%

Sankey diagrams visually show energy inputs and outputs.

Thick arrows = large amounts of energy

Thin arrows = wasted energy

1	Leaving your electronics and appliances plugged in.		8	Setting your thermostat too high or low.	
2	Not utilizing sleep or standby settings for your electronics.		9	Forgetting to replace your HVAC system's air filters.	
3	Forgetting to turn the lights off.		10	Taking extra-long showers.	
4	Using inefficient light bulbs.		11	Keeping water heater settings cranked up.	
5	Running the dishwasher when it's not full.		12	Failing to landscape strategically.	
6	Washing your clothes in hot water.		13	Letting air leaks go unnoticed.	
7	Using extra energy when cooking.				

Constellation

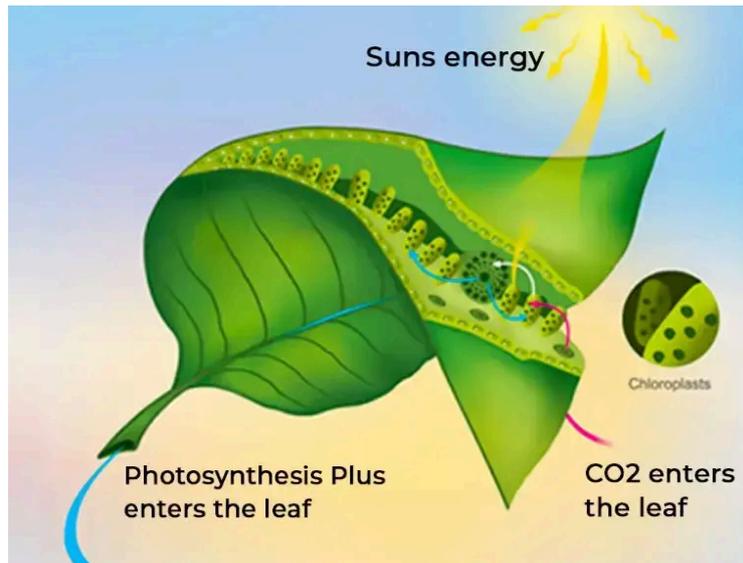
Energy Transfer & Transformation:

Energy moves between objects or changes form:

Electrical → thermal (toasters)

Chemical → kinetic (muscles)

Light → chemical (photosynthesis)



Renewable vs Non-Renewable Resources:

Renewable: solar, wind, hydro, geothermal, biomass. Replenish naturally and generally cleaner.

Non-renewable: coal, oil, natural gas, nuclear fuels. Limited supply and higher pollution.



Environmental Impact of Energy Use:

Fossil fuels: CO₂ emissions, air pollution, climate change

Renewables: cleaner, but require land, materials, and careful planning. Sustainability requires balancing energy needs with environmental protection.

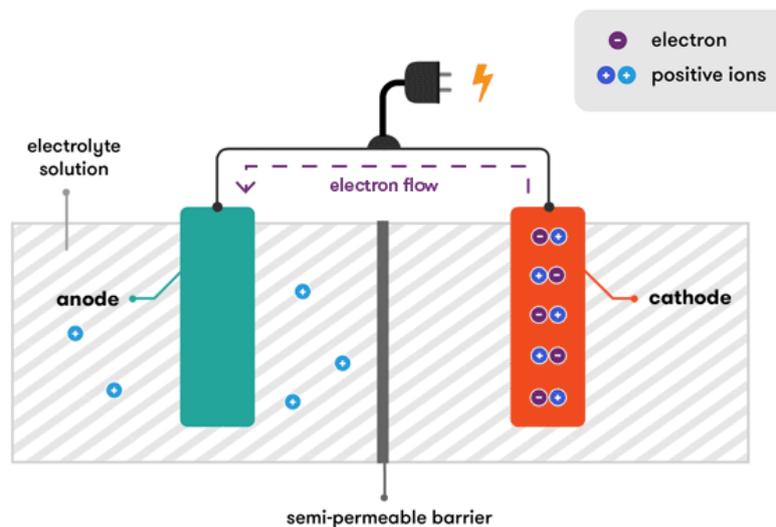
Difference Between Green, Renewable and Clean Energy

This slide represents the difference between green, clean and renewable energy based on energy sources, impact on the environment, and availability of resources.

Parameters	Green Energy	Clean Energy	Renewable Energy
› Renewable	› Most significant environmental advantage	› Although there are no emissions, renewable energy is not always renewable	› Endless source of energy
› Energy Sources	› Derived from natural sources such as the sun, wind and water	› Defined as the energy that does not pollute the atmosphere	› Sources include hydroelectric, wind energy, and solar energy, which are continually replenished
› Impact on Environment	› Emits no carbon dioxide and has the least environmental impact	› Zero-carbon power tent is larger; it includes not just 100% renewables but also nuclear energy and the carbon-neutralizing impact of technologies such as carbon capture and sequestration (CCS)	› Even though renewable energy systems employ natural resources as fuel, they can nevertheless have an impact on the atmosphere
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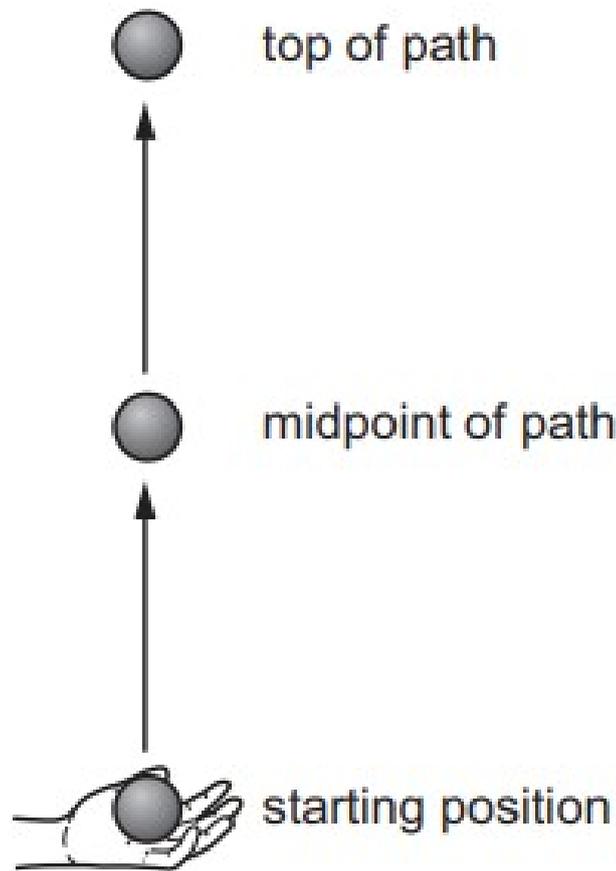
Everyday Example

A mobile phone charger converts electrical energy into chemical energy stored in the battery. However, some energy is lost as heat why chargers feel warm. Improving efficiency reduces wasted energy and electricity bills.



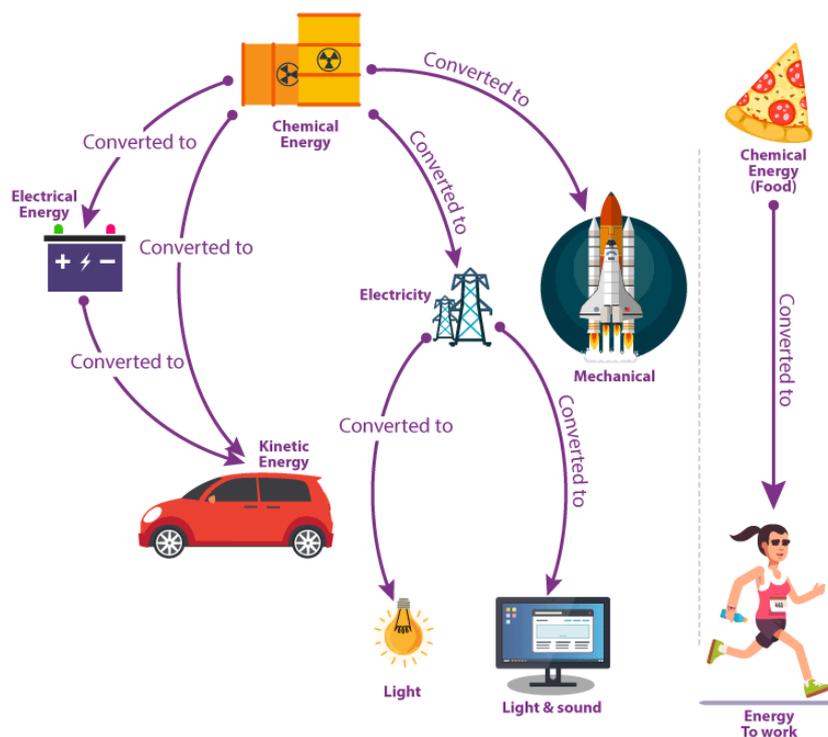
Think & Reflect

Why does a ball thrown upward eventually fall back down even though you gave it energy? If a machine is 40% efficient, what happens to the other 60% of the energy?



Summary

Energy powers everything we do, from movement to technology. By understanding how energy transforms and flows through systems, we can design more efficient devices and make responsible choices about our planet's resources. The future depends on smart, sustainable energy use.



Next Step

To explore worked problems, exam-style questions, and deeper analysis, check [LumiKnow Premium Physics Notes](#).