The Principle of Conservation of Energy

- The Principle of Conservation of Energy states that:
  - **Energy cannot be created or destroyed, it can only change from one form to another**
- This means the total amount of energy in a closed system remains constant, although how much of each form there is may change
- Common examples of energy transfers are:
  - A falling object (in a vacuum): gravitational potential energy → kinetic energy
  - A battery: chemical energy → electrical energy → light energy (if connected to a bulb)
  - Horizontal mass on a spring: elastic potential energy → kinetic energy

Types of energy

FORM	WHAT IS IT?
KINETIC	THE ENERGY OF A MOVING OBJECT.
GRAVITATIONAL POTENTIAL	THE ENERGY SOMETHING GAINS WHEN YOU LIFT IT UP, AND WHICH IT LOSES WHEN IT FALLS.
ELASTIC	THE ENERGY OF A STRETCHED SPRING OR ELASTIC BAND.(SOMETIMES CALLED STRAIN ENERGY)
CHEMICAL	THE ENERGY CONTAINED IN A CHEMICAL SUBSTANCE.
NUCLEAR	THE ENERGY CONTAINED WITHIN THE NUCLEUS OF AN ATOM.
INTERNAL	THE ENERGY SOMETHING HAS DUE TO ITS TEMPERATURE (OR STATE). (SOMETIMES REFERRED TO AS THERMAL OR HEAT ENERGY)

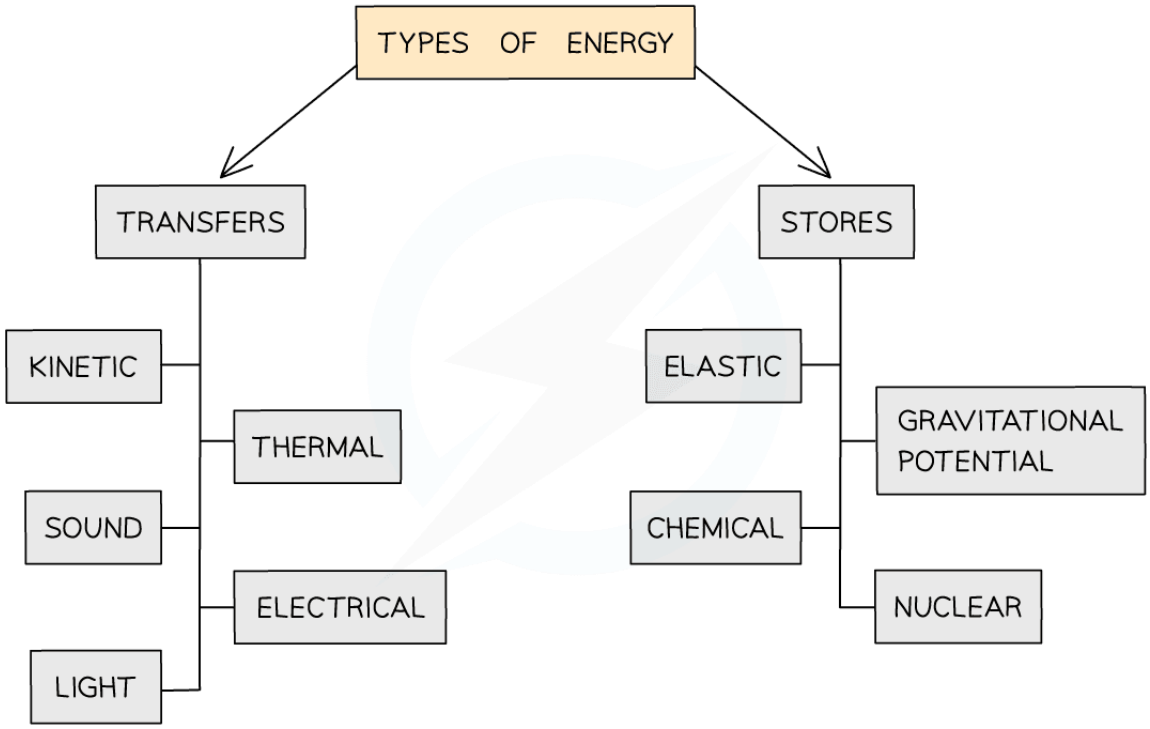


Diagram showing the forms of energy transfers and stores

Energy dissipation

- When energy is transferred from one form to another, not all the energy will end up in the desired form (or place)
- Dissipation is used to describe ways in which energy is wasted
- Any energy not transferred to useful energy stores is wasted because it is lost to the surroundings
- These are commonly in the form of **thermal (heat), light or sound** energy
- What counts as **wasted energy** depends on the system
- For example, in a **television**:

electrical energy → light energy + sound energy + thermal energy

  - Light and sound energy are useful energy transfers whereas thermal energy (from the heating up of wires) is wasted

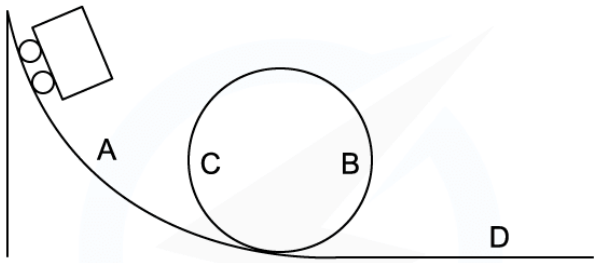
- Another example, in a **heater**:

electrical energy → thermal energy + sound energy

  - The thermal energy is useful, whereas sound is not

Worked example

The diagram shows a rollercoaster going down a track.
The rollercoater takes the path A → B → C → D.



Which statement is true about the energy changes that occur for that occur for the rollercoaster down this track?

A. KE - GPE - GPE - KE
B. KE - GPE - KE - GPE
C. GPE - KE - KE - GPE
D. GPE - KE - GPE - KE

ANSWER: D

- **At point A:**
  - The rollercoaster is raised above the ground, therefore it has **GPE**
  - As it travels down the track, **GPE** is converted to **KE** and the roller coaster speeds up
- **At point B:**
  - **KE** is converted to **GPE** as the rollercoaster rises up the loop
- **At point C:**
  - This **GPE** is converted back into **KE** as the rollercoaster travels back down the loop
- **At point D:**
  - The flat terrain means the rollercoaster only has **KE**