

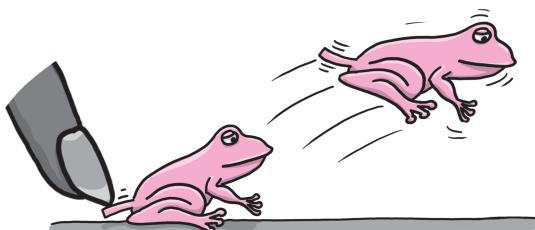
Energy Stores

Energy allows things to happen, it **does not make** things happen - just like money allows you to buy a packet of sweets, but it doesn't buy the sweets.

The energy of an object is stored in an **energy store**. Energy can be **transferred** from one energy store to another.

Energy has units of Joules or J. Here are some energy stores:

Gravitational potential energy	Electrostatic energy
Elastic potential energy	Magnetic energy
Kinetic energy	Chemical energy
Nuclear energy	Thermal energy



The **total energy** of a **system** is **conserved**. Energy can not be **made** or **lost**. This is the **Law of conservation of energy**.

Total energy stored before = total energy stored after

- 4 A bank of batteries is used to power a hot plate to heat up cup of water. Every time the water's temperature increased by 1°C , the amount of energy left in the battery was measured. This was recorded in the table below.

Chemical energy left in batteries (J)	5000	4000	3000	2000	1000	0
Thermal energy of water (J)	1000	2000	3000	4000	5000	6000

- (a) How much chemical energy did the battery bank have at the start?

- (b) How much energy is needed to increase the water's temperature by $1\text{ }^{\circ}\text{C}$?
- (c) How much energy would you need to increase the water's temperature from $6\text{ }^{\circ}\text{C}$ to $10\text{ }^{\circ}\text{C}$, that is increase its thermal energy from 6000 J to 10000 J ?
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- 5 A ball rolls up a ramp and comes to a rest at the top. At the bottom of the ramp, it has a kinetic energy store of 1 J .
- (a) To what store has the energy transferred to?
- (b) How much is in the new energy store of the ball?
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- 6 A toy train moves up a ramp. When it gets to the top of the ramp, it is still moving. The train's battery has 3 J in its chemical store.
- (a) To what stores has the energy transferred to?
- (b) If 1 J of energy went to the potential energy store of the train, how much is in the other store?
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- Energy can be **transferred** from the **system** to its surroundings. This energy is **dissipated**. It is stored in a **useless** store.
- 7 The brakes stop the bicycle when the cyclist comes to a red light. Before putting on the breaks, they had 270 J .
- (a) How much energy is in the thermal energy store of the breaks once the bike has stopped?
- (b) Can this store usefully be used by the cyclist?
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- 8 When a football is kicked, it changes shape and makes a noise, before moving away.
- (a) Which energy stores does the ball have when it is being kicked?
- (b) The foot has a kinetic energy of 100 J . One tenth of this is dissipated by sound waves and heat. How much of the useful kinetic energy store is left?