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

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1 Which of these have an energy store?

(a) A book on a table

(b) Person reaching the top of Ben Nevis

(c) A hot bath

(d) A banana

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2 Link each situation with the right energy store.

A nest in a tree	Gravitational potential energy
Two magnets close together	Magnetic energy
A charged battery	Chemical energy
A compressed spring	Elastic potential energy

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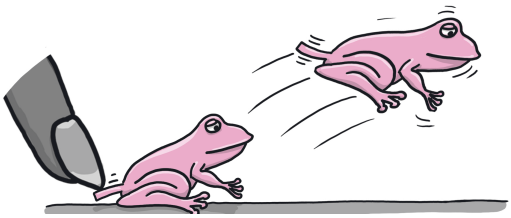
3 Which energy store is the energy moved from and to which one(s) does it go to?

(a) A bird gliding down from the nest.

(b) A battery powering a toy train.

(c) A pop-up toy that jumps into the air.



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

$$\text{Total energy stored before} = \text{total energy stored after}$$

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 $1\,^{\circ}\text{C}$, 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 $1\ ^{\circ}$C?

(c) How much energy would you need to increase the water's temperature from $6\ ^{\circ}$C to $10\ ^{\circ}$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, and the chemical store is empty. The train's battery had 3 J at the start.

(a) To what stores has the energy transferred to?

(b) At the top of the ramp, the chemical energy store of the battery is empty. If 1 J of energy went to the potential energy store of the train, how much is in the other store?

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?