

LO: Describe how energy is dissipated and stored.

**Do Now:**

1. State the four ways by which energy is transferred between stores. (4)
2. Name the main store of energy in a moving object. (1)
3. Define the word “dissipate”. (1)
4. Name the apparatus shown at right . (1)
5. Calculate the mean for the data set below: (2)

35.4 38.2 35.2 35.3 36.0

**New Information – Energy Stores**

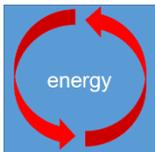
We have learned about the law of conservation of mass, which states that matter cannot be created or destroyed. Today, we’re going to apply the same language to energy. In our last lesson we learnt that the law of conservation of energy states that **energy cannot be created or destroyed, only transferred from one store to another.**

open systems

A **system** is an object or group of objects. Changes in energy stores happen within systems.

closed systems

In an **open system**, energy can be exchanged with the environment. There is a net change in energy in the system, although no energy has been created or destroyed



In a **closed system**, there is no exchange of energy with the environment. **Where there are energy transfers in a closed system, there is no net change to the total energy.** Closed systems can be theorised, but are impossible to construct in reality.

**Pause Point** (Copy and complete the following sentences):

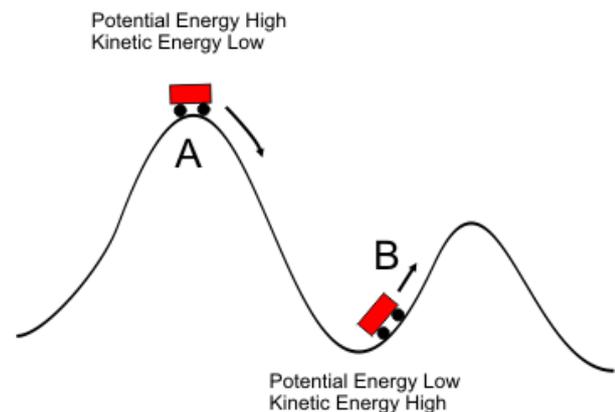
- A closed system is ...
- An open system is ...

**New Information – Example**

Let’s look at an example: a rollercoaster. When the carriage is at the top of the rail (A) there is a maximum store of gravitational potential energy.

As the carriage starts to fall, the store of gravitational potential energy decreases and the store of kinetic energy increases. At the bottom, all the GPE will have been transferred to kinetic energy. Now, this is the ideal picture. However, if you have been on the rollercoaster you will know that you can hear the carriage moving and also the wheels of carriage get hot.

This is because, while the majority of the gravitational potential energy is converted to kinetic energy, some energy has been transferred mechanically to the thermal store of the wheels and some has been transferred by radiation to sound.



However – the TOTAL amount of energy in the system has not changed. We call the less useful energy stores or transfers as “wasted” energy or “dissipated energy”

**Key Knowledge:** Complete 2 x LCWC in your book – don’t forget to green pen this

An object or group of objects are called ...	A system
A system in which energy can be transferred to and from the environment is ...	An open system
A system in which energy cannot be transferred to and from the environment is ..	A closed system
How is energy commonly dissipated?	By heating or by radiating (e.g. as sound)
Is dissipated energy useful or wasted?	Wasted energy.
Give two common methods of reducing dissipated energy in an open system.	Lubrication and/or thermal insulation.

**Recall Quiz:** Answer the following questions from memory in your books, remember to do this without looking back at your key knowledge

1. Because energy can never be \_\_\_\_\_ or \_\_\_\_\_, the overall amount of energy in a system must always ...
2. Dissipated energy is ...
3. The two most common types of transfer which result in wasted energy are by \_\_\_\_ or \_\_\_\_
4. The two ways of reducing unwanted energy transfers in an open system are \_\_\_\_ or \_\_\_\_
5. A squeaky hinge is dissipating energy by ...
6. One way to reduce the amount of energy being wasted by the hinge is to use a ...

*Self-Assess your recall quiz answers using the key knowledge table*

**I do, We do, You do:** Complete the following table, the first one has been done for you as a model:

System	Useful energy store	Wasted energy store	Ideas for reducing wasted energy
Bike	kinetic	Sound + thermal	Lubricating the wheels
Car engine			
Kettle			
Coffee cup			

**Application:** Copy and complete the following questions in your books.

**Example:** The ball is thrown up in the air with 100J of kinetic energy stored. How much gravitational potential energy does the ball have stored at the peak of its throw? **Answers: 100 J**

1. A ball stores 50J of kinetic energy as it is thrown in the air. At the peak, there are 45J of gravitational potential energy, how much energy is dissipated as sound and heat energy?
2. A kettle has a store of 400J of thermal energy in the heating filament. 345J is transferred by heating to thermal energy store of water. How much energy is dissipated as sound?
3. A kettle has 660J of electrical energy input. How much energy is transferred to thermal energy store of the filament?
4. A speaker stores 95J of kinetic energy. How much of the energy is radiated as sound?
5. A TV has 5000J of energy transferred electrically. 70J is wasted thermally, how much energy is transferred usefully?
6. A speaker has 95J of kinetic energy. 6J of energy is dissipated as heat, how much energy is transferred by radiation into sound?
7. A TV has 9000J of energy transferred electrically. How much energy is transferred usefully as light and sound?

**Extended Writing Task: Describe the laws which control energy transfers within a system and explain how wasted energy can be reduced. (Use the sentences below to help structure your answer in your books).**

- The law of conservation of energy states that . . .
- If we think about a sledge going down a steep hill, the energy in the system is, to begin with, in the \_\_\_\_\_ store.
- As it begins to move, the energy is transferred into a \_\_\_\_\_ store.
- As a force is being applied to the sledge, we can say this transfer occurs by...
- The sledge creaks as it goes down. This is an example of energy being d\_\_\_\_\_ by (heating/radiating)
- We can reduce the amount of energy being wasted by...
- If we did this, I think that the sledge might go (faster/slower) because (more/less) energy would then be transferred into the \_\_\_\_\_ store.