# PiXL Science

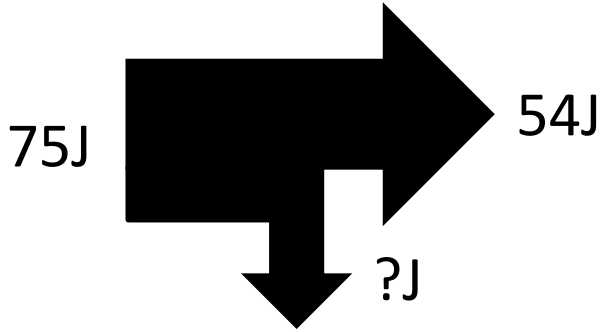
## KS3 Application

## Energy

# Energy

You need to remember that energy can only be **stored**, **transferred** or **dissipated**, it cannot be created or destroyed. When energy is transferred, the total amount of energy is **conserved** even though some is dissipated.

**Look at the following Sankey diagram:**

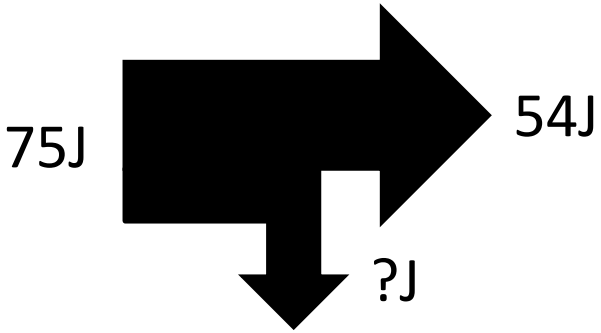



**Calculate:**

a) **The amount of energy 'wasted' as thermal energy.**
b) **The efficiency of the energy transfer.**

# Energy - answers

**Look at the following Sankey diagram:**




**Calculate:**

**a) The amount of energy 'wasted' as thermal energy.**

75 = 54 + thermal energy

75 – 54 = 21J

**b) The efficiency of the energy transfer.**

Efficiency = useful output energy ÷ total input energy

= 54 ÷ 75 = 0.72 or 72%

# Efficiency

Look at the image of a fan. The blades of the fan are turned by an **electric motor** powered by a **battery**. For every **180 J** of **electrical energy** transferred only **160 J** is used to turn the blades of the fan.

**Draw a flow diagram to show the useful transfer of energy between the energy stores.**

**Calculate the amount of 'wasted' energy. State what happens to this 'wasted' energy.**

**Draw a Sankey diagram showing the transfer of energy from the electric motor to the blades.**

**Calculate the efficiency of the motor to 2 d.p.**

# Efficiency - answers

**Draw a flow diagram to show the useful transfer of energy between the energy stores.**

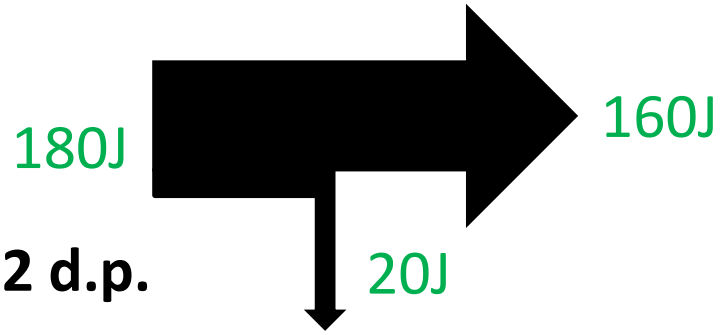
Chemical → Electric → Kinetic

**Calculate the amount of 'wasted' energy. State what happens to this 'wasted' energy.**

180 – 160 = 20 J; dissipated to the surroundings

**Draw a Sankey diagram showing the transfer of energy from the electric motor to the blades.**

(Size of arrows should relate to amount)




**Calculate the efficiency of the motor to 2 d.p.**

160 ÷ 180 = 0.89 or 89%

# Energy transfers

A student carries a rubber ball up a flight of stairs to a landing. They hold the ball in the air and then release it. The ball falls to the ground and bounces.

**State the type of energy store the ball has whilst held in the air.**

**Describe the energy changes of the ball during the sequence.**

**Explain why, in terms of energy, the ball does not bounce to the same height it was dropped.**

# Energy transfers

**State the type of energy store the ball has whilst held in the air.**

Gravitational potential.

**Describe the energy changes of the ball during the sequence.**

Chemical to kinetic (whilst in hand); kinetic to gravitational potential (whilst climbing stairs); gravitational potential to kinetic energy (as it falls); kinetic to thermal, elastic (as it hits the floor); elastic potential to kinetic energy (as it bounces up); kinetic energy to gravitational (as it rises).

**Explain why, in terms of energy, the ball does not bounce to the same height it was dropped.**

Not all energy is transferred between GPE and KE; thermal energy dissipated to surroundings.

# Methods of thermal energy transfer

A vacuum flask is designed to keep liquids hot or cold by preventing the transfer of thermal energy.

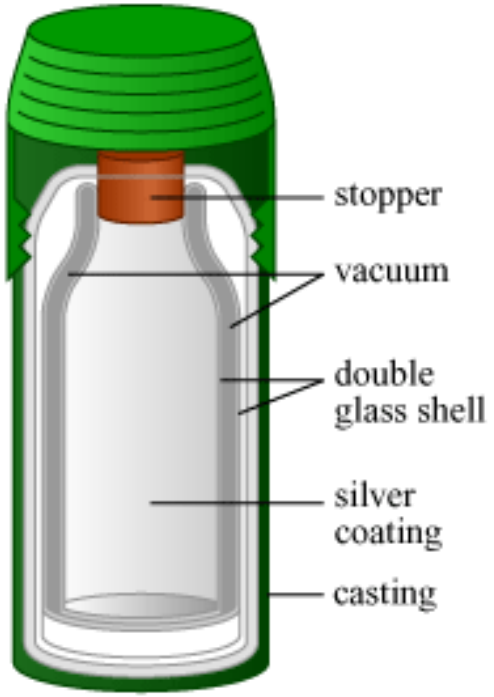
**What is the common name for thermal energy?**

**State the three methods of thermal energy transfer.**

**Which two methods of thermal energy transfer require particles?**

**Explain how the following features of the vacuum flask help to prevent thermal energy transfer:**

**a. Vacuum.** **b. Shiny silver coating.**



# Methods of thermal energy transfer

**What is the common name for thermal energy?**

Heat energy.

**State the three methods of thermal energy transfer.**

Conduction, convection, radiation.

**Which two methods of thermal energy transfer require particles?**

Conduction, convection.

**Explain how the following features of the vacuum flask help to prevent thermal energy transfer:**

a. **Vacuum.**

   No particles present for convection and conduction; stops energy transfer between the two walls of the flask.

b. **Shiny silver coating.**

   Reflect infrared radiation; stops energy transfer by radiation.