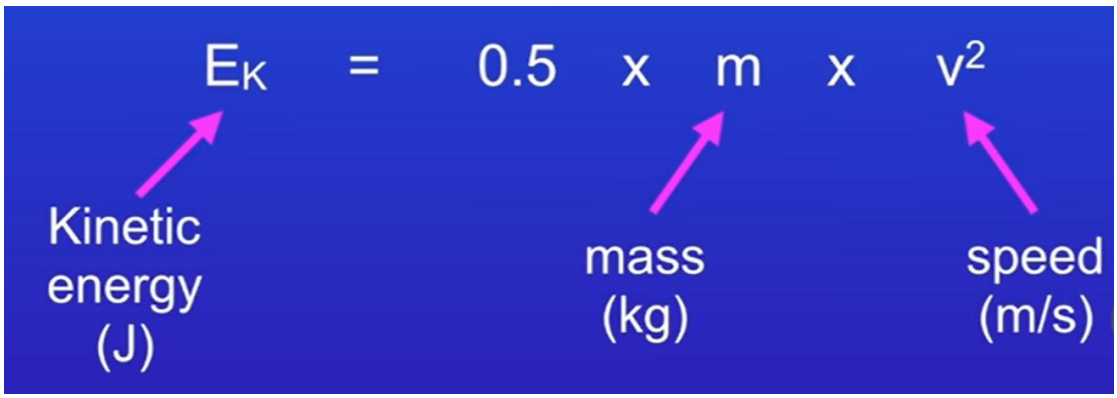
Kinetic Energy:

Kinetic energy is the energy stored in moving objects

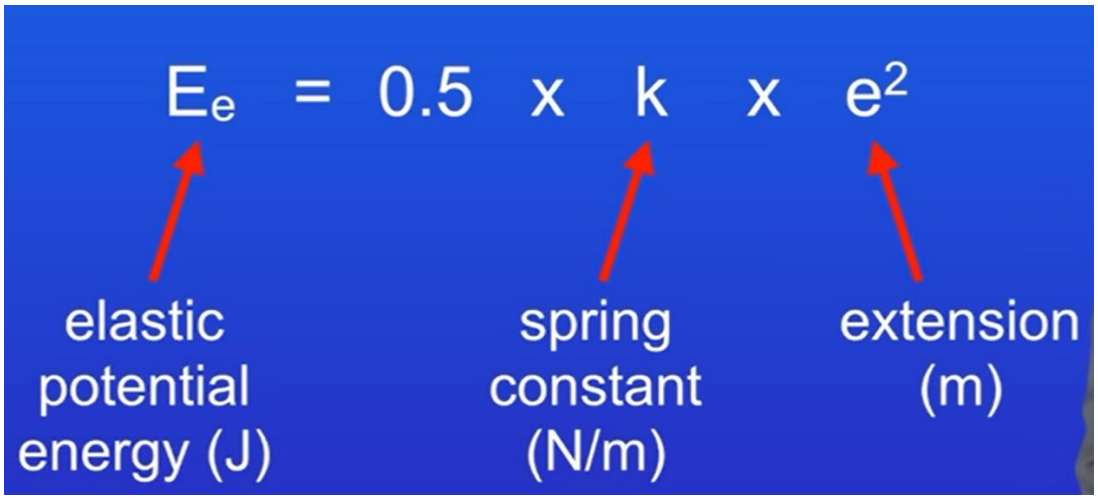


Springs and elastic potential energy:

When we apply force to a spring, this is called work

The stretch of the spring is called the extension

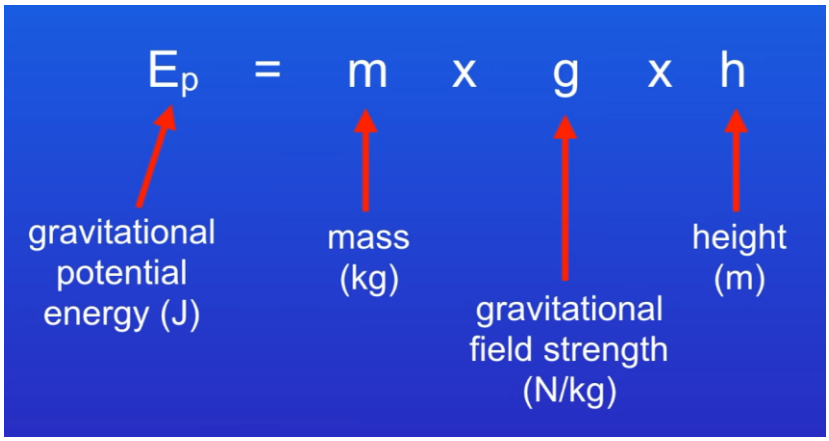
If we compare the force and the extension, they are both directly proportional but if we apply to much force then it will not be directly proportional



Gravitational potential energy:

The force of gravity acting upon an object

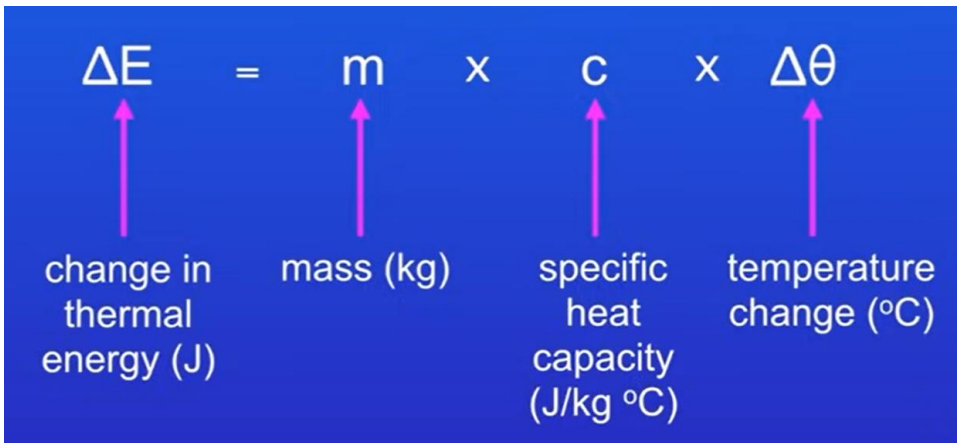
As we increase the distance from the object and the surface, the gravitational potential energy increases but if the ball is already on the surface then there is no gravitational potential energy



Earth's gravitational potential energy = 9.8N/kg

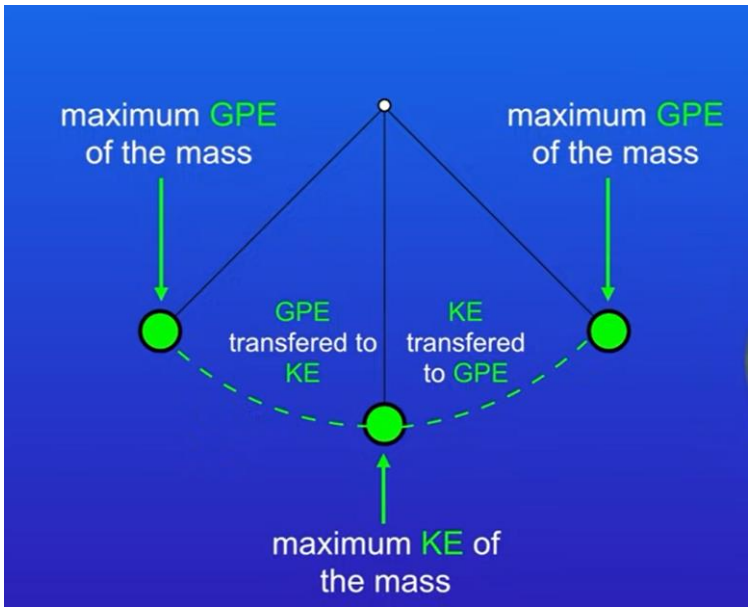
Specific heat capacity:

Specific heat capacity is the amount of energy required to raise the temperature of 1kg substance by 1°C



Energy transfers – pendulum:

Law of conservation of energy – Energy cannot be created or destroyed



This is a pendulum

As the ball swings, their is friction when the pendulum moves through the air particles which also transfers into kinetic energy. This is dissipated energy which causes the pendulum to slow down and eventually stop.

We can reduce the friction such as adding lubricants to the moving point such as oils or completely removing the air particles around the pendulum

Energy transfers – bungee jumper:

How the bungee jumper works:

1. When he is on the platform, this energy store is gravitational potential energy
2. As he jumps, there is kinetic energy
3. As the string starts to tighten, there is maximum kinetic energy
4. When the rope is fully extended, there is elastic potential energy
5. When the rope recoils, elastic potential energy is transferred into kinetic energy
6. When the jumper goes back up, gravitational energy starts to increase
7. At the top, there is gravitational potential energy

The jumper never is in the original position because the energy is dissipated as thermal energy. Thermal energy is created with the friction with the air particles. The rope is also having stretching effects which is not fully elastic.

Work done:

Work is done when energy is transferred from one store to another

Mechanical work involves using a force to move an object

Electrical work done involves a current transferring energy

Mechanical work:

Work done (J) = Force (N) x Distance (m)

Calculating power:

Power is the rate which energy is transferred or the rate at which work is done

$$\text{Power (W)} = \frac{\text{Energy transferred (J)}}{\text{Time (s)}}$$

$$\text{Power (W)} = \frac{\text{Work done (J)}}{\text{Time (s)}}$$

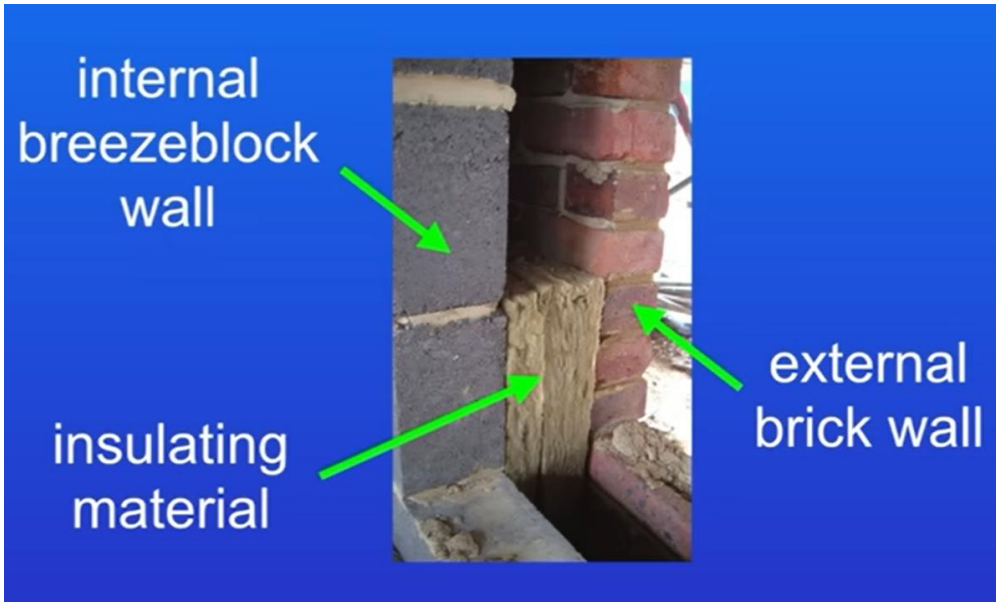
Efficiency:

$$\text{Efficiency} = \frac{\text{Useful output energy transfer}}{\text{Total input energy transfer}}$$

$$\text{Efficiency} = \frac{\text{Useful power output}}{\text{Total power input}}$$

Factor that affects the cooling of a building:

Thermal conductivity – The higher the thermal conductivity of a material, the higher rate of energy transfer



Insulation prevents heat from escaping and the insulating material has a very low thermal conductivity

We can build a house with thick walls which reduces heat from escaping the house

We can also have double glazed windows which lowers the thermal conductivity

We can have loft insulation to stop heat escaping through the roof of the house

Required practical – Specific heat capacity:

How to perform for vegetable oil:

1. Place a beaker on a balance and set it to zero
2. Now add the vegetable oil and record the mass
3. Now place a thermometer and an immersion heater into the oil
4. Read the starting temperature
5. Wrap the beaker in insulating foam
6. Connect a joulemeter and a power pack to the immersion heater
7. Time for half an hour
8. Read the total joules on the joulemeter
9. Read the final temperature of the oil
10. Calculate the specific heat capacity using the equation rearranged

There may be inaccurate results:

- Thermal energy has passed out of the beaker into the air, we can use an insulator with a much more lower thermal conductivity
- Not all thermal conductivity is passing into the oil, we can fully submerge the immersion heater
- We can misread the thermometer, we can use an electronic probe
- Thermal energy not being spread in oil, we can stir the oil

Required practical – Thermal insulation:

How to perform:

1. First we place a small beaker inside a larger beaker
2. We then use a kettle to boil water
3. Pour 80cm^3 of the hot water into the small beaker
4. We use a cardboard lid with a hole in the middle to place a thermometer
5. We record the initial temperature of the water and start the stopwatch
6. We need to record the temperature every three minutes for fifteen minutes
7. We repeat the experiment except that we use insulating material to fill the gap between the two beakers
8. We can use different insulating materials

Independent variable – The type of insulating material

Dependent variable – The temperature

Control variable – The volume of water in the beaker and the mass of the insulating material

We can record the results into the table

We can plot cooling graphs and see which one took the longest to cool down which makes it the most effective cooling down material

We can also the investigate the effect of thickness:

1. We can get a beaker and pour 80cm^3 of hot water
2. We can wrap the beaker with two layers of newspaper
3. We can double it each time

Fossil fuels:

There are three types of fossil fuels:

- Coal
- Oil
- Gas

Advantages:

- Reliable
- A lot of energy supplied

- There is a lot of fossil fuels
- Cheap
- We can use it for anything

Disadvantages:

- Carbon dioxide emissions
- Non-renewable
- Burning fossil fuels can release other pollutants

Nuclear power:

Nuclear power is non renewable

Advantages:

- Reliable
- Zero carbon emissions

Disadvantages:

- Dangerous
- At the end of nuclear power plants life, it has to be taken apart which is expensive
- It is very hard to store

UK energy mix:

The UK has a lot of different ways to generate electricity

20% of energy comes from nuclear power stations

The UK switched to burning gas

Burning gas advantages:

- less carbon dioxide than burning coal
- Gas power stations have a very short startup time

Renewable energy sources:

Three main uses of energy:

- Transport
- Generating electricity
- Heating

Different types of renewable energy sources:

- Solar power
- Wind power
- Tidal power
- Geothermal power
- Water power
- Hydroelectric power
- Biofuels

Advantages of renewable of energy resources:

- Renewable energy sources never run out
- Zero carbon emissions

Disadvantages of renewable energy resources:

- Not reliable
- Harm to environment

Biofuels are carbon neutral (plants take in carbon which it released)