

Dave boils a litre of water in his electric kettle, describe the changes that occur in the way energy is stored.

The kettle transfers electrical energy into heat energy, some of this usefully heats the water and some is waste energy heating the kettle itself.

What is the equation for calculating the kinetic energy of a moving object?

$$\text{Kinetic energy} = 0.5 \times \text{mass} \times \text{velocity}^2$$

Jenny throws a 100g ball to her friend Dawn, it travels at a speed of 3.5 metres per second. Calculate the kinetic energy of the ball. Show full working out and include units.

$$\begin{aligned} \text{Kinetic energy of the ball} &= 0.5 \times 100\text{g} \times 3.5\text{m/s}^2 \\ &= 0.5 \times 0.1\text{Kg} \times 12.25\text{m/s}^2 \\ &= 0.6125 \text{ Joules} \end{aligned}$$

The amount of elastic potential energy stored in a stretched spring can be calculated using the equation: Elastic potential energy = $0.5 \times \text{spring constant} \times \text{extension}^2$ Bob goes bungee jumping, he uses a bungee cord with a spring constant of 40N/m and at the lowest point of his jump he is located 30 m below his starting point. How much elastic potential energy does the cord have at full stretch? Show full working out and include units.

$$\begin{aligned} \text{Elastic Potential Energy} &= 0.5 \times 40\text{N/m} \times 30\text{m}^2 \\ &= 20\text{N/m} \times 900 \text{ metres} \\ &= 18,000 \text{ Joules} \end{aligned}$$

What is the equation for calculating the gravitational potential energy gained by an object raised above ground level?

$$\text{Gravitational potential energy} = \text{mass} \times \text{gravitational field strength} \times \text{height}$$

Erica lifts a 2Kg block off a table 80 centimetres up into the air. Calculate the gravitational potential energy gained by the block. Show full working out and include units. The gravitational field strength on Earth is 9.8N/Kg

$$\begin{aligned} \text{GPE gained by the block} &= 2\text{Kg} \times 9.8\text{N/Kg} \times 0.8\text{m} \\ &= 15.68 \text{ Joules} \end{aligned}$$

What is the specific heat capacity of a substance?

The amount of energy required to raise the temperature of one kilogram of the substance by one degree Celsius.

Dan heats a volume of Castor oil that weighs 0.025Kg from a starting temperature of 20OC to a temperature of 40 OC. He looks up the specific heat capacity of Castor oil and finds that it is 1,800 J/Kg/OC. How much thermal energy did the Castor oil gain?

Use the following equation, show working out and include units.

$$\begin{aligned} \text{Change in Thermal Energy} &= \text{mass} \times \text{specific heat capacity} \times \text{temperature change} \\ \text{Change in Thermal Energy} &= 0.025\text{Kg} \times 1,800 \text{ J/Kg/OC} \times 40 \text{ OC} \\ &= 900 \text{ Joules} \end{aligned}$$

What is the equation for calculating the energy efficiency of an electrical appliance?

$$\text{Energy Efficiency} = \frac{\text{Useful Energy Output}}{\text{Total Energy Input}}$$

Are the following energy resources renewable or non-renewable?

Coal = **Non-renewable**

Wind = **Renewable**

HEP = **Renewable**

Oil = **Non-Renewable**

Nuclear = **Non-Renewable**

Geothermal = **Renewable**

Biomass = **Renewable**

Answers

PHYSICS

Unit: Energy

Jenny wants to calculate the power of a light bulb, what equation should she use?

$$\text{Power} = \frac{\text{Energy Transferred}}{\text{Time}}$$

Calculate the energy efficiency of this filament light bulb. Express your answer as a percentage efficiency. Show full working out.



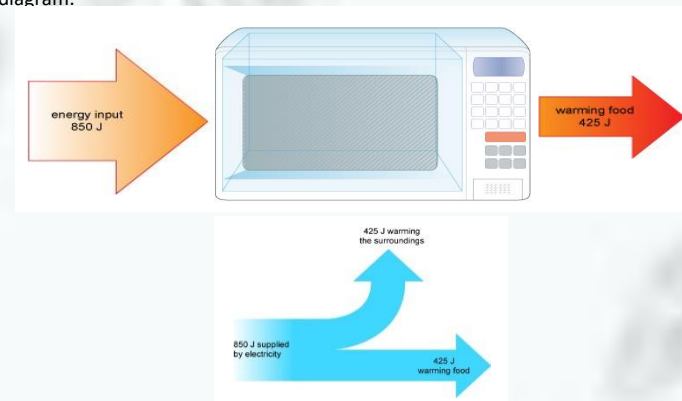
$$\begin{aligned} \text{Energy Efficiency} &= 54\text{J} / 60\text{J} \times 100 \\ &= 90\% \end{aligned}$$

Calculate the energy efficiency of this filament light bulb. Express your answer as a percentage efficiency. Show full working out.



$$\begin{aligned} \text{Energy Efficiency} &= 6\text{J} / 11\text{J} \times 100 \\ &= 54\% \end{aligned}$$

Sketch a Sankey diagram to show the energy efficiency of this microwave. Label all parts of your diagram.



My new filament light bulb transfers 500 Joules of energy every 5 seconds. Circle below which of these two light bulbs is mine:



Give one advantage and two disadvantages of increasing the number of wind turbines in the UK.

Advantages

Wind is a renewable energy resource so there is a potentially infinite supply

Disadvantages

Manufacture of wind turbines is expensive

Some people think wind farms are a source of visual and noise pollution