Edexcel IGCSE Physics

4 - Energy Resources and Transfers

Flashcards

There are 8 main stores of energy.
State 4 of these main energy stores.

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-Chemical

-Gravitational

-Thermal

-Electrostatic

-Kinetic

-Elastic

-Magnetic

-Nuclear

What is meant by the "conservation of energy"?

What is meant by the conservation of energy?

- Energy cannot be made or destroyed but can change from one form to another (for example GPE to KE).

- The total amount of energy in a closed system remains constant

What are the four main transfer types between energy stores?

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-Mechanically (by force)
-Electrically (includes current flow)
-By heating (conduction,convection,radiation)
-By radiation (light and sound)

How can energy be transferred through electrical equipment?

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Energy is stored as chemical in the battery. Then current converts chemical energy into other forms electrically.

How can energy be changed through work done by forces?

How can energy be changed through work done by forces?

A force converts energy mechanically by work done. E.g If a moving objects is travelling upwards, its kinetic energy is converted to GPE by work done against its weight(force)

A skateboarder starts at rest at the top of a hill, she pushes herself down a rough hill and comes to rest at the bottom. What energy changes take place?

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- She starts with GPE and does work to push herself down the hill.
- As she is riding down, GPE turns into KE and friction.
- Eventually all of the energy is lost through heating the surroundings through the friction between the ground. There is no KE and she is at rest.

State an equation that is used to calculate "efficiency" of a system

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$$\text{Efficiency} = \frac{\text{Useful Energy Output}}{\text{Total Energy Input}} \times 100\%$$

What energy changes are involved when a moving car stops?

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Kinetic energy changes to heat energy (through friction) and sound energy

What changes are involved when a ball (initially stationary) rolls down a hill?

What changes are involved when a ball (initially stationary) rolls down a hill?

- GPE turns into KE as it rolls downwards
- The speed will increase as the vertical height decreases

What is wasted energy?

What is wasted energy?

- The energy that is not used by the device for its desired purpose is the waste energy.

- An example is a kettle: when energy is changed to sound energy it is classed as waste energy since it is not being used to heat the water.

In what ways thermal energy can be transferred?

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- Conduction

- Convection

- Radiation

Explain why electrical heater of a kettle is placed at the bottom

Heating element

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Heat is mainly transferred by convection within fluids. When a part of the liquid is heated, it expands and becomes less dense therefore it rises up within the fluid. Colder part of the liquid is now denser so it sinks down within the liquid and this forms a convection current when heater is placed at the bottom.

How does the thickness of a building's walls affect the rate of cooling?

How does the thickness of a building's walls affect the rate of cooling?

The thicker the building walls are the further heat has to travel to escape, hence as you increase the thickness you decrease the rate of cooling.

How does the thermal conductivity of a building's walls affect the rate of cooling?

How does the thermal conductivity of a building's walls affect the rate of cooling?

The higher the thermal conductivity the easier it is for heat to escape, hence as you increase the thermal conductivity, you also increase the rate of cooling. Metals have high thermal conductivity so they are conductors. Air has lower thermal conductivity so air is an insulator.

Explain how surfaces can be adjusted for heat transfer by radiation
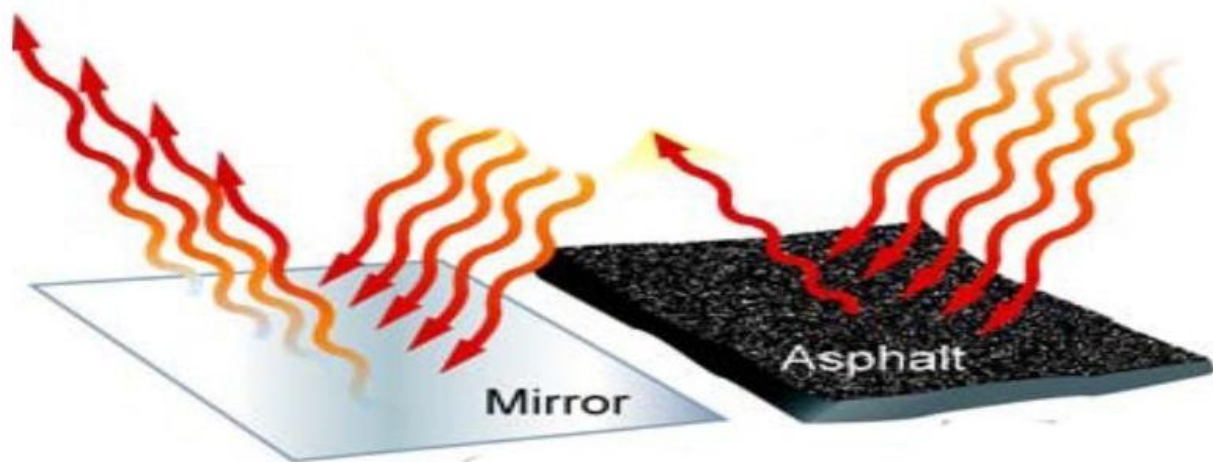
Explain how surfaces can be adjusted for heat transfer by radiation

If an object is hotter than the environment it emits, if it's colder it absorbs thermal radiation.
Black, dull surfaces are good emitters/absorbers but bad reflectors of thermal radiation
White, shiny surfaces are bad emitters/absorbers but good reflectors of thermal radiation

How can you reduce unwanted heat transfer?

How can you reduce unwanted energy transfer?

- Insulation in walls and ceilings, this causes the room to be heated up slower or cooled down slower
- Double glazed windows reduces conduction by putting air or vacuum in between
- Curtains to prevent heat loss by radiation etc.

What equation is used to measure the work done on an object?

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$$Work(J) = Force(N) \times Distance(m)$$

$$W = F \times d$$

What is the relationship between work done on an object and energy transferred to the object?

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Work Done = Energy Transferred

$$W = \Delta E$$

What equation is used to calculate the change in gravitational potential energy?

What equation is used to calculate the change in gravitational potential energy?

$\Delta GPE = m \times g \times \Delta h$

Change in gravitational potential energy (J) = mass (kg) × gravitational field strength (m/s²) × change in vertical height (m)

What equation is used to calculate kinetic energy?

What equation is used to calculate kinetic energy?

$KE = \frac{1}{2}mv^2$

kinetic energy (joule, J) = ½ × mass (kilogram, kg) × (speed)^2 ((m/s)^2)

Explain what "power" means in physics.

Explain what "power" means in physics.

- The rate at which energy is transferred.
- Work done(energy transferred) per unit of time

State an equation linking work done, power and time taken for an appliance

What equation is used to calculate the power of a device?

$$Power(W) = \frac{Work\ Done(J)}{Time\ Taken(s)}$$

What is another way of describing a Watt?

What is another way of describing a watt?

1 Watt = 1 joule per second (J/s).