Edexcel GCSE Physics

Topic 8: Energy- forces doing work

Notes

(Content in bold is for Higher Tier only)

Energy

- Energy is never created or destroyed, it is only transferred
- When a system changes, energy is transferred from one form to another
    - Electrical energy changes into kinetic energy in a motor
- A closed system is a system which experiences no external forces
    - E.g. a circuit, or a skydiver
    - In a closed system, the total energy remains the same at all times

$$\Delta GPE = mg\Delta h$$

- Change in gravitational potential energy (joule, J) = mass (kilogram, kg) × gravitational field strength (newton per kilogram, N/kg) × change in vertical height (metre, m)

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

- Kinetic energy (joule, J)= ½ ×mass (kilogram, kg) × (speed)^2 *((metre/second)^2, (m/s)^2)*

Changes

- Work done
    - This is when an external force transfers energy to a system
    - E.g. a human doing work to push a ball up a hill
- Electric
    - Chemical potential energy (stored in batteries) forms electric
- Heating
    - Electric transfers to thermal energy, as work is done against the heating coils causing it to heat up

$$E = Fd\ (moved\ in\ the\ direction\ of\ the\ force)$$

- Work done (joule, J) = force (newton, N) × distance moved in the direction of the force (metre, m)

Waste

- Energy is rarely 100% transferred into the desired form
    - Some energy is dissipated so it is stored in less useful ways
- Mechanical processes are wasteful when they get hot (usually due to friction)
    - Energy is dissipated as heat, causing a rise in temperature
    - So the energy is lost to the surroundings

Power

- The rate at which energy is transferred

$$P = \frac{E}{t}$$

- Power (watt, W) = energy transferred or work done (joule, J) ÷ time taken (second, s), where 1 Watt is equal to 1 Joule per second.

Efficiency

- Measure of how much energy is not lost as waste

$$\text{efficiency} = \frac{\text{useful output energy}}{\text{total input energy}}$$