Your notes

GCSE Physics: revision notes

Energy stores and transfers

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Start here: energy is stored, then moved

- Energy is never made or destroyed: it is kept in stores and moved between them. As a ball falls, its gravitational potential store empties into its kinetic store.
- The stores to know: kinetic, gravitational potential, elastic potential, thermal, chemical, magnetic, electrostatic and nuclear.
- Energy moves between stores by heating, by a force doing work, or by an electric current. Some always ends up wasted, usually heating the surroundings.

Energy stores

- Energy can be stored as kinetic, gravitational potential, elastic potential, thermal (internal), chemical, magnetic, electrostatic or nuclear energy.
- A moving object has energy in its kinetic store; a raised object has energy in its gravitational potential store.

Ways energy is transferred

- Mechanically: when a force moves an object (**work done**).
- Electrically: when a current flows.
- By heating, and by radiation such as light and sound.

Conservation of energy

- Energy can be transferred usefully, stored or **dissipated**, but it cannot be created or destroyed.
- In a **closed system**, the total energy stays the same.

- Wasted energy is usually **dissipated** to the surroundings as thermal energy.

Equations to learn

- **Kinetic energy**: $E_k = ½ m v^2$
- **Gravitational potential energy**: $E_p = m g h$ ($g = 9.8$ N/kg on Earth; Edexcel and OCR papers use 10 N/kg)
- **Elastic potential energy**: $E_e = ½ k e^2$
- **Work done**: $W = F s$

Reducing unwanted energy transfers

- Lubrication reduces friction between moving parts.
- Thermal insulation reduces the rate of heat loss from buildings.
- Thicker walls made of materials with low thermal conductivity reduce energy transfer.

Exam tip

- Describe energy in stores and transfers: 'energy is transferred from the chemical store to the thermal store'.
- Copy the equation, substitute, then calculate. In **kinetic energy**, square the speed first.

Common mistakes

- Forgetting to square v.
- Saying energy is used up. It's transferred and spreads out.
- Leaving mass in grams when it should be in kilograms.

Worked examples

A 0.5 kg ball moves at 4 m/s. Calculate the energy in its kinetic store.

Write the equation: kinetic energy = ½ × mass × speed^2. **$E_k = ½ m v^2$**

Square the speed first, then multiply. **$½ × 0.5 × 4^2 = 0.25 × 16$**

Answer: 4 J

A 2 kg book is lifted 1.5 m. Calculate the energy gained by its gravitational potential store. ($g = 9.8$ N/kg)

Write the equation: energy = mass × gravitational field strength × height. **$E_p = m g h$**

Put the numbers in. **$2 × 9.8 × 1.5$**

Answer: 29.4 J

Your notes

Key terms

Energy store	A way energy is held, such as kinetic, thermal or chemical.
Kinetic energy	Energy an object has because it is moving: $E_k = ½mv^2$.
Gravitational potential energy	Energy gained by raising an object: $E_p = mgh$.
Elastic potential energy	Energy stored in a stretched or squashed object: $E_e = ½ke^2$.
Dissipated	Spread out to the surroundings and wasted, usually as thermal energy.
Closed system	A system where no energy enters or leaves, so the total stays the same.
Work done	Energy transferred when a force moves an object: $W = Fs$.
Conservation of energy	Energy cannot be created or destroyed, only transferred.

Quick questions

Cover the answers and test yourself: remembering is what makes it stick.

1. Which energy store increases when a ball is lifted up?
2. Which equation gives kinetic energy?
3. Energy cannot be created or destroyed. What is this called?
4. Where does most wasted energy end up?
5. A 2 kg ball moves at 3 m/s. What is its kinetic energy?
6. A 5 kg box is lifted 2 m ($g = 9.8$ N/kg). How much gravitational potential energy does it gain?
7. Which of these is a way of transferring energy rather than a store?
8. In which store is the energy of a stretched spring?

Answers

1. Gravitational potential
2. $E_k = ½mv^2$
3. Conservation of energy
4. The thermal store of the surroundings
5. 9 J
6. 98 J
7. Heating
8. Elastic potential

What to do next

Practise 12 questions on this topic

Try 7 exam questions, with mark schemes

Read the lesson, one step at a time

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