

Energy Stores Transfers

GCSE Physics · Written to the shared content for AQA, Edexcel and OCR

Name _____ Class _____ Date _____

1. Worked example

A 0.50 kg ball moves at 4.0 m/s. Calculate its kinetic energy. (2 marks)

Step 1 · Write the equation

$$\text{kinetic energy} = \frac{1}{2} \times \text{mass} \times \text{speed}^2, E_k = \frac{1}{2} m v^2$$

Step 2 · Substitute

$$E_k = \frac{1}{2} \times 0.50 \times 4.0^2 = \frac{1}{2} \times 0.50 \times 16$$

Step 3 · Calculate with unit

$$E_k = 4.0 \text{ J}$$

Answer: 4.0 J

Check: Square the speed first ($4.0^2 = 16$), then multiply.

2. Now try one with the steps

Amara (mass 52 kg) climbs a hill 120 m high. Calculate the gravitational potential energy she gains. $g = 9.8 \text{ N/kg}$. (2 marks)

Step 1 · Write the equation

Step 2 · Substitute

Step 3 · Calculate

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. State the principle of conservation of energy. [2]

2. Name the energy store that increases when a spring is stretched. [1]

3. Describe the energy transfers when a battery-powered fan is switched on. [3]

4. Calculate the kinetic energy of a 60 kg runner moving at 5 m/s. Give your answer in joules. [2]

5. A 2.5 kg bag is lifted 1.2 m onto a shelf. Calculate the gravitational potential energy gained. $g = 9.8$ N/kg. Give your answer in joules. [2]

6. Calculate the kinetic energy of a 900 kg car travelling at 20 m/s. Give your answer in kJ. [3]

7. Explain what is meant by a closed system. [1]

8. A spring with spring constant 40 N/m is stretched by 0.15 m. Calculate the elastic potential energy stored. Give your answer in joules. [2]

9. The speed of a car doubles. State the factor by which its kinetic energy increases. [1]

10. An object moving at 10 m/s has 400 J of kinetic energy. Calculate its mass. [3]

11. A 0.20 kg ball is dropped from a height of 5.0 m. Calculate its speed just before it hits the ground, ignoring air resistance. $g = 9.8 \text{ N/kg}$. Give your answer in m/s to 2 significant figures. [4]

12. Explain why the real ball in question 11 hits the ground at a lower speed than calculated. [2]

13. A spring launcher ($k = 600 \text{ N/m}$) is compressed by 0.050 m and fires a 0.050 kg toy straight up. Calculate the maximum height the toy could reach. $g = 9.8 \text{ N/kg}$. Give your answer to 2 significant figures. [4]

14. A swinging pendulum gradually stops. Explain this in terms of energy, using the idea of conservation of energy. [3]

4. Before you hand it in

$E_k = \frac{1}{2} \times 2 \times 3 = 3 \text{ J}$ for a 2 kg mass at 3 m/s

$E_k = \frac{1}{2} m v^2$: square the speed first. $\frac{1}{2} \times 2 \times 3^2 = 9 \text{ J}$.

"The energy was used up" or "the energy was lost"

Say energy was transferred to another store or dissipated (spread out) to the surroundings, usually by heating.

Putting an extension of 8 cm into $E_e = \frac{1}{2} k e^2$ as 8

Convert first: 8 cm = 0.08 m. Check whether your answer is sensible for the object.

Stopping at $v^2 = 392$ and writing 392 m/s

When you rearrange $\frac{1}{2} m v^2$ for v , you must take the square root at the end: $v = \sqrt{392} = 19.8 \text{ m/s}$.