Conservation of Energy

KS3 Physics · Follows the national curriculum

Name _____ Class _____ Date _____

1. Worked example

A toaster takes in 1000 J. 700 J heats the bread. How much is wasted?

Step 1 · Energy in = energy out

Total out must equal 1000 J (conservation of energy).

Step 2 · Subtract the useful part

Wasted = 1000 − 700 = 300 J.

Answer: 300 J wasted

Check: 700 + 300 = 1000 J ✓

2. Now try one with the steps

Where does the wasted energy from a TV go?

Step 1 · Useful outputs

Step 2 · Wasted output

Step 3 · What happens next

Answer:

3. Practice

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

1. State the law of conservation of energy. [1]

2. What does 'dissipated' mean? [1]

3. A lamp takes in 60 J and gives out 6 J of light. How much energy is wasted, in joules? [1]

4. A radio takes in 400 J. 120 J is useful sound. How much is wasted, in joules? [1]

5. Name the useful and the wasted energy outputs of a hair dryer. [2]

6. A kettle takes in 2000 J and 1800 J heats the water. What is its efficiency, percentage? [2]

7. A motor is 60% efficient and takes in 1000 J. How much useful energy does it give out, in joules? [2]

8. An old filament bulb takes in 100 J and gives out 5 J of light. Calculate its efficiency percentage. [2]

9. In a Sankey diagram, what does the width of each arrow show? [1]

10. Oiling a squeaky bike chain makes the bike more efficient. Explain why. [2]

11. A machine is 80% efficient and wastes 50 J. How much energy goes in, in joules? [3]

12. Zara says her new electric scooter is 110% efficient. Explain why this is impossible. [2]

13. A swinging pendulum slowly stops. Use conservation of energy to explain what has happened. [3]

14. An LED bulb and a filament bulb give out the same amount of light. The LED takes in 8 J each second and the filament bulb takes in 60 J each second. The LED gives 3 J of light each second. How much more energy does the filament bulb waste each second, in joules? [3]

4. Before you hand it in

"The wasted energy is lost and gone."
Say it is dissipated: spread out into the surroundings, usually by heating.

Efficiency = total in ÷ useful out.
Efficiency = useful out ÷ total in × 100%. It is always 100% or less.

Forgetting energy can be useful in one device and wasted in another.
Heating is useful in a toaster but wasted in a TV.