

Name _____

Class _____

Date _____

By the end of this worksheet I can...

- ☐ explain conservation of energy
- ☐ calculate potential energy changing into kinetic energy
- ☐ find a velocity from a height
- ☐ use the total energy of a system to find an unknown

I DO

Key ideas and worked example Read this first

Energy cannot be created or destroyed: it can only change from one form to another. In a closed system the **total energy stays the same**.

Position of a falling ball	Energy it has	Total energy E_T
At the top, at rest	Potential only	$E_T = E_{p1}$
Half-way down	Some potential, some kinetic	$E_T = E_{p2} + E_{k1}$
Just before it lands	Kinetic only	$E_T = E_{k2}$

Remember

If no energy is lost, the potential energy lost = the kinetic energy gained.

A 30 kg body falls freely from a height of 20 m.

Example Find its kinetic energy and velocity just before impact.

Worked answer set out every step like this

$$E_p = mgh = 30 \times 9.8 \times 20 = 5880 \text{ J}$$

No energy is lost, so $E_k = 5880 \text{ J}$ (5.9 kJ)

$$E_k = \frac{1}{2}mv^2, \text{ so } v^2 = 2 \times 5880 \div 30 = 392$$

$$v = \sqrt{392} = 20 \text{ m/s}$$

WE DO

Guided practice Follow the steps to help you

A 1.5 kg buggy rolls from the top of a 50 cm ramp.

1 Calculate the potential and kinetic energy at the top and half-way down, and the energy transferred. (4 marks)

Steps

1. Top: $E_p = 1.5 \times 9.8 \times 0.5$, and $E_k = 0$ (at rest)
2. Half-way: the height is 0.25 m, so find E_p there
3. E_k half-way = E_p at top – E_p half-way

YOU DO

On your own Give answers to two significant figures. Show your working.

2 A 3 kg buggy rolls from the top of an 80 cm ramp. Calculate the potential and kinetic energy at the top and half-way down.

3 A 5 kg mass is raised steadily through 2 m. Calculate the work done and the potential energy gained. What do you notice?

4 A 20 kg mass falls freely. When it is 16 m above the ground its total energy is 3531 J. Calculate the height it started from. (3 marks)

5 A 30 kg body is thrown straight up at 20 m/s. Calculate its kinetic energy and the height it rises to.

6 A 60 kg skateboarder starts at rest at the top of a 500 m hill. Ignoring friction, find the potential and kinetic energy at the top, the middle and the bottom.

Position	E_p (J)	E_k (J)
Top (500 m)		
Middle (250 m)		
Bottom (0 m)		

Check and reflect

Mark your answers with the answer sheet. Which “I can” statement above still needs work? Look back at the notes for that topic on the site.
