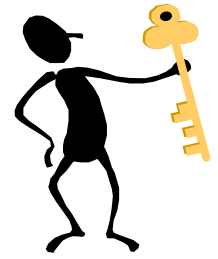


Potential and Kinetic Energy

Miss K Smith



Starter Activity



What would the world be like if gravity worked the other way up?
Explain



Learning Objectives

- To calculate gravitational potential energy
- To calculate kinetic energy
- To describe and explain conservation of energy

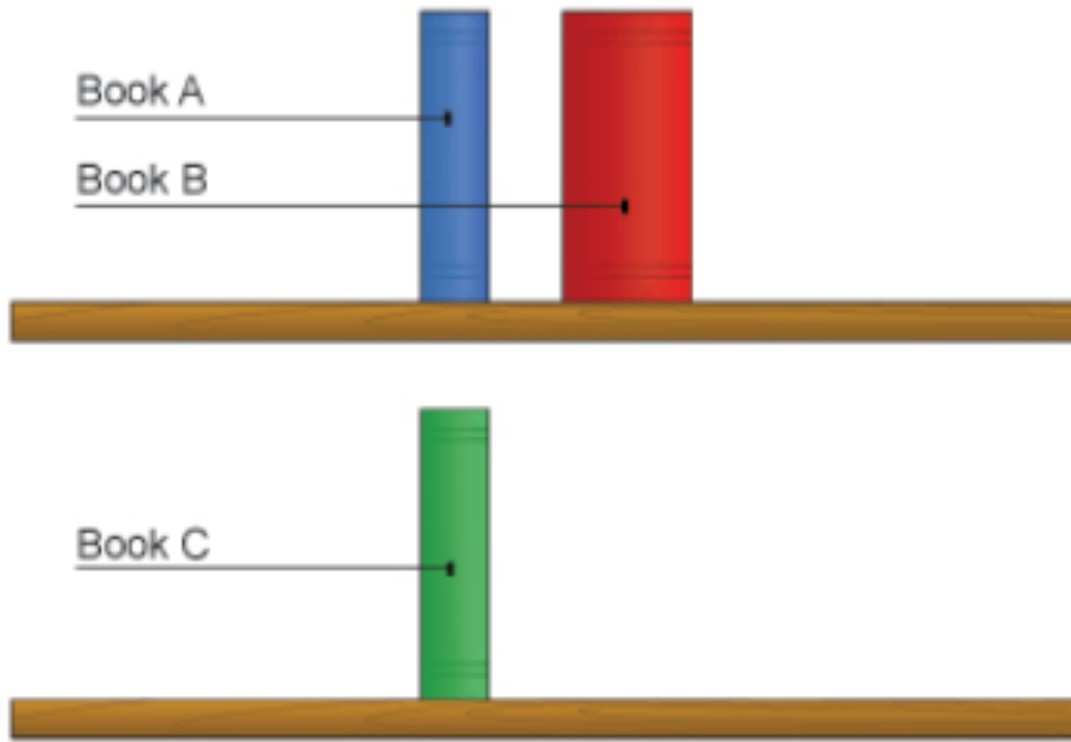
GPE - Key Points

- Every time you lift an object up you transfer energy by work
- Chemical energy from your muscles transfers to GPE in the object that was lifted

GPE is energy stored in an object because of its position in the Earth's gravitational field

- Earth's gravitational field strength is 10N/kg

$$\text{GPE (J)} = \text{mass(kg)} \times \text{GFS (N/kg)} \times \text{vertical height (m)}$$



1. Which books have GPE?
2. Which book has the most GPE?
3. Which book has the least GPE?

Calculating GPE

- A student weights 300N climbs on a platform which is 1.2m higher than the floor. Calculate the increase in GPE

Independent Task

ALL Complete GPE Work sheet

Weight and Gravitational Potential Energy

1. Assuming that the object was on Earth, where acceleration due to gravity is 10N/kg , calculate the gravitational potential energy that they had.

Mass (kg)	Weight (N)	Height (m)	Gravitational Potential energy (J)
5		2	
2		6	
8		5	
20		0.6	
5000		2	
0.2		10	
67		44	

2. Re-calculate the weight for the same objects, if they were on Mercury (where the acceleration due to gravity is 4N/kg)

Mass (kg)	Weight (N)	Height (m)	Gravitational Potential energy (J)
5		2	
2		6	
8		5	
20		0.6	
5000		2	
0.2		10	
67		44	



Extension Question

Why is the force of gravity less on Mercury? _____

EXTENSION

Complete Extension question on the sheet

<https://www.youtube.com/watch?v=iCQEc736G04>

Kinetic Energy

What energy transfers are taking place at Ai Pioppi?



Kinetics Energy - Key Points

- Kinetic energy is energy an object has due to motion. It depends on two things:
 - The objects mass
 - The objects speed

$$\text{Kinetic Energy (J)} = \frac{1}{2} \times \text{mass(kg)} \times \text{Velocity}^2(\text{m/s}^2)$$

Calculating KE

- A car with a mass of 500 kg is moving at a velocity of 12 m/s. How much kinetic energy does it have?

Independent Activity & Homework

Kinetic energy calculations

This is what you really need to be able to do – use the equation exactly as it is given to you to be able to calculate kinetic energy. Try for yourself – have a go at these questions:

1. A car that travels at a speed of 20m/s and has a mass of 1200 kg.
2. A year 11 pupil with a mass of 55kg swinging back on their chair and falling off it at a speed of 0.6m/s.
3. A runner with a mass of 62kg running at a speed of 0.8m/s.
4. A tennis ball travelling at a speed of 45m/s with a mass of 58kg.
5. A dog running across a field at a speed of 1.2m/s with a mass of 1.2kg.

These are the tricky ones – if you can do these then you really know what you're doing.

Calculating velocity:

6. Bus travelling through town, with a mass of 5040kg and kinetic energy of 492900J.
7. A lift travelling up to the top floor of the Empire State building with a mass of 4200kg and a kinetic energy of 4116J.
8. Bird flying towards its nest with a mass of 0.25kg and a kinetic energy of 40.5J.
9. A Wii remote flung from a hand through a TV, with a kinetic energy of 1.44J and a mass of 4.5kg.
10. Hot air balloon with a kinetic energy of 76550J and a mass of 1890kg.

Calculating mass:

11. Soccer ball, travelling at 20m/s, with a kinetic energy of 1.5J.
12. Wind turbine blade with a kinetic energy of 104040J, turning at 6m/s.
13. Aeroplane travelling at 75m/s with a kinetic energy of 842700J.
14. Canoe moving down the river with a kinetic energy of 5J and a speed of 0.5m/s.
15. Child riding a bike at a speed of 6m/s, with a total kinetic energy of 1224J. If the mass of the child is 20kg, what is the mass of the bike?



ALL

- Complete Kinetics Energy Calculations Sheet
- Answer all questions on pages 248 - 251
- **DUE: Thursday 7th April**

Plenary

R A G

1 2 3 4 5

Learning Objectives

- To calculate gravitational potential energy
- To calculate kinetic energy
- To describe and explain conservation of energy