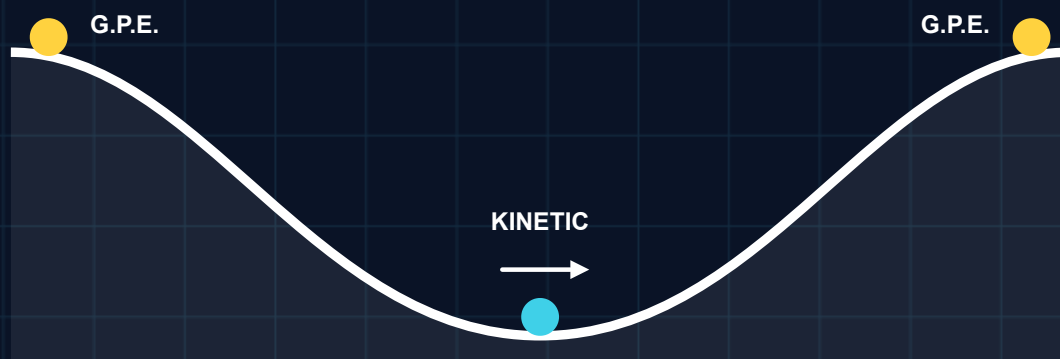


ENERGY STORES AND TRANSFERS

UNIT REVIEW

AFTER LESSON 9

Mixed exam-style questions from the whole unit, a fix-it log and the equation toolkit.



NAME

CLASS

TEACHER

TARGET GRADE

UNIT REVIEW

Mixed questions from the whole unit, like a real exam. Try each question without looking back. The equation toolkit is on the last page. Then mark your answers with your teacher and fill in the “fix it” log.



AQA-STYLE

MIXED EXAM PRACTICE

40 marks, about 45 minutes

- 1 Draw **one** line from each object to the energy store that is filling up. [3 marks]

a book being lifted onto a shelf

elastic potential store

a bow being pulled back

thermal store

a cup of tea being heated

gravitational potential store

- 2 A battery-powered fan is switched on. Describe the useful energy transfer. [2 marks]

- 3 A car of mass 1200 kg travels at 15 m/s. Calculate the energy in the kinetic store of the car. Use $E_k = \frac{1}{2} m v^2$ [3 marks]

EQUATION	
SUBSTITUTE	
ANSWER	unit:

- 4 A climber of mass 60 kg climbs 12 m up a rock face. Calculate the energy transferred to the climber's gravitational potential store. Gravitational field strength = 9.8 N/kg [3 marks]

EQUATION	
SUBSTITUTE	
ANSWER	unit:

5

A student hangs weights on a spring and measures its extension.

[6 marks]

Force / N	0	1.0	2.0	3.0	4.0	5.0
Extension / cm	0	2.0	4.0	6.0	8.0	10.9

(a) Calculate the spring constant. Use the reading at 2.0 N, and $F = ke$

EQUATION	
REARRANGE	
SUBSTITUTE	
ANSWER	unit:

(b) Calculate the energy in the elastic potential store when the extension is 0.060 m. Use $E_e = \frac{1}{2}ke^2$

EQUATION	
SUBSTITUTE	
ANSWER	unit:

(c) Explain what the result at 5.0 N shows.

- 6 A ball of mass 0.50 kg is dropped from a height of 3.2 m. Gravitational field strength = 9.8 N/kg [6 marks]

(a) Calculate the energy in the ball's gravitational potential store before it is dropped.

EQUATION	
SUBSTITUTE	
ANSWER	unit:

(b) Ignoring air resistance, how much energy is in the ball's kinetic store just before it hits the ground?

(c) The ball bounces back to a height of only 2.4 m. Explain why, using the idea of conservation of energy.

(d) Calculate the efficiency of the bounce. Use $\text{efficiency} = \frac{\text{bounce height}}{\text{drop height}}$

- 7 A motor lifts a load. It transfers 4800 J to the load in 12 s. [4 marks]

(a) Calculate the power of the motor. Use $P = \frac{E}{t}$

EQUATION	
SUBSTITUTE	
ANSWER	unit:

(b) A 600 W motor transfers the same 4800 J. Calculate how long it takes.

EQUATION	
REARRANGE	
SUBSTITUTE	
ANSWER	unit:



Q	What went wrong?	The correct physics (or method) is...	Lesson to revisit

EQUATION TOOLKIT

Every equation in the unit. AQA prints all of them on the equation sheet in the exam, but you still need to know what each symbol means, its unit, and how to use it. Use $g = 9.8 \text{ N/kg}$.

- 1 Cover the quantity you want to find.
- 2 What is left side by side? **Multiply**.
- 3 One above the other? **Divide** the top by the bottom.

Example: to find h from $E_p = mgh$, cover h . E_p is above m and g , so $h = \frac{E_p}{mg}$. Kinetic and elastic potential energy have no triangle: in this unit you only use them to calculate the energy.

$$E_k = \frac{1}{2} m v^2$$

Lesson 2

kinetic energy = 0.5 × mass × (speed)²

J, kg, m/s

Use it to calculate the energy. Only the speed is squared.

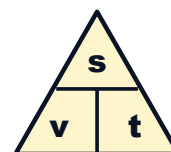
$$s = vt$$

Lesson 2

distance travelled = speed × time

m, m/s, s

$$v = \frac{s}{t} \text{ and } t = \frac{s}{v}$$



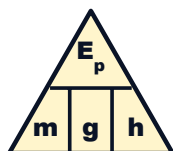
$$E_p = mgh$$

Lesson 3

gravitational potential energy = mass × gravitational field strength × height

J, kg, N/kg, m

$$h = \frac{E_p}{mg} \text{ and } m = \frac{E_p}{gh}$$



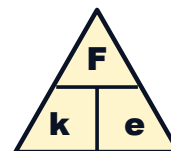
$$F = ke$$

Lesson 4

force = spring constant × extension

N, N/m, m

$$k = \frac{F}{e} \text{ and } e = \frac{F}{k}$$



$$E_e = \frac{1}{2} k e^2$$

Lesson 5

elastic potential energy = 0.5 × spring constant × (extension)²

J, N/m, m

Use it to calculate the energy. Only the extension is squared.

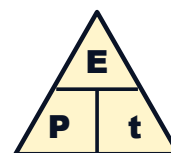
$$P = \frac{E}{t}$$

Lesson 7

power = energy transferred ÷ time

W, J, s

$$E = Pt \text{ and } t = \frac{E}{P}$$



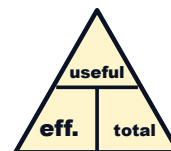
$$\text{eff.} = \frac{\text{useful output}}{\text{total input}}$$

Lesson 9

efficiency = useful output ÷ total input, using energy (J) or power (W)

no unit: a decimal up to 1, or × 100 for a percentage

$$\text{useful} = \text{eff.} \times \text{total}; \text{total} = \frac{\text{useful}}{\text{eff.}}$$



1

Write what you know.
Convert first: g → kg, cm → m, kJ → J, min → s, % → decimal.

2

Write the equation in symbols.

3

Rearrange if you need to, then substitute the numbers.

4

Give the answer with a unit. Ask: is it sensible?