



HOMEWORK BOOKLET

P1



Energy Mixed Calculations

For each question:

- write down the equation you will use;
- show all of your working out, including how you have rearranged equations and converted units if necessary;
- give your answer to three significant figures.

elastic potential energy = $0.5 \times \text{spring constant} \times (\text{extension})^2$	$E_e = \frac{1}{2}ke^2$
kinetic energy = $0.5 \times \text{mass} \times (\text{velocity})^2$	$E_k = \frac{1}{2}mv^2$
gravitational potential energy = $\text{mass} \times \text{gravitational field strength} \times \text{height}$	$E_p = mgh$

1. A car has a mass of 1700kg and travels at a constant velocity of 12m/s.

Calculate its kinetic energy store.

kinetic energy store = _____ J

2. An elastic band has been stretched 0.9m from its equilibrium position. The spring constant of the elastic band is 20.5N/m.

Calculate its elastic potential energy store.

elastic potential energy store = _____ J



3. At an archery competition, a 300g arrow has struck the target and is suspended 0.9m above the ground. The gravitational field strength is 9.8N/kg.

Calculate the gravitational potential energy store of the arrow.

gravitational potential energy store = _____ J

4. A rider with a mass of 70kg has a gravitational potential store of 1260J while sat on their horse. The gravitational field strength is 9.8N/kg.

Calculate the height the rider is sat at.

height = _____ m

5. A cyclist and their bike are travelling at a constant velocity of 8.43m/s. Their kinetic energy store is 2.7kJ.

Calculate the combined mass of the cyclist and their bike.

mass = _____ kg

6. The string on an archer's bow has an elastic potential store of 205J. The spring constant of the bowstring is 900N/m.

Calculate the distance it has been stretched from its equilibrium position.

distance = _____ m



Power Calculations

Power can be calculated using the equation: $\text{power (W)} = \frac{\text{energy transferred (J)}}{\text{time (s)}}$

Use the equation to answer the questions below.

1. A kettle takes 300 seconds to boil some water. During this time, the kettle transfers 825 000 J of energy.

Calculate the power of the kettle.

power = _____ W

2. A microwave transfers 900 000 J of energy in 600 seconds.

Calculate the power of the microwave.

power = _____ W

3. A small motor runs for 60 minutes. The energy transferred during this time is 18 000 J.

Calculate the power of the motor.

power = _____ W

4. A person spends 8 minutes in an electric shower. The energy transferred during the shower is 4 320 000 J.

Calculate the power of the shower.

power = _____ W



5. Write down the equation that links time, power and work done.

6. A person sprints for 2 minutes. They do 84 960 J of work during the sprint.

Calculate the power output of the person during the sprint.

power = _____ W

7. A person used 908 W to lift a 100 kg mass in 50 seconds.

Calculate the work done during the lift.

work done = _____ J

8. A 1100 W toaster transfers 198 kJ of energy toasting some bread.

Calculate the time it takes.

time = _____ s

9. A 70 kg person ran to the top of some stairs with a power of 882 W. They did 1234.8 J of work during the run.


Calculate the time it took the person to reach the top of the stairs.


time = _____ s

Energy Transfer Diagrams

Silver 

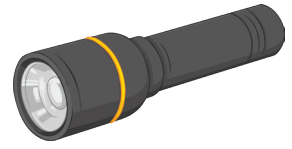
Draw the energy transfer diagrams to represent the transfers in each situation below.

1.	A clockwork toy has elastic potential energy which is transferred as kinetic and sound energy.	

2.	A hairdryer transfers electrical energy into heat, sound and kinetic energy into the surroundings.	

3.

A torch transfers stored chemical energy in the batteries to light and heat energy into the surroundings.



Efficiency

1. A man is researching energy saving light bulbs. One of the bulbs he is interested in is a 40W bulb which uses 700J of electrical energy in a given time period during which it transfers 500J of light energy. The remaining energy is wasted.

a. (i) How much energy is wasted during this period of time? (1)

a. (ii) What type of energy is the wasted energy transferred to? (1)

b. Calculate how efficient this light bulb is to 2 decimal places. (2)

Use the equation $\text{efficiency} = \frac{\text{useful power output}}{\text{total power output}}$

Efficiency: _____

c. How long in seconds is the time period in which the 40W light bulb transfers 700J? (2)

Use the equation $P = \frac{E}{t}$

Time: _____ seconds.

2. Different bulbs have different life spans and costs to run. The table below shows two bulb types compared.

Bulb type	Life span (hours)	Buying cost	Cost over life span
LED	42 000	£25.00	£65.00
Halogen	3 000	£2.10	£13.00

A lady has a broken halogen bulb and is looking at replacing it. She wonders if it is more economical to replace it with an LED or not.

Compare the bulbs in terms of life span and cost – include your calculations. (4)
