

AQA GCSE Physics Energy & Power Calculations Worksheet

Instructions: Answer all questions, showing your full working. Remember to include units in your answers. (Assume gravitational field strength = 9.8 N/kg where needed)

1. The Jumping Frog

A frog with a mass of 0.1 kg jumps 0.5 meters into the air.

- Calculate the gravitational potential energy gained by the frog at the highest point of its jump.

2. The Hot Bath

A bath contains 100 kg of water at 40°C . You want to increase the temperature to 45°C . The specific heat capacity of water is $4200 \text{ J/kg}^\circ\text{C}$.

- Calculate the amount of thermal energy needed to heat the bath water.

3. The Speedy Car

A car with a mass of 1000 kg accelerates from rest to a speed of 20 m/s .

- Calculate the kinetic energy of the car at this speed.

4. The Stretched Spring

A spring with a spring constant of 200 N/m is stretched by 0.1 meters .

- Calculate the elastic potential energy stored in the spring.

5. The Falling Rock

A rock with a mass of 2 kg falls from a cliff that is 50 meters high.

- Calculate the speed of the rock just before it hits the ground. (Assume no energy is lost due to air resistance.)

6. The Cooling Cup

A cup of tea containing 250g of water cools from 80°C to 20°C . The specific heat capacity of water is $4200 \text{ J/kg}^\circ\text{C}$.

- Calculate the change in thermal energy of the tea.

7. The Lifting Weightlifter

A weightlifter lifts a 150 kg weight above their head to a height of 2 meters in 3 seconds .

- Calculate the power output of the weightlifter.

8. The Efficient Light Bulb

An energy-efficient light bulb has a power rating of 10 W and is left on for 5 hours .

- Calculate the energy transferred by the light bulb.

9. The Rolling Ball (Challenge)

A ball rolls down a hill, converting gravitational potential energy into kinetic energy. At the top of the hill, the ball has 10 J of gravitational potential energy. At the bottom of the hill, the ball has 7 J of kinetic energy.

- How much energy was lost due to friction?
- If the ball took 2 seconds to roll down the hill, what was the average power output due to the decrease in gravitational potential energy?

10. The Kettle (Challenge)

A kettle has a power rating of 2500 W. It is used to heat 1.5 kg of water from 20°C to 100°C. The specific heat capacity of water is 4200 J/kg°C.

- Calculate the theoretical minimum time it should take to boil the water. (Assume 100% efficiency). Why might it take longer in reality?

This worksheet provides a good mix of questions covering:

- Kinetic energy
- Gravitational potential energy
- Elastic potential energy
- Specific heat capacity and changes in thermal energy
- Power calculations
- Energy efficiency considerations

Good luck to your students! Let me know if you need the answers as well.