

AQA GCSE Physics Energy Calculations Worksheet | Kinetic, Potential & Elastic Energy

Question 1: The Speedy Squirrel

- **Answer:** Kinetic energy = $0.5 * \text{mass} * (\text{speed})^2 = 0.5 * 0.5 \text{ kg} * (4 \text{ m/s})^2 = 4 \text{ J}$

Question 2: The Stretching Spring

- **Answer:** Elastic potential energy = $0.5 * \text{spring constant} * (\text{extension})^2 = 0.5 * 100 \text{ N/m} * (0.2 \text{ m})^2 = 2 \text{ J}$

Question 3: The Climbing Cat

- **Answer:** Gravitational potential energy = $\text{mass} * \text{gravitational field strength} * \text{height} = 4 \text{ kg} * 9.8 \text{ N/kg} * 5 \text{ m} = 196 \text{ J}$

Question 4: The Rolling Ball

- **Answer:** Energy lost = Initial gravitational potential energy - Final kinetic energy = $20 \text{ J} - 15 \text{ J} = 5 \text{ J}$

Question 5: The Bouncing Ball

- **Answer a):** Gravitational potential energy = $\text{mass} * \text{gravitational field strength} * \text{height} = 0.1 \text{ kg} * 9.8 \text{ N/kg} * 2 \text{ m} = 1.96 \text{ J}$
- **Answer b):** Kinetic energy (just before hitting the ground) = Gravitational potential energy (at the top) = **1.96 J** (assuming no energy loss)
- **Answer c):** Kinetic energy = $0.5 * \text{mass} * (\text{speed})^2$ $1.96 \text{ J} = 0.5 * 0.1 \text{ kg} * (\text{speed})^2$ $\text{speed}^2 = 39.2$ $\text{speed} = \sqrt{39.2} = 6.26 \text{ m/s}$ (approximately)

Question 6: The Sliding Child

- **Answer a):** Gravitational potential energy = $\text{mass} * \text{gravitational field strength} * \text{height} = 30 \text{ kg} * 9.8 \text{ N/kg} * 3 \text{ m} = 882 \text{ J}$
- **Answer b):** Kinetic energy (at the bottom) = Gravitational potential energy (at the top) = **882 J** (since the slide is frictionless)
- **Answer c):** Kinetic energy = $0.5 * \text{mass} * (\text{speed})^2$ $882 \text{ J} = 0.5 * 30 \text{ kg} * (\text{speed})^2$ $\text{speed}^2 = 58.8$ $\text{speed} = \sqrt{58.8} = 7.67 \text{ m/s}$ (approximately)

Question 7: The Stretched Elastic Band

- **Answer:** Elastic potential energy = $0.5 * \text{spring constant} * (\text{extension})^2 = 0.5 * 50 \text{ N/m} * (0.1 \text{ m})^2 = 0.25 \text{ J}$

Question 8: The Falling Apple

- **Answer a):** Gravitational potential energy = $\text{mass} * \text{gravitational field strength} * \text{height} = 0.2 \text{ kg} * 9.8 \text{ N/kg} * 2 \text{ m} = 3.92 \text{ J}$
- **Answer b):** Kinetic energy (just before hitting the ground) = Gravitational potential energy (at the top) = **3.92 J** (assuming no energy loss)
- **Answer c):** Kinetic energy = $0.5 * \text{mass} * (\text{speed})^2$ $3.92 \text{ J} = 0.5 * 0.2 \text{ kg} * (\text{speed})^2$ $\text{speed}^2 =$

39.2 speed = $\sqrt{39.2} = 6.26 \text{ m/s}$ (approximately)

Question 9: The Pendulum Swing

- **Answer a):** Gravitational potential energy = mass * gravitational field strength * height = $0.5 \text{ kg} * 9.8 \text{ N/kg} * 0.1 \text{ m} = 0.49 \text{ J}$
- **Answer b):** Kinetic energy (at the lowest point) = Gravitational potential energy (at the highest point) = **0.49 J** (assuming no energy loss)
- **Answer c):** Kinetic energy = $0.5 * \text{mass} * (\text{speed})^2$ $0.49 \text{ J} = 0.5 * 0.5 \text{ kg} * (\text{speed})^2$ $\text{speed}^2 = 1.96$ $\text{speed} = \sqrt{1.96} = 1.4 \text{ m/s}$

Question 10: The Compressed Spring

- **Answer:** Elastic potential energy = $0.5 * \text{spring constant} * (\text{compression})^2 = 0.5 * 200 \text{ N/m} * (0.15 \text{ m})^2 = 2.25 \text{ J}$