AQA GCSE Physics Energy & Power Calculations Worksheet - ANSWERS

1. The Jumping Frog

- **Answer:** Gravitational potential energy = mass * gravitational field strength * height = 0.1 kg * 9.8 N/kg * 0.5 m = **0.49 J**

2. The Hot Bath

- **Answer:** Change in thermal energy = mass * specific heat capacity * temperature change = 100 kg * 4200 J/kg°C * (45°C - 40°C) = **2,100,000 J**

3. The Speedy Car

- **Answer:** Kinetic energy = 0.5 * mass * (speed)² = 0.5 * 1000 kg * (20 m/s)² = **200,000 J**

4. The Stretched Spring

- **Answer:** Elastic potential energy = 0.5 * spring constant * (extension)² = 0.5 * 200 N/m * (0.1 m)² = **1 J**

5. The Falling Rock

- **Answer:** Gravitational potential energy at the top = kinetic energy just before impact (assuming no energy loss) mass * gravitational field strength * height = 0.5 * mass * (speed)² 9.8 N/kg * 50 m = 0.5 * (speed)² speed² = 980 speed = √980 = **31.3 m/s** (approximately)

6. The Cooling Cup

- **Answer:** Change in thermal energy = mass * specific heat capacity * temperature change = 0.25 kg * 4200 J/kg°C * (20°C - 80°C) = **-63,000 J** (The negative sign indicates energy is lost)

7. The Lifting Weightlifter

- **Answer:** Work done = force x distance = mass * gravitational field strength * distance = 150 kg * 9.8 N/kg * 2 m = 2940 J Power = work done / time = 2940 J / 3 s = **980 W**

8. The Efficient Light Bulb

- **Answer:** Time in seconds = 5 hours * 60 minutes/hour * 60 seconds/minute = 18,000 s Energy transferred = power * time = 10 W * 18,000 s = **180,000 J**

9. The Rolling Ball (Challenge)

- **Answer a):** Energy lost = Initial gravitational potential energy - Final kinetic energy = 10 J - 7 J = **3 J**
- **Answer b):** Power = work done / time = (change in gravitational potential energy) / time = 10 J / 2 s = **5 W**

10. The Kettle (Challenge)

- **Answer:** Energy required to heat water = mass * specific heat capacity * temperature change = 1.5 kg * 4200 J/kg°C * (100°C - 20°C) = 504,000 J Time = energy transferred / power = 504,000 J / 2500 W = **201.6 seconds** (approximately) In reality, it would take longer because

some energy is always lost to the surroundings (e.g., heating the kettle itself, heat loss to the air). This means the kettle is not 100% efficient.