

Energy Unit Practice Test

Section 1: Definitions (10 marks)

1. Define **energy** in your own words. (1 mark)
2. Differentiate between **kinetic energy** and **potential energy**. Provide one example of each. (2 marks)
3. State the **Law of Conservation of Energy**. (1 mark)
4. What is **efficiency**? How is it calculated? (2 marks)
5. What is **specific heat capacity**? What are its units? (2 marks)
6. What is the difference between **thermal energy** and **heat**? (2 marks)

Section 2: Calculations (41 marks)

1. A 0.25 kg volleyball is served with a speed of 20 m/s. Calculate the kinetic energy of the volleyball. (3 marks)
2. A 70 kg rock climber is standing at the top of a 30 m cliff. Calculate the rock climber's gravitational potential energy relative to the ground. (3 marks)
3. A 1.5 kg textbook is lifted from the floor to a shelf 2.1 m high.
 - o Calculate the work done in lifting the book. (2 marks)
 - o Calculate the potential energy of the book on the shelf. (2 marks)
4. A 10 kg bowling ball is rolling down the lane at a speed of 4 m/s. Calculate the bowling ball's kinetic energy. (3 marks)
5. A roller coaster car with a mass of 500 kg starts from rest at a height of 45 m. Assuming no energy loss due to friction, calculate the speed of the roller coaster car at the bottom of the hill. (4 marks)
6. A 2 kg object is thrown vertically upward with an initial kinetic energy of 100 J. Calculate the maximum height the object will reach. (4 marks)
7. A pendulum with a bob of mass 0.5 kg is released from a height of 0.2 m. Calculate the speed of the bob at its lowest point, assuming no energy loss due to friction. (4 marks)
8. A 0.1 kg apple falls from a tree branch 3 m high.
 - o Calculate the apple's potential energy before it falls. (2 marks)
 - o Calculate the apple's kinetic energy just before it hits the ground. (2 marks)
9. A 400 g metal block ($C = 385 \text{ J/kg}^\circ\text{C}$) is heated from 20°C to 100°C . Calculate the amount of heat energy absorbed by the metal block. (4 marks)
10. A light bulb uses 100 J of electrical energy and produces 20 J of light energy. Calculate the efficiency of the light bulb. (3 marks)
11. Jack pedaled up a hill and gained a vertical distance of 25 m. Then he turned around and coasted down the hill, reaching a speed of 13 m/s at the bottom. The combined mass of Jack and his bike is 68 kg. What was the efficiency of the transformation of his gravitational potential energy into kinetic energy going down the hill? (4 marks)
12. A 60 kg skier starts from rest at the top of a 50 m high slope. If the skier reaches the bottom of the slope with a speed of 15 m/s, what is the efficiency of the energy transformation? (4 marks)
13. 2.5 kg of aluminum is heated from 20°C to 80°C . If the aluminum absorbed 135,000 J of energy, what is the specific heat capacity of aluminum? (3 marks)

14. A 55.0 g sample of an unknown metal absorbs 2.75 kJ of heat and its temperature increases from 10.0°C to 110.0 °C. What is the specific heat capacity of the metal? (4 marks)
15. A 1.8 kg iron skillet is heated on a stovetop by absorbing 162 kJ of heat. If the specific heat capacity of iron is 450 J/kg°C, and the initial temperature of the skillet was 25 °C, what is the final temperature of the skillet? (4 marks)