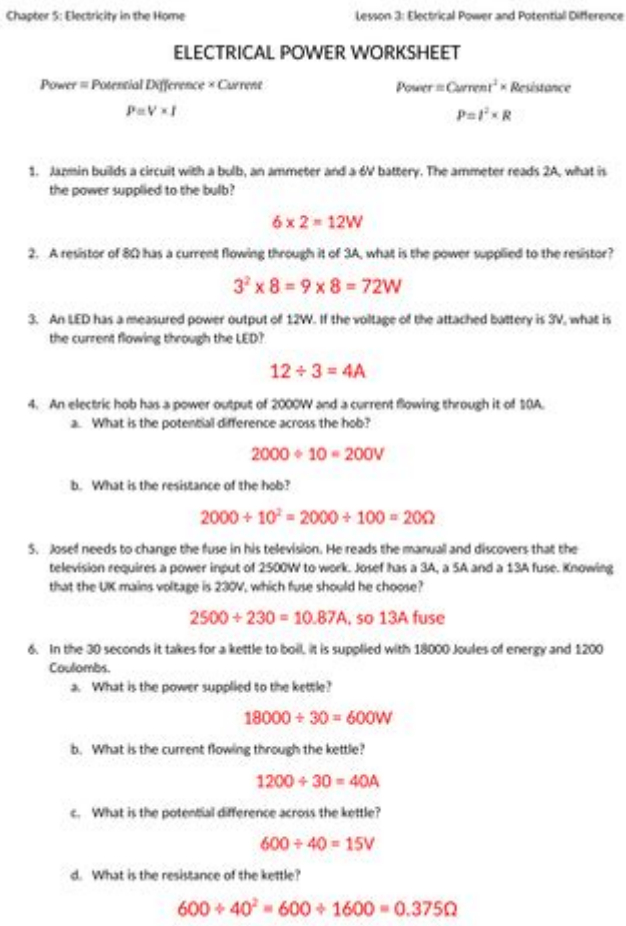
Work Power And Energy Worksheet Answer Key



Chapter 5: Electricity in the Home — Lesson 3: Electrical Power and Potential Difference

ELECTRICAL POWER WORKSHEET

$Power = Potential\ Difference \times Current$ $\quad P = V \times I$

$Power = Current^2 \times Resistance$ $\quad P = I^2 \times R$

1. Jazmin builds a circuit with a bulb, an ammeter and a 6V battery. The ammeter reads 2A, what is the power supplied to the bulb?

   6 x 2 = 12W

2. A resistor of 8Ω has a current flowing through it of 3A, what is the power supplied to the resistor?

   3^2 x 8 = 9 x 8 = 72W

3. An LED has a measured power output of 12W. If the voltage of the attached battery is 3V, what is the current flowing through the LED?

   12 ÷ 3 = 4A

4. An electric hob has a power output of 2000W and a current flowing through it of 10A.
   a. What is the potential difference across the hob?

      2000 ÷ 10 = 200V

   b. What is the resistance of the hob?

      $2000 \div 10^2 = 2000 \div 100 = 20\Omega$

5. Josef needs to change the fuse in his television. He reads the manual and discovers that the television requires a power input of 2500W to work. Josef has a 3A, a 5A and a 13A fuse. Knowing that the UK mains voltage is 230V, which fuse should he choose?

   2500 ÷ 230 = 10.87A, so 13A fuse

6. In the 30 seconds it takes for a kettle to boil, it is supplied with 18000 Joules of energy and 1200 Coulombs.
   a. What is the power supplied to the kettle?

      18000 ÷ 30 = 600W

   b. What is the current flowing through the kettle?

      1200 ÷ 30 = 40A

   c. What is the potential difference across the kettle?

      600 ÷ 40 = 15V

   d. What is the resistance of the kettle?

      $600 \div 40^2 = 600 \div 1600 = 0.375\Omega$

Work power and energy worksheet answer key is an essential educational tool for students studying physics and related sciences. Understanding the concepts of work, power, and energy is fundamental in the field of mechanics, as they form the backbone of various physical phenomena and applications. This article will delve into the significance of these concepts, provide a comprehensive overview of their definitions, calculations, and relationships, and present a hypothetical answer key to a worksheet designed for educational purposes.

Understanding Key Concepts

1. Work

Work is defined as the measure of energy transfer that occurs when an object is moved over a distance by an external force. The formula for calculating work (W) is given by:

$$ W = F \times d \times \cos(\theta) $$

Where:
- W = Work done (in joules)
- F = Force applied (in newtons)
- d = Distance moved (in meters)
- θ = Angle between the force and the direction of movement

Key Points about Work:
- Work can be positive, negative, or zero.
- Positive work occurs when the force and motion are in the same direction.
- Negative work occurs when the force and motion are in opposite directions.
- Zero work occurs when the force is perpendicular to the direction of motion.

2. Power

Power is the rate at which work is done or energy is transferred over time. The formula for power (P) is:

$$P = \frac{W}{t}$$

Where:
- P = Power (in watts)
- W = Work done (in joules)
- t = Time taken (in seconds)

Key Points about Power:
- 1 watt equals 1 joule per second.
- Power can be thought of as how quickly work is done.
- Different units of power include horsepower and kilowatts.

3. Energy

Energy is the capacity to do work. It exists in various forms, such as kinetic energy, potential energy, thermal energy, etc. The two most commonly discussed forms of energy in mechanics are:

- Kinetic Energy (KE): The energy possessed by an object due to its motion, calculated by the formula:

$$KE = \frac{1}{2} mv^2$$

Where:
- m = mass (in kilograms)
- v = velocity (in meters per second)

- Potential Energy (PE): The energy stored in an object due to its position or configuration, particularly in a gravitational field, calculated by:

$$PE = mgh$$

Where:
- m = mass (in kilograms)

- g = acceleration due to gravity (approximately 9.81 m/s²)
- h = height above a reference point (in meters)

Key Points about Energy:
- Energy can be transformed from one form to another.
- The Law of Conservation of Energy states that energy cannot be created or destroyed, only transformed.

Relationships Between Work, Power, and Energy

Understanding the relationship between work, power, and energy is crucial for solving physics problems. Here are some important relationships:

- Work-Energy Principle: The work done on an object is equal to the change in its kinetic energy.

$$ W = \Delta KE = KE_{\text{final}} - KE_{\text{initial}} $$

- Power and Energy: Power can also be expressed in terms of energy.

$$ P = \frac{E}{t} $$

Where E is the energy transferred.

- Work Done Against Gravity: When lifting an object, the work done against gravitational force can be expressed as:

$$ W = mgh $$

In this case, the work done is equal to the change in gravitational potential energy.

Sample Worksheet on Work, Power, and Energy

To better illustrate these concepts, consider the following sample worksheet, which can be utilized in a classroom setting.

Worksheet Questions:
1. A force of 10 N is applied to move a box 4 m in the direction of the force. Calculate the work done.
2. If the same work is done in 2 seconds, what is the power exerted?
3. A 5 kg object is lifted to a height of 10 m. Calculate the potential energy gained.
4. A car moving at a speed of 20 m/s has a mass of 1000 kg. Calculate its kinetic energy.
5. If a machine does 500 J of work in 5 seconds, what is its power output?

Hypothetical Answer Key:
1. Work done $W = F \times d = 10 \, \text{N} \times 4 \, \text{m} = 40 \, \text{J}$
2. Power $P = \frac{W}{t} = \frac{40 \, \text{J}}{2 \, \text{s}} = 20 \, \text{W}$
3. Potential energy $PE = mgh = 5 \, \text{kg} \times 9.81 \, \text{m/s}^2 \times 10 \, \text{m} =$

490.5 \, \text{J} \)
4. Kinetic energy \(KE = \frac{1}{2} mv^2 = \frac{1}{2} \times 1000 \, \text{kg} \times (20 \, \text{m/s})^2 = 200,000 \, \text{J} \)
5. Power \(P = \frac{W}{t} = \frac{500 \, \text{J}}{5 \, \text{s}} = 100 \, \text{W} \)

Conclusion

In summary, the work power and energy worksheet answer key serves as a practical guide for students to understand and apply the foundational concepts of physics. Mastery of work, power, and energy not only enhances problem-solving skills but also fosters a deeper comprehension of the physical world. By engaging with worksheets and their corresponding answer keys, students can reinforce their knowledge and gain confidence in their ability to tackle various scientific challenges. This understanding is crucial for advancing in physics education and applying these principles in real-world scenarios.

Frequently Asked Questions

What is the purpose of a work power and energy worksheet?

The purpose of a work power and energy worksheet is to help students practice and apply concepts related to the physical principles of work, power, and energy, reinforcing their understanding through problem-solving.

How can I find the answer key for a work power and energy worksheet?

The answer key for a work power and energy worksheet is typically provided by the teacher, available in educational resources, or can be found in textbooks or online educational platforms.

What key concepts are usually covered in a work power and energy worksheet?

Key concepts covered in a work power and energy worksheet usually include definitions and formulas for work, power, kinetic and potential energy, conservation of energy, and problem-solving techniques.

Are there online resources where I can find practice worksheets on work, power, and energy?

Yes, there are several online educational platforms, such as Khan Academy, Physics Classroom, and Teachers Pay Teachers, where you can find practice worksheets on work, power, and energy.

What are some common mistakes students make when

solving work power and energy problems?

Common mistakes include misapplying formulas, neglecting units, not accounting for all forms of energy, and misunderstanding the relationships between work, power, and energy.

How can I effectively use the answer key for my work power and energy worksheet?

To effectively use the answer key, first attempt to solve the problems independently, then check your answers against the key, and review any discrepancies to understand where you went wrong.

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