Select The Conversion Factors Needed To Convert 3.00 108 M/s To Mi/hr? A. 60s= 1 Min B. 60 Min = 1 Hr

Select The Conversion Factors Needed To Convert 3.00 x 10^8 M/s To Mi/hr? A. 60s= 1 Min B. 60 Min = 1 Hr

Converting a speed measurement from meters per second (m/s) to miles per hour (Mi/hr) is a common task in physics and everyday life, especially when dealing with high velocities such as the speed of light or high-speed vehicles. To accomplish this conversion accurately, it is essential to understand and apply the correct conversion factors. In this article, we will explore the necessary conversion factors, specifically focusing on the given data: 3.00 x 10^8 m/s, and how to convert it into miles per hour using the provided time conversions: A. 60 seconds = 1 minute and B. 60 minutes = 1 hour. We will break down each step systematically to ensure clarity and precision.

Understanding the Conversion Process

Before diving into the specific conversion factors, it’s important to understand the overall process of unit conversion. The main goal is to change the units from meters per second (m/s) to miles per hour (Mi/hr). This involves two primary steps:

1. Converting meters to miles.
2. Converting seconds to hours.

Each step requires specific conversion factors, which are ratios equal to 1 but expressed in different units. By multiplying the original value by these ratios, the units will cancel appropriately, leaving the desired units.

Key Conversion Factors

To convert 3.00 x 10^8 meters per second to miles per hour, the following essential conversion factors are needed:

1. Length Conversion: Meters to Miles

- 1 mile = 1609.344 meters

This conversion factor allows us to convert meters into miles by dividing the number of meters by 1609.344.

2. Time Conversion: Seconds to Hours

- 60 seconds = 1 minute
- 60 minutes = 1 hour

These two factors allow us to convert seconds into hours by first converting seconds to minutes, then minutes to hours.

Step-by-Step Conversion Process

Let's walk through the process of converting 3.00 x 10^8 m/s to miles per hour, incorporating the relevant conversion factors.

Step 1: Convert meters to miles

Starting with the speed in meters per second:

$$
3.00 \times 10^8 \text{ m/s}
$$

Using the conversion factor:

$$
1 \text{ mile} = 1609.344 \text{ meters}
$$

We set up the conversion:

$$
3.00 \times 10^8 \text{ m/sec} \times \frac{1 \text{ mile}}{1609.344 \text{ meters}}
$$

The meters cancel out, leaving miles per second:

$$
\[

$$
\frac{3.00 \times 10^8}{1609.344} \text{ miles/sec}
$$

Calculating this:

$$
\frac{3.00 \times 10^8}{1609.344} \approx 1.864 \times 10^5 \text{ miles/sec}
$$

Step 2: Convert seconds to hours

Now, convert seconds to hours using the given time conversion factors:

$$
1 \text{ minute} = 60 \text{ seconds}
$$
$$
1 \text{ hour} = 60 \text{ minutes}
$$

Thus,

$$
1 \text{ hour} = 60 \times 60 = 3600 \text{ seconds}
$$

Set up the conversion:

$$
1.864 \times 10^5 \text{ miles/sec} \times \frac{3600 \text{ sec}}{1 \text{ hour}}
$$

Seconds cancel out, leaving miles per hour:

$$
1.864 \times 10^5 \times 3600 \text{ miles/hour}
$$

Calculate:

$$
1.864 \times 10^5 \times 3600 \approx 6.71 \times 10^8 \text{ miles/hour}
$$

Final Result:
The speed of $3.00 \times 10^8 \text{ m/sec}$ is approximately 671 million miles per hour.

Summary of Conversion Factors Needed

To perform this conversion accurately, you need the following key factors:

1. **Length Conversion:** 1 mile = 1609.344 meters
2. **Time Conversion:** 60 seconds = 1 minute
3. **Time Conversion:** 60 minutes = 1 hour

Combining the time factors, you can convert seconds to hours efficiently:

$$
1 \text{ hour} = 60 \times 60 = 3600 \text{ seconds}
$$

These conversion factors enable you to convert any speed from meters per second to miles per hour with precision.

Additional Tips for Accurate Conversions

- Always verify the conversion factors from reliable sources; for example, the exact length of a mile is 1609.344 meters.
- When dealing with large numbers like 3.00×10^8, consider using scientific notation to maintain clarity.
- Keep track of units at each step to avoid errors in cancellation.
- Use a calculator for precise multiplication and division, especially with large or small numbers.

Conclusion

Converting 3.00 x 10^8 meters per second to miles per hour requires a clear understanding of the relevant conversion factors. The critical factors include:

- Length Conversion: 1 mile = 1609.344 meters
- Time Conversion: 60 seconds = 1 minute and 60 minutes = 1 hour

By systematically applying these factors, converting units becomes straightforward, allowing for accurate and meaningful comparisons across different measurement systems. Whether you're calculating the speed of light or converting speeds for practical applications, mastering these conversion factors is essential for precise scientific and everyday calculations.

Frequently Asked Questions

What is the initial value in meters per second that needs to be converted?

The initial value is 3.00 × 10^8 meters per second.

Which conversion factors are necessary to convert meters per second to miles per hour?

The necessary conversion factors are: 1 mile = 1609 meters, and 1 hour = 3600 seconds.

How many seconds are in one minute according to the given data?

There are 60 seconds in one minute.

How many minutes are in one hour based on the provided information?

There are 60 minutes in one hour.

What is the primary purpose of selecting these conversion factors?

To systematically convert meters per second to miles per hour by canceling out units step-by-step.

What is the first step in converting 3.00 × 10^8 m/s to mi/hr using the provided conversion factors?

Convert meters to miles by dividing by 1609 meters per mile.

After converting meters to miles, what is the next step to arrive at miles per hour?

Multiply the result by 3600 seconds per hour to convert seconds to hours.

Why are the specific conversion factors 60 seconds = 1 minute and 60 minutes = 1 hour important?

They allow you to convert seconds to hours accurately when changing from per second to per hour units.

What is the final formula to convert 3.00 × 10^8 m/s to mi/hr using these factors?

Divide 3.00 × 10^8 meters per second by 1609, then multiply by 3600 seconds per hour, resulting in miles per hour.

Additional Resources

Conversion Factors: Unlocking the Speed of Scientific Measurement

When dealing with scientific data, engineering calculations, or even everyday conversions, understanding how to accurately switch between units is crucial. One fundamental aspect of this process involves identifying and employing the correct conversion factors. Today, we'll explore how to convert a velocity of $3.00 \times 10^8 \text{ m/s}$ into miles per hour (mi/hr), a common unit used in the United States and in various engineering contexts.

In this analysis, we will focus on two essential conversion factors:
- A. 60 seconds = 1 minute
- B. 60 minutes = 1 hour

By unpacking these factors and understanding their significance, we can demonstrate the step-by-step process of converting meters per second into miles per hour with precision.

Understanding the Units and the Need for Conversion

Before diving into the conversion process, it's vital to grasp the significance of the units involved:

- Meters per second (m/s): A SI (International System of Units) measure of velocity, commonly used in physics to express speed.
- Miles per hour (mi/hr): A customary unit of speed, primarily used in the United States and some other countries, especially in transportation contexts.

The given speed $3.00 \times 10^8 \text{ m/s}$ is remarkably close to the speed of light (~3.00×10^8 m/s), making this an interesting case for unit conversion given the magnitude of the value.

The goal: Convert $3.00 \times 10^8 \text{ m/s}$ into miles per hour (mi/hr).

Step 1: Recognize the Required Conversion Path

Converting from meters per second to miles per hour involves two key steps:

1. Convert meters to miles.
2. Convert seconds to hours.

Breaking this down, the overall conversion factor is:

$$
\text{Velocity in mi/hr} = \text{Velocity in m/s} \times
\left(\frac{\text{miles}}{\text{meters}}\right) \times
\left(\frac{\text{hours}}{\text{seconds}}\right)
$$

This indicates we need:

- The number of meters in a mile.
- The number of seconds in an hour.

Step 2: Identifying the Essential Conversion Factors

Conversion Factors Needed:

- Length Conversion: Meters to miles.
- Time Conversion: Seconds to hours.

The two specific factors highlighted are:

A. 60 seconds = 1 minute

B. 60 minutes = 1 hour

Additionally, to perform the full conversion, we will need:

- 1 mile = 1609.344 meters (standard conversion)
- 1 hour = 3600 seconds (since 60 seconds per minute and 60 minutes per hour)

Together, these enable us to convert from meters per second to miles per hour systematically.

Why are these specific factors important?

The two factors provided (A and B) are fundamental in converting time units from seconds to hours, which is a critical step in the process. Structuring the conversion carefully ensures accuracy and clarity.

Step 3: Applying the Conversion Factors to the Problem

Let's now perform the conversion step-by-step.

1. Convert meters to miles

$$
1 \text{ mile} = 1609.344 \text{ meters}
$$

$$
\Rightarrow 1 \text{ meter} = \frac{1}{1609.344} \text{ miles}
$$

2. Convert seconds to hours

Using the provided factors:

- 60 seconds = 1 minute
- 60 minutes = 1 hour

Therefore,

$$
1 \text{ hour} = 60 \text{ minutes} \times 60 \text{ seconds} = 3600 \text{ seconds}
$$

This makes the conversion straightforward: to convert seconds to hours, divide by 3600.

Step 4: Formulating the Complete Conversion Equation

Starting with:

$$
3.00 \times 10^8 \text{ m/s}
$$

We convert meters to miles:

$$
\text{miles} = \text{meters} \times \frac{1 \text{ mile}}{1609.344 \text{ meters}}
$$

And seconds to hours:

$$
\text{hours} = \text{seconds} \times \frac{3600 \text{ seconds}}{1 \text{ hour}}
$$

Because we are converting from m/s to mi/hr, the combined conversion factor is:

$$
\frac{1 \text{ mile}}{1609.344 \text{ meters}} \times \frac{3600 \text{ seconds}}{1 \text{ hour}}
$$

Note: Since the original data is in m/s, the seconds cancel out, and the meters are converted to miles.

Step 5: Performing the Calculation

Putting it all together:

$$
\text{Velocity in mi/hr} = 3.00 \times 10^8 \text{ m/s} \times \frac{1 \text{ mile}}{1609.344 \text{ meters}} \times 3600 \text{ seconds/hour}
$$

Simplify step-by-step:

1. Divide the meters:

$$
\frac{3.00 \times 10^8}{1609.344} \approx 1.864 \times 10^5 \text{ miles/sec}
$$

2. Convert seconds to hours:

$$
1.864 \times 10^5 \times 3600 \approx 6.71 \times 10^8 \text{ mi/hr}
$$

Final Result and Interpretation

The conversion yields:

$$
\boxed{
\text{Speed} \approx 6.71 \times 10^8 \text{ miles per hour}
}
$$

This is an extraordinarily high speed, roughly twice the speed of light in miles per hour (~670,616,629 mi/hr), which underscores the importance of understanding unit conversions in physics and engineering.

Summary of Key Conversion Factors and Their Roles

Conversion Factor	Description	Significance in Calculation
A. 60 seconds = 1 minute	Converts seconds to minutes	Used to understand time units and facilitate conversion to hours
B. 60 minutes = 1 hour	Converts minutes to hours	Critical for moving from seconds to hours in the final velocity unit
1 mile = 1609.344 meters	Converts meters to miles	Needed to switch from SI length units to customary units
1 hour = 3600 seconds	Converts seconds to hours	Directly used in the calculation to express velocity in miles per hour

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Conclusion: The Power of Proper Conversion Factors

Converting a velocity of $3.00 \times 10^8 \text{ m/s}$ to miles per hour exemplifies how fundamental conversion factors serve as the backbone of precise scientific computation. The two key factors—seconds to minutes and minutes to hours—are indispensable for transforming time units, ensuring that the final velocity is expressed accurately in the desired unit.

Understanding and properly applying these conversion factors is crucial not just in academic exercises but also in real-world engineering, physics research, and technological applications where unit consistency and accuracy are paramount. Whether dealing with astrophysical phenomena or everyday transportation metrics, mastering unit conversions with the right factors empowers professionals and enthusiasts alike to interpret data correctly and make informed decisions.

In essence, the combination of these conversion factors allows us to traverse from the international standard SI units to customary units used in everyday contexts, illustrating the interconnectedness of measurement systems and the importance of foundational knowledge in scientific calculations.

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