

Specific Heat Worksheet With Answers

Specific Heat and Heat Capacity

Name _____ KEY _____ Period _____

1. Calculate the amount of heat needed to increase the temperature of 250 g of water from 20 °C to 46 °C.

$$q = m \times C \times \Delta T$$
$$q = 250 \text{ g} \times 4.18 \text{ J/g}^\circ\text{C} \times 26^\circ\text{C}$$
$$q = 27,170 \text{ J or } 27 \text{ kJ}$$

2. Calculate the specific heat capacity of copper given that 204.75 J of energy raises the temperature of 15 g of copper from 25 °C to 60. °C.

$$q = m \times C \times \Delta T$$
$$C = q/m \times \Delta T$$
$$C = 204.75 \text{ J} / (15 \text{ g} \times 35^\circ\text{C})$$
$$C = 0.39 \text{ J/g}^\circ\text{C}$$

3. 216 J of energy is required to raise the temperature of aluminum from 15 °C to 35 °C. Calculate the mass of aluminum. (Specific heat capacity of aluminum is 0.90 J/g °C).

$$q = m \times C \times \Delta T$$
$$m = q/C \times \Delta T$$
$$m = 216 \text{ J} / (0.90 \text{ J/g}^\circ\text{C} \times 20^\circ\text{C})$$
$$m = 12 \text{ g}$$

4. The initial temperature of 150 g of ethanol was 22 °C. What will be the final temperature of the ethanol if 3240 J was needed to raise the temperature of the ethanol? (Specific heat capacity of ethanol is 2.44 J/g °C).

$$q = m \times C \times \Delta T$$
$$\Delta T = q/m \times C$$
$$\Delta T = 3240 \text{ J} / (150 \text{ g} \times 2.44 \text{ J/g}^\circ\text{C})$$
$$\Delta T = 8.85^\circ\text{C}$$
$$T_{\text{final}} = 22^\circ\text{C} + 8.85^\circ\text{C} = 31^\circ\text{C}$$

5. When 435 J of heat is added to 3.4 g of olive oil at 21 °C, the temperature increases to 85 °C. What is the specific heat of the olive oil?

$$q = m \times C \times \Delta T$$
$$C = q/m \times \Delta T$$
$$C = 435 \text{ J} / (3.4 \text{ g} \times 64^\circ\text{C})$$
$$C = 2.0 \text{ J/g}^\circ\text{C}$$

6. How many kilojoules of heat are absorbed when 1.00 L of water is heated from 18 °C to 85 °C? (Hint: You first need to determine the mass of the water, then calculate q in the requested unit.)

Specific Heat Worksheet with Answers: Mastering Thermodynamics

Are you struggling to grasp the concept of specific heat? Do endless calculations leave you feeling frustrated and confused? This comprehensive guide provides you with a specific heat worksheet with answers, designed to help you conquer this fundamental thermodynamics concept. We'll break down the principles, provide example problems with detailed solutions, and give you the resources you need to master specific heat calculations. Get ready to boost your understanding and ace your next physics or chemistry exam!

Understanding Specific Heat Capacity

Before we dive into the worksheet, let's solidify our understanding of specific heat. Specific heat capacity (often shortened to specific heat) is the amount of heat required to raise the temperature of one gram of a substance by one degree Celsius (or one Kelvin). It's a crucial property that helps us understand how different materials respond to heat. A high specific heat indicates that a substance requires a significant amount of heat to change its temperature, while a low specific heat means the temperature changes easily with minimal heat input.

The Formula: $Q = mc\Delta T$

The fundamental equation governing specific heat calculations is:

$$Q = mc\Delta T$$

Where:

Q represents the heat energy transferred (measured in Joules, J)

m represents the mass of the substance (measured in grams, g)

c represents the specific heat capacity of the substance (measured in $\text{J/g}^\circ\text{C}$ or J/gK)

ΔT represents the change in temperature (measured in $^\circ\text{C}$ or K) ($\Delta T = T_{\text{final}} - T_{\text{initial}}$)

Units and Consistency

Remember, consistent units are critical for accurate calculations. If you're using grams for mass and Celsius for temperature change, your specific heat capacity must be expressed in $\text{J/g}^\circ\text{C}$. Using inconsistent units will lead to incorrect answers.

Specific Heat Worksheet: Practice Problems

Now, let's put our knowledge into practice with a specific heat worksheet with answers. Each problem will guide you through the steps, and the answers are provided to allow you to check your understanding.

Problem 1:

How much heat is required to raise the temperature of 50 grams of water from 20°C to 100°C ? The specific heat capacity of water is $4.18 \text{ J/g}^\circ\text{C}$.

Answer: $Q = mc\Delta T = (50 \text{ g})(4.18 \text{ J/g}^\circ\text{C})(100^\circ\text{C} - 20^\circ\text{C}) = 16720 \text{ J}$

Problem 2:

A 100-gram piece of aluminum is heated from 25°C to 75°C . If 1000 Joules of heat were added, what is the specific heat capacity of aluminum?

Answer: $c = Q / (m\Delta T) = 1000 \text{ J} / (100 \text{ g})(75^\circ\text{C} - 25^\circ\text{C}) = 0.2 \text{ J/g}^\circ\text{C}$

Problem 3:

A 25-gram sample of an unknown metal absorbs 350 Joules of heat and its temperature increases from 20°C to 40°C . What is the specific heat capacity of the metal?

Answer: $c = Q / (m\Delta T) = 350 \text{ J} / (25 \text{ g})(40^\circ\text{C} - 20^\circ\text{C}) = 0.7 \text{ J/g}^\circ\text{C}$

Problem 4: (Challenge Problem)

A calorimeter contains 100g of water at 25°C . A 50-gram piece of metal at 100°C is added to the water. The final temperature of the mixture is 28°C . Assuming no heat loss to the surroundings, what is the specific heat capacity of the metal? (Hint: The heat lost by the metal equals the heat gained by the water).

Answer: This problem requires understanding that the heat lost by the metal (Q_{metal}) is equal to the heat gained by the water (Q_{water}). Therefore: $m_{\text{metal}}c_{\text{metal}}\Delta T_{\text{metal}} = m_{\text{water}}c_{\text{water}}\Delta T_{\text{water}}$. Solving for c_{metal} yields approximately $0.42 \text{ J/g}^\circ\text{C}$

More Practice and Resources

These problems offer a starting point for understanding specific heat calculations. You can find numerous additional worksheets and practice problems online through educational websites and textbooks. Remember to focus on understanding the underlying principles and using consistent units.

Conclusion

Mastering specific heat calculations is a crucial step in your understanding of thermodynamics. By practicing with worksheets and understanding the fundamental formula ($Q = mc\Delta T$), you can build a solid foundation in this essential concept. Remember to check your work and focus on unit

consistency for accurate results. Keep practicing, and you'll soon be an expert in specific heat!

FAQs

1. What is the difference between specific heat and heat capacity? Specific heat is the heat capacity per unit mass. Heat capacity refers to the total amount of heat required to change the temperature of an object, while specific heat is specific to one gram (or other unit of mass).
2. Why is the specific heat of water so high? Water has a high specific heat due to the strong hydrogen bonds between its molecules. These bonds require a significant amount of energy to break, leading to a higher specific heat capacity.
3. Can the specific heat of a substance change? The specific heat of a substance can vary slightly depending on factors such as temperature and pressure. However, for most calculations, it's treated as a constant.
4. How is specific heat used in real-world applications? Specific heat is crucial in various applications, including designing cooling systems, understanding climate change effects, and developing materials with specific thermal properties.
5. Where can I find more specific heat worksheets? You can find many more specific heat worksheets with answers through online educational resources, textbooks, and physics/chemistry educational websites. Search for "specific heat problems" or "specific heat practice" to find numerous examples.

specific heat worksheet with answers: University Physics Samuel J. Ling, Jeff Sanny, William Moebs, 2017-12-19 University Physics is designed for the two- or three-semester calculus-based physics course. The text has been developed to meet the scope and sequence of most university physics courses and provides a foundation for a career in mathematics, science, or engineering. The book provides an important opportunity for students to learn the core concepts of physics and understand how those concepts apply to their lives and to the world around them. Due to the comprehensive nature of the material, we are offering the book in three volumes for flexibility and efficiency. Coverage and Scope Our University Physics textbook adheres to the scope and sequence of most two- and three-semester physics courses nationwide. We have worked to make physics interesting and accessible to students while maintaining the mathematical rigor inherent in the subject. With this objective in mind, the content of this textbook has been developed and arranged to provide a logical progression from fundamental to more advanced concepts, building upon what students have already learned and emphasizing connections between topics and between theory and applications. The goal of each section is to enable students not just to recognize concepts, but to work with them in ways that will be useful in later courses and future careers. The organization and pedagogical features were developed and vetted with feedback from science educators dedicated to the project. VOLUME II Unit 1: Thermodynamics Chapter 1: Temperature and Heat Chapter 2: The Kinetic Theory of Gases Chapter 3: The First Law of Thermodynamics Chapter 4: The Second Law of Thermodynamics Unit 2: Electricity and Magnetism Chapter 5: Electric Charges and Fields Chapter 6: Gauss's Law Chapter 7: Electric Potential Chapter 8: Capacitance Chapter 9: Current and Resistance Chapter 10: Direct-Current Circuits Chapter 11:

Magnetic Forces and Fields Chapter 12: Sources of Magnetic Fields Chapter 13: Electromagnetic Induction Chapter 14: Inductance Chapter 15: Alternating-Current Circuits Chapter 16: Electromagnetic Waves

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delight and wonder of the explanatory power of science.

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and natural gas distribution pipelines? If you came upon an overturned truck on the highway that was leaking, would you be able to identify if it was hazardous and know what steps to take? Questions like these and more are answered in the Emergency Response Guidebook. Learn how to identify symbols for and vehicles carrying toxic, flammable, explosive, radioactive, or otherwise harmful substances and how to respond once an incident involving those substances has been identified. Always be prepared in situations that are unfamiliar and dangerous and know how to rectify them. Keeping this guide around at all times will ensure that, if you were to come upon a transportation situation involving hazardous substances or dangerous goods, you will be able to help keep others and yourself out of danger. With color-coded pages for quick and easy reference, this is the official manual used by first responders in the United States and Canada for transportation incidents involving dangerous goods or hazardous materials.

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forward, not just to slow the earth's warming but to reach drawdown, that point in time when greenhouse gases in the atmosphere peak and begin to decline. These measures promise cascading benefits to human health, security, prosperity, and well-being—giving us every reason to see this planetary crisis as an opportunity to create a just and livable world.

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solutions by cross checking Plenty of graded exercise problems from simple to complex situations are included Variety of questions have been included for the clear grasping of the basic principles Redrawing of all the figures for more clarity and understanding Radiation shape factor charts and Heisler charts have also been included Essential tables are included The basic topics have been elaborately discussed Presented in a more better and fresher way Contents: An Overview of Heat Transfer Steady State Conduction Conduction with Heat Generation Heat Transfer with Extended Surfaces (FINS) Two Dimensional Steady Heat Conduction Transient Heat Conduction Convection Convective Heat Transfer Practical Correlation Flow Over Surfaces Forced Convection Natural Convection Phase Change Processes Boiling, Condensation, Freezing and Melting Heat Exchangers Thermal Radiation Mass Transfer

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Hosts of all kinds, this is a must-read! --Chris Anderson, owner and curator of TED From the host of the New York Times podcast Together Apart, an exciting new approach to how we gather that will transform the ways we spend our time together—at home, at work, in our communities, and beyond. In *The Art of Gathering*, Priya Parker argues that the gatherings in our lives are lackluster and unproductive—which they don't have to be. We rely too much on routine and the conventions of gatherings when we should focus on distinctiveness and the people involved. At a time when coming together is more important than ever, Parker sets forth a human-centered approach to gathering that will help everyone create meaningful, memorable experiences, large and small, for work and for play. Drawing on her expertise as a facilitator of high-powered gatherings around the world, Parker takes us inside events of all kinds to show what works, what doesn't, and why. She investigates a wide array of gatherings--conferences, meetings, a courtroom, a flash-mob party, an Arab-Israeli summer camp--and explains how simple, specific changes can invigorate any group experience. The result is a book that's both journey and guide, full of exciting ideas with real-world applications. *The Art of Gathering* will forever alter the way you look at your next meeting, industry conference, dinner party, and backyard barbecue--and how you host and attend them.

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specific heat worksheet with answers: Creations of Fire Cathy Cobb, Harold Goldwhite, 2013-11-11 the history of chemistry is a story of human endeavor—and as essential as human nature itself. Progress has been made in fits and starts, and it has come from all parts of the globe. Because the scope of this history is considerable (some 100,000 years), it is necessary to impose some order, and we have organized the text around three discernible—albeit gross—divisions of time: Part 1 (Chaps. 1-7) covers 100,000 BCE (Before Common Era) to the late 1700s and presents the

background of the Chemical Revolution; Part 2 (Chaps. 8-14) covers the late 1700s to World War I and presents the Chemical Revolution and its consequences; Part 3 (Chaps. 15-20) covers World War I to 1950 and presents the Quantum Revolution and its consequences and hints at revolutions to come. There have always been two tributaries to the chemical stream: experiment and theory. But systematic experimental methods were not routinely employed until the 1600s-and quantitative theories did not evolve until the 1700s-and it can be argued that modern chemistry as a science did not begin until the Chemical Revolution in the 1700s. xi xii PREFACE We argue however that the first experiments were performed by artisans and the first theories proposed by philosophers-and that a revolution can be understood only in terms of what is being revolted against.

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