

Student Exploration: Calorimetry Lab

Gizmo Warm-up

A calorimeter is an insulated container filled with a liquid, usually water. When a hot object is placed in the calorimeter, heat energy is transferred from the object to the water and the water heats up.

Calorimeters can be used to find a substance's **specific heat capacity**. You will use the Calorimetry Lab Gizmo™ to determine the specific heat capacities of various substances.



- On the **SIMULATION** pane, select **Copper**. Use the slider to set its **Mass** to 200 g. Set the **Water mass** to 200 g. Check that the **Water temp** is set to 30.0 °C and the copper's **Temp** is 90 °C. Select the **GRAPH** tab, and click **Play** ().

A. What was the **Final temperature** of the copper and the water?

34.96°C

B. How much did the temperature of the copper change?

$$\begin{aligned} T &= T_f - T_i \\ &= (34.96^\circ\text{C} - 90^\circ\text{C}) \\ &= -55.04^\circ\text{C} \end{aligned}$$

The temperature of the copper changed about 55°C.

C. How much did the temperature of the water change?

$$\begin{aligned} T &= T_f - T_i \\ &= (34.96^\circ\text{C} - 30^\circ\text{C}) \\ &= 4.96^\circ\text{C} \end{aligned}$$

The temperature of the water changed about 5°C.

- Specific heat capacity can be described as a substance's resistance to temperature changes. Which substance has a greater specific heat capacity, copper or water? Explain.

$$\begin{aligned} c_w &= 4.184 \text{ J/g} \\ c_c &= 0.385 \text{ J/g} \end{aligned}$$

Water has a greater specific heat capacity.

Activity A:

Heat transfer

Get the Gizmo ready:

- Click **Reset** (.



Question: What factors determine how heat energy transfers between objects?

- Predict: In the Gizmo warm-up, you saw how 200 g of 90 °C copper transfers heat to 200 g of 30.0 °C water.

A. How do you think increasing the water's mass would affect the final temperature?

Answers For Calorimetry Gizmo

IM Harris

A red circular graphic with a gradient, appearing as a semi-circle or a partial circle, located to the right of the IM Harris text.

Answers For Calorimetry Gizmo:

Calorimetry Stefan Mathias Sarge, Günther W. H. Höhne, Wolfgang Hemminger, 2014-02-25 Clearly divided into three parts this practical book begins by dealing with all fundamental aspects of calorimetry The second part looks at the equipment used and new developments The third and final section provides measurement guidelines in order to obtain the best results The result is optimized knowledge for users of this technique supplemented with practical tips and tricks

Calorimetry, 2016 **Calorimetry ...** American Meter Company, 1914 **Calorimetry** Wolfgang Hemminger, 1984

A convection-scope & calorimeter Alfred Rosling Bennett, 1897 **Calorimetry** Frank H. Bates, 1902 *Application of Calorimetry in Life Sciences* I. Lamprecht, 1977 **Animal and Human Calorimetry** J. A. McLean, G. Tobin, 2007-12-03 This volume provides a comprehensive survey of the theory practice and techniques of calorimetry as applied to the study of energy metabolism in humans and animals Calorimetry is used to estimate nutritional requirements of man and farm livestock and to evaluate different foods It is also a powerful tool used in research into fundamental nutritional and physiological life processes and in the evaluation of stresses imposed by abnormal or severe environments It is currently being applied in various branches of medical research and can be used as a diagnostic tool in hospitals for investigation of metabolic disorders The authors discuss both direct calorimetry which measures heat loss directly and indirect calorimetry where heat loss is inferred by measurement of some of the chemical byproducts of metabolism In addition guidance is provided to the instrumentation technical problems and precautions necessary to obtain accurate calorimetric measurements

The Modern Calorimeter Walter Porter White, 1928 **Calorimetry in Medicine** William Sharp McCann, 1924

Fuel Calorimetry Brinley Pugh, 1966 Analytical Calorimetry Roger Stephen Porter, 2000 *Methods and Standards in Bomb Calorimetry* J. August Fries, 1910 **Calorimetry** Wojciech Zielenkiewicz, 2008 **Clinical Calorimetry ...** Russell Sage Institute of Pathology, 1915 Analytical Calorimetry, 1970 Calorimetric Rules, Regulations and Specifications Joint Committee on Calorimetry, 1910 Calorimetry: Modern Concepts and Applications Bruce Rhames, 2015-03-13 As a technique for thermal analysis calorimetry has a broad spectrum of applications which are not only restricted to studying the thermal characterization e g melting temperature denaturation temperature and enthalpy change of small and large drug molecules but are also extended to characterization of fuel metals and oils Differential Scanning Calorimetry is applied to study the thermal behaviors of drug molecules and excipients by calculating the differential heat flow required to maintain the temperature difference between the sample and reference cells Microcalorimetry is applied to study the thermal transition and folding of biological macromolecules in dilute solutions and could also be applied in formulation and stabilization of therapeutic proteins This book consists of research from around the world on the usage of calorimetry which is grouped under three sections namely Thermal Analysis of Phase Transitions of Polymers and Paraffinic Wax Indirect Calorimetry to Measure Energy Expenditure and Applications of Calorimetry into Propellants Alloys Mixed Oxides and Lipids

Calorimetry of Non-reacting Systems Donald William Scott, 1968
Recent advances, techniques and applications ,1998

Handbook of Thermal Analysis and Calorimetry:

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