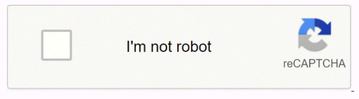


Next

Calorimetry lab answers gizmo

Name: Period:

Student Exploration: Calorimetry Lab

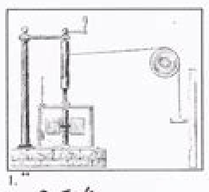
Name Key (1)

Period ____ Date ____

Chemistry

Calorimetry Worksheet

(You need to show **all work** to receive credit.)



To the left is a diagram of an apparatus used by James Joule to determine the relationship between the classical definition of energy (as described by Newtonian physics) and thermal energy. In the space below labeled #1, please answer the following question. A liquid other than water is placed in the calorimeter. What would be its specific heat if a 9.50 kg mass is dropped a total of 1.80 meters and there are 750. grams of the liquid in the calorimeter and it undergoes a temperature change of 0.158 of a degree Celsius. The rate an object accelerates due to gravity is 9.81 meters per second squared. Potential energy is equal to mass (in kg) times gravity times the change in height. One joule of energy is equivalent to the units **kg times meters squared per second squared.** $J = \frac{kg \times m^2}{s^2}$

1. **

$PE = S_{l/g} \times m_{l/g} \times \Delta T_{l/g}$

$m_{obj} = 9.50 kg$, $g = 9.81 m/s^2$, $\Delta h = 1.80 m$, $m_{l/g} = 750. g$, $\Delta T_{l/g} = 0.158°C$, $S_{l/g} = ?$

$$\frac{m_{obj} \times g \times \Delta h}{m_{l/g} \times \Delta T_{l/g}} = \frac{S_{l/g} \times m_{l/g} \times \Delta T_{l/g}}{m_{l/g} \times \Delta T_{l/g}}$$

$$\frac{9.50 kg \times 9.81 m/s^2 \times 1.80 m}{750. g \times 0.158°C} = S_{l/g}$$

$S_{l/g} = 1.42 J/g \times °C$

2. Another liquid, other than water, was placed in Joule's apparatus. A 25.5 kg mass was dropped a total of 1.50 meters. If 950. grams of the liquid in the calorimeter changes temperature from 20.316 °C to 20.491 °C, what is the specific heat (s) of the liquid? Acceleration of an object due to gravity is 9.81 m/s². *(VODCast Solution)*

$(Potential\_Energy)\ PE = (mass)\ m \times (gravity)\ g \times (Change\_in\_Height)\ \Delta h$

$(heat\_or\_energy)\ q = (specific\_heat)\ s \times (mass\_of\_liquid)\ m \times (change\_in\_temperature)\ \Delta T \quad \Delta T = T_{final} - T_{initial}$

$(Potential\_Energy)\ PE = (heat)\ q$

$\therefore (specific\_heat)\ s \times (mass\_of\_liquid)\ m \times (change\_in\_temperature)\ (T_{final} - T_{initial}) = (mass)\ m \times (gravity)\ g \times (change\_in\_height)\ \Delta h$

$m_{obj} = 25.5 kg$, $g = 9.81 m/s^2$, $\Delta h = 1.50 m$, $m_{l/g} = 950. g$, $\Delta T = ?$ $\Delta T = 20.491°C - 20.316°C = 0.175°C$, $T_i = 20.316°C$ $T_f = 20.491°C$

$$\frac{m_{obj} \times g \times \Delta h}{m_{l/g} \times \Delta T_{l/g}} = \frac{m_{obj} \times S_{l/g} \times \Delta T_{l/g}}{m_{l/g} \times \Delta T_{l/g}}$$

$$\frac{25.5 kg \times 9.81 m/s^2 \times 1.50 m}{950. g \times 0.175°C} = S_{l/g}$$

$2.26 J/g \times °C = S_{l/g}$

3. **How much heat (q) is lost by 300. grams of water if the temperature of the water changes from 77.4 °C to 65.2 °C. The specific heat of water (s) is 4.184 J/g. x °C.

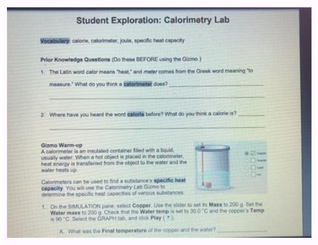
$q = ?$, $m = 300. g$, $T_i = 77.4°C$, $T_f = 65.2°C$, $\Delta T = 65.2°C - 77.4°C / \Delta T = -12.2°C$, $S = 4.184 J/g \times °C$

$q = S \times M \times \Delta T$

$$q = \frac{4.184 J}{g \times °C} \times \frac{300. g}{1} \times \frac{(-12.2°C)}{1}$$

$q = -15,300 J$

↑ Negative sign indicates energy lost by the water.



Student Exploration: Calorimetry Lab

Use the following equation to make the calculation.

calories = (grams of water) x (temperature change) x (specific heat of water)

calories = (100g) x (34 °C – 28.6 °C) x (1 calorie/gram °C) = 540 calories

2. Divide the calories from question 1 by the change in mass of the puff. This determines the calories released per gram of puff burned. Record your answer in Kcal or Calories.

540 calories / (1.1 g – 0.6 g) = 1080 calories/g = 1.08 Calories/g

3. Multiply the measured Calories by the number of grams in a serving size, obtained from nutritional panel.

1.08 Calories/g x (28 g/14 cheese puffs) = 2.16 Calories/cheese puff

4. Compare your Calorie results to the nutritional panel.

150 Calories / 14 cheese puffs = 10.71 Calories/cheese puff > 2.16 Calories/cheese puff

5. Conclusion: There are _____fewer_____ Calories in a cheese puff than the number listed on the nutrition label.

6. Calculate your percent error.

$$\frac{\text{actual} - \text{measured Calories per serving}}{\text{actual Calories per serving}} \times 100 =$$

$$\frac{(5.36 - 1.08)}{(5.36)} \times 100 = 79.85\%$$

7. Why do you suppose the calculated values for calories per gram are less than the actual value listed on the nutrition label? What could account for the difference? What are possible reasons for the inaccuracy?

- Didn't burn the entire cheese puff- had mass left over
- Burning cheese puff could have lost heat to air/surroundings instead of transferring all heat energy directly to the water filled can
- Inaccurate temperature readings

Scaffolded summary of experiment:

The increase in the __temperature__ of the water shows that ___heat energy___ had been stored in the cheese puff, which was released while it burned. We can look at the change in ___heat/temperature___ of the water to find out how much ___heat energy___ is trapped/stored in a cheese puff (the change in enthalpy).

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Student Exploration: Mineral Identification Vocabulary:is Baa160; crystal, density, hardness, homogeneity, brightness, mass, mineral, stingray, volume Prior Knowledge Questions is it is enough to find a yellow metal pedal in a stream. How can you know if © real gold? 2. In the city, a street vendor offers him a diamond ring for thirty DOMs. How can you test if the stone in the ring © A real diamond? Gizmo Heating: Determination of density A is Baa160; mineral is ME160s © a naturally formed crystal. You can identify a mineral by its properties. In Mineral, it's no ere is no 160. Identification is ME160; GizmoTM, subaltern Josu1601; Density. Massive the amount of substance in an object. Drag the mineral sample to the balance. What is © the mineral mass? Volumes the amount of space an object occupies. The volume © measured by the amount of water that rises in a graduated cylinder. Drag the mineral into the cylinder. What is © the volume of the mineral? Density IS IS IS IS IS IS IS IS SUMMARY SUMMARY IN GUARANTEE OR GUARANTEE AID, AN OBJECT © for your size. To find the density of an object, divide the mass by volume. (Calculators are recommended.) What is © The density of the mining question: What properties allow us to identify miners is? Note: The minerals are made of atoms in a repeated pattern and often form it's no good. crystals. The shapes of the crystals can help identify the mineral. The surface of Luster is ME160s © the way minerals in GARANTIAS reflect light. There are many ways to describe the brightness, four examples are shown. Color can sometimes be a useful way to identify a mineral, but not always © Reliable. Describe the shape of the crystal and be an A: Describe your color and brightness: Calculate: Select the eff. What is © the density of is MENSE160; Exhibit A? Measurement: Select your health and be patient. Hardness Test is Joshua 160; Hardness is 160; Wow. © a measure of how easily a mineral can be scratched. It's measured on a scale from 1 to 10 called the Mohs Scale. If a mineral scratches a nail (hard 2.5) but not a penny (3.5), its hardness is © About three. Drag the mineral sample for each test object. What objects are crossed out? What is © the estimated mineral hardness? Watch: Select patipatipatiis is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is It's no use. It's no use. It's no use. Wow. © the color of an Alsatian materiality pad. You can see the stingray rubbing the mineral through © is of a tile called an order ray plate. Drag the mineral sample through the striae plate. What is © the color of the drive? (Note: In some cases, the traction © colorless and cannot be seen.) Note: Select the acid test. Some minerals cause hydrochloric acid to bubbles and bubbles. Drag the eyedropper from the acid to the mineral. Does acid work? Identification: Now © Time to identify the mineral. Look at your health is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is is goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes goes Jos160; Mineral Key. Find a mineral that has properties that match the properties of the match is NO. ExhibiA. Enter the name of the patient's is It's no use. It's no use. It's no use. Lots of guesses to get right. What minerals are © It's safe to stay in. It's pati IS IS IS IS IS IS IS GOAL: Use a key to identify minerals. Collecting data: Use Gizmo to collect mineral data It's safe to stay in. It's pati it? Is it? Use the It's safe to stay in. It's pati no use. It's no use. It's no use. It's no use. It's not safe to go to life no use. It's no use. rave your results below: By itself: Continue to practice the identification of minerals. (26 samples in Gizmo: It is Jos160; catch © IS ME160Z.) record their conclusions in their notebook or in separate sheets of paper. What properties were most useful to identify minerals? Why? Use the following steps to identify a mineral: 1. Decide if the mineral is © Methyl or not metaphorical based on its brightness and rays. 2. If the mineral is not © Methodic, decide if © light or dark in colour. 3. Find a mineral on the list with the same density and hardness as your sample. 4. Check that the other propertiesateateateateateateatez in crystalline, colour, streak, nicotine acid reaction match. Methyl minerals (brightness of each range of minerals, from methane to boredom) minerals, not methane, mostly dark (crystalline, pea © rolls or Methyl minerals, mainly of light color (brightness, bread © The best documents shared by your colleagues, organized into one place only. You are in good company Hundreds of thousands of students from all over the world are already using StuDocu to share their documents and improve their grades. BooksDownload Universities free study guides, summaries, practical questions, reading notes, allocations, solutions and more! All documents have been evaluated by your colleagues to maintain excellent quality. We will keep you informed of the new documents that other students have uploaded to their courses. "Can you think of answering a question?" Ask for help and your colleagues will be happy to respond. Just write the name of your university and start sailing on your courses. Because your planning is not always © perfect, you need to be able to study always, anywhere. Read your notes one last time on your tablet or phone while you're moving. Download App

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