

32140 CALORIMETER, ECONOMY

Purpose:

This apparatus is designed to demonstrate the methods used in determining the energy content in the specified solid foods.

Required Accessories:

One (1) Thermometer
 Samples of various nut meats (peanuts, walnuts...)
 Balance , centigram or equivalent
 Matches

Assembly:

Assemble the apparatus as pictured. Push the pin through the top of the cork until it's head is flush with the cork. Construct a data table with the following column headings: Food Type, Sample Weight (grams), Beginning Combined Weight (grams), Ending Combined Weight (grams), Change (grams), Beginning Water Temperature (°C), Final Water Temperature (°C), Change in Water Temperature (°C) and Calories Calculated.



Procedure:

Weigh the flask, then add fifty milliliters of water. Weigh the flask again. Place the neck of the flask through the hole in the calorimeter lid, and rotate a quarter turn. Slip the flask support around its neck. Place this assembly on top of calorimeter can. Insert the thermometer into the flask. Read and record the stable beginning water temperature in data table.

Securely place a 0.3 gram or less food sample on the pin. Weigh and record this as the beginning combined weight in the data table (peanut, walnut, Brazil nut, etc...). Using a match, ignite the food sample. Slide it into position, directly under the center and approximately two centimeters from the bottom of the flask.

CAUTION: Under no circumstances should any other heating method be used.

After the food has burned, read the maximum temperature of the water and record it as the Final Water Temperature in the data table. Weigh and record the sample's ash, pin, and cork as the Ending Combined Weight. Calculate and record the number of calories released using the following equation:

$$\text{Heat Loss by Food Sample} = \text{Heat Gained by Water}$$

Q_w = Quantity of Heat Gained by Water

M_w = Mass of the Water

C_w = Specific Heat of Water = 1 Cal/g per C°

T_w = Change in Water Temperature

Calculate the number of calories per gram of nut meat sample. Compare several different sample types.

Sources of Error:

No experimental procedure or science apparatus yields perfect results. In spite of this, the scientific enterprise moves on, refining our understanding of the way the world works. One very important part of this is that every investigator carefully considers the possible sources of error in the apparatus or procedure. Put very simply, the investigator asks, (What would I change or do differently next time to yield a better result?" For instance: Was all of the heat released actually captured by the water? Was anything else being heated? Was the water warmed or cooled in any way that was not accounted for? If you were building the apparatus from scratch, what would you do differently?

Time Allocation:

To prepare this product for an experimental trial should take less than five minutes. Actual experiments will vary with needs of students and the method of instruction, but are easily concluded within one class period.

Feedback:

If you have a question, a comment, or a suggestion that would improve this product, you may call our toll free number.

