Combustion of alcohols transcript

The amount of heat energy released during a chemical reaction can be measured using a calorimeter.

This video will show you how to use a simple calorimeter to measure the heat energy released from burning different alcohols in a virtual chemistry laboratory.

The efficiency of alcohol fuels will be investigated by measuring how much alcohol is required to raise the temperature of a fixed volume of water.

On the bench, you have all the equipment and chemicals needed for this experiment:

* a spirit burner containing an alcohol
* a conical flask clamped over the alcohol burner
* a measuring cylinder containing a known quantity of water
* a thermometer to measure the temperature of water
* a lighter
* and a weighing balance, also called scales.

Once you start the experiment, you will be able to choose an alcohol using a drop-down menu; the choices are methanol, ethanol, propan-2-ol and butan-1-ol. For the purpose of this video, we will select ethanol.

Your first task is to weigh the burner containing your selected alcohol, also ensuring that the cap on the burner. This initial mass should be recorded in your lab-book.

The alcohol burner is then placed back under the conical flask.

Next, you will add 100 ml of tap water to the conical flask and the initial temperature of the water should be recorded in your lab-book.

Now, you can remove the cap from the burner and ignite the wick using the lighter, thus starting the combustion of alcohol.

As the temperature of water increases, gently stir the water using the thermometer to ensure a uniform temperature throughout.

When the temperature of the water has increased by a number of degrees, you will extinguish the flame by placing the cap back onto the burner.

Record the final temperature of the water immediately after stopping the combustion.

The change in temperature of water during the combustion of your selected alcohol is a direct measure of the alcohol energy content.

Note that the increase in temperature of water should be kept constant in all of your experiments; an increase between 20 to 40 degrees will provide you with good data.

Reweigh the alcohol burner with its cap and record the final mass. The weight of the alcohol burner before and after the combustion will provide you with the mass of alcohol burned to heat the water.

By selecting the ‘Reset trial’ you will be able to choose a different alcohol and the water in the measuring cylinder will be refreshed, allowing you to run a new experiment.

For each alcohol, you are advised to repeat the experiment at least twice.

In this interactive screen experiment, you do not need to worry about other variables, such as the volume of the water added to the conical flask and the distance between the wick and the bottom of the conical flask, because these will remain constant throughout.

To ensure laboratory safety and to prevent deviations from the protocol that could introduce experimental errors, there are a series of built-in alerts that will advise you on how to continue the experiment safely and avoid potential errors.

Once you have collected calorimetry data from different alcohols, use the changes in water temperature and the masses of alcohol burned to calculate your experimental values for the enthalpy of combustion for each alcohol.