

## To show that food contains energy

Food contains chemical energy. When we eat, the energy in our food is converted into the energy we need to carry out our life processes. (There are roughly 4 joules in 1 Calorie) You will convert the energy contained in a walnut into heat energy in a test tube of water.

Apparatus:

TI 83+	50 cm <sup>3</sup> water
CBL 2	Walnut
Temperature probe	Candle
Boiling tube	Tongs

Place the temperature probe into the test tube of water, ensuring that it is close to the bottom, but not touching the glass. Set up the calculator to take temperature readings over time.

### PROCEDURE

Plug a temperature probe into channel 1 of the CBL. Turn on the CBL and calculator. Select the **DATAMATE** programme from the **APPS** menu.

Press **ENTER** at the welcome screen. Press **CLEAR** to reset the programme. The CBL will check for probes. Screen 1 will be shown.

```

CH 1:TEMP(C)      17.9

MODE: TIME GRAPH-120
-----
1:SETUP      4:ANALYZE
2:START      5:TOOLS
3:GRAPH      6:QUIT
    
```

Screen 1

Select **1: Setup** and press the up arrow  $\uparrow$  to highlight **MODE**. Press **ENTER** to get screen 2

```

SELECT MODE
-----
1:LOG DATA
2:TIME GRAPH
3:EVENTS WITH ENTRY
4:SINGLE POINT
5:SELECTED EVENTS
6:RETURN TO SETUP SCREEN
    
```

Screen 2

Select **2: Time graph** to get screen 3

```

TIME GRAPH SETTINGS
TIME INTERVAL:      3
NUMBER OF SAMPLES: 60
EXPERIMENT LENGTH: 240
-----
1:OK      3:ADVANCED
2:CHANGE TIME SETTINGS
    
```

Screen 3

Select **2: change time settings**

Enter 2 as time between samples in seconds  
Enter 60 as number of samples  
Press **ENTER** to get screen 4

```

TIME GRAPH SETTINGS
TIME INTERVAL:      2
NUMBER OF SAMPLES: 60
EXPERIMENT LENGTH: 120
-----
1:OK      3:ADVANCED
2:CHANGE TIME SETTINGS
    
```

Screen 4

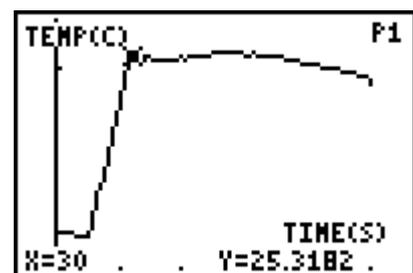
Select **1: OK** to confirm settings, select **1: OK** again to return to the main menu.

Weigh the walnut and record the mass

Select **2: START** The calculator will start to record data.

Use a Bunsen to light the walnut. Hold the walnut under the test tube. As soon as the data collection has finished, blow out the walnut.

The calculator will auto scale the data. As in Screen 5



Screen 5

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Use the ◀▶ cursors to locate the minimum and maximum temperatures. Record these values.

Reweigh the walnut and record these values.

### Results

Minimum temperature	
Maximum temperature	
Change in temperature	
Weight	
Change in temperature Per gram	

### Processing the data

Print a graph of change of temperature with time, and answer the following questions.

1. Is there more or less energy in the walnut before it was burned than after it was burned?
2. Where did the energy from the walnut go?
3. Is burning a walnut an exothermic or an endothermic reaction?
4. In this experiment, the \_\_\_\_\_ Energy in the walnut is changed to \_\_\_\_\_ energy in the water.