

Student Activity Guide for NAEP Interactive Science Task: Bottling Honey



http://www.nationsreportcard.gov/science_2009/ict_tasks.asp

Select "Take this task" under Bottling Honey.

 <p>GRADE 4 Cracking Concrete Predict the effect of the freeze/thaw cycle on a concrete sidewalk. Duration: 20 minutes Take this task > Scoring information ></p>	 <p>GRADE 4 Here Comes the Sun Predict path of the sun and number of daylight hours to determine best planting location. Duration: 20 minutes Take this task > Scoring information ></p>	 <p>GRADE 4 Mystery Plants Determine optimum amount of light and nutrients for plant growth. Duration: 40 minutes Take this task > Scoring information ></p>
 <p>GRADE 8 Bottling Honey Investigate flow rates of four liquids to determine best temperature for bottling honey. Duration: 20 minutes Take this task > Scoring information ></p>	 <p>GRADE 8 Playground Soil Investigate attributes of two soil samples to determine the best site for building a playground. Duration: 20 minutes Take this task > Scoring information ></p>	 <p>GRADE 8 Planning a Park Evaluate the impact of a planned recreation park on specific organisms. Duration: 40 minutes Take this task > Scoring information ></p>
 <p>GRADE 12 Energy Transfer Investigate energy transfer between substances to determine the best metal for a cooking pot. Duration: 20 minutes Take this task > Scoring information ></p>	 <p>GRADE 12 Starlight Investigate relationships between the luminosity and temperature of different stars. Duration: 20 minutes Take this task > Scoring information ></p>	 <p>GRADE 12 Phytoplankton Factor Investigate ocean conditions that support phytoplankton growth. Duration: 40 minutes Take this task > Scoring information ></p>

In this task, you will investigate how four different liquids behave when they are poured and how temperature affects the flow rates of the liquids. Then you will determine the best temperature range for bottling honey that will take the least amount of time while using as little energy as possible.

Read the information on each screen. Select "NEXT" when you have finished reading the information on the screen. Screen shots of each screen are on this worksheet.

 	<p>Welcome!</p> <p>The two liquids shown on the left, honey and water, have different properties. One difference is the speed at which they flow (the flow rate) when they are poured.</p> <p>In this activity, you will use four different liquids: corn syrup, honey, olive oil, and water to investigate how these liquids behave when they are poured and how temperature affects the flow rates of the liquids.</p> <p>Then you will determine the best temperature range for bottling honey that will take the least amount of time while using as little energy as possible.</p> <p>Click "NEXT" to continue.</p>
<input type="button" value="BACK"/>	<input type="button" value="NEXT"/>

One way to find out how a liquid behaves when it is poured is to drop a steel ball through the liquid. The faster the ball falls through the liquid, the faster the liquid flows when it is poured.

You will now use a computer simulation to drop a steel ball through the liquids. Each of the cylinders contains a different liquid.

For each liquid, click the up arrow to increase the temperature, and click the down arrow to decrease the temperature. Note that the minimum and maximum temperatures of the liquids are not all the same.

Click "DROP" to drop the four steel balls into the cylinders. The timers below each cylinder will record how long it takes for the ball to reach the bottom of that cylinder.

For a new trial, click "RESET" to place all of the balls at their starting positions.

After you have tried the simulation, click "NEXT" to continue.

Use the simulation to investigate the flow rates of the four liquids at 20 degrees Celsius.

Which liquid flows most slowly at 20 degrees Celsius?

A Corn syrup

B Honey

C Water

D Olive oil

Click "NEXT" to continue.

When there is a question, write your answer on this worksheet, not on the computer screen. If you answer directly on the computer, your answer will not be saved. You do not need to answer anything directly on the computer. After answering, select "NEXT" to continue.

Question 1

Which liquid flows most slowly at 20 degrees Celsius?

- A. Corn syrup
- B. Honey
- C. Water
- D. Olive oil

Which liquid has the same flow rate at 30 degrees Celsius as water at 30 degrees Celsius?

A Olive oil
 B Corn syrup
 C Honey

Explain how you know. Use your data to support your explanation.

Click "NEXT" to continue.

Question 2

Which liquid has the same flow rate at 30 degrees Celsius as water at 30 degrees Celsius?

- A. Olive oil
- B. Corn syrup
- C. Honey

Explain how you know. Use your data to support your explanation.

Next you will use the simulation to investigate how temperature affects the flow rates of the liquids.

You can select which liquid to test. The data from each test you run will be recorded in the table. Time is shown in seconds.

You may clear data from a row by clicking "REMOVE" in that row.

Describe the steps you will take to investigate which liquids flow more quickly at a higher temperature than at a lower temperature.

Click "NEXT" to start your investigation.

Liquid	Temperature (°C)	Time (s)

Question 3

Describe the steps you will take to investigate which liquids flow more quickly at a higher temperature than at a lower temperature.

DROP **RESET**

Select Liquid:

Corn Syrup
Honey
Water
Olive Oil

Time (s)
0.0

Temperature (°C)
30

Which liquid flows more quickly at a higher temperature than at a lower temperature? Select all that apply.

A Corn syrup
 B Honey
 C Water
 D Olive oil

Explain how you know. Use your data to support your explanation.

Click "NEXT" to continue.

Liquid	Temperature (°C)	Time (s)

BACK **NEXT**

Question 4

Which liquid flows more quickly at a higher temperature than at a lower temperature? Select all that apply.

- A. Corn syrup
- B. Honey
- C. Water
- D. Olive oil

Explain how you know. Use your data to support your explanation.

DROP **RESET**

Select Liquid:

Time (s)
0.0

Temperature (°C)
30

Liquid	Temperature (°C)	Time (s)

A food processing company bottles honey. They want to bottle the honey as quickly as possible while using the least amount of energy to heat the honey.

Now use the simulation to investigate the relationship between the temperature and the flow rate of honey over a range of temperatures.

Which graph shown below best represents your results?

GRAPH 1 GRAPH 2 GRAPH 3 GRAPH 4

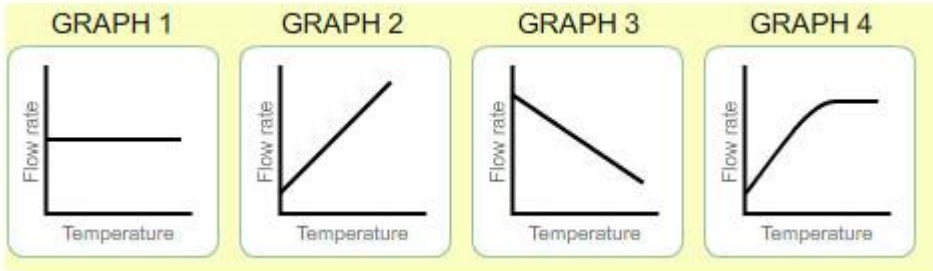
A Graph 1
 B Graph 2
 C Graph 3
 D Graph 4

Explain how you know. Use your data to support your explanation.

Click "NEXT" to continue.

Question 5

Which graph shown below best represents your results?



- A. Graph 1
- B. Graph 2
- C. Graph 3
- D. Graph 4

Explain how you know. Use your data to support your explanation.

DROP **RESET**

Select Liquid:

Time (s): **0.0**

Temperature (°C): **30**

The food processing company wants to bottle the honey as quickly as possible while using the least amount of energy to heat the honey. Assume that the honey has already been pasteurized.

Which temperature range is best to use for bottling the honey to meet both of these conditions?

A 25-35 degrees Celsius
 B 40-50 degrees Celsius
 C 55-65 degrees Celsius
 D 70-80 degrees Celsius

Explain how you know. Use your data to support your explanation.

Liquid	Temperature (°C)	Time (s)

BACK **DONE**

Question 6

Which temperature range is best to use for bottling the honey to meet both of these conditions?

- A. 25-35 degrees Celsius
- B. 40-50 degrees Celsius
- C. 55-65 degrees Celsius
- D. 70-80 degrees Celsius

Explain how you know. Use your data to support your explanation.
