# How quickly does a birthday candle burn?

Part One

# Purpose

To determine the rate at which a birthday candle burns.

# Hypothesis

Do you think a birthday candle bums at a constant rate? Or does it slow down as it gets shorter? Sketch a graph of candle height (vertical axis) vs. time (horizontal axis) · to illustrate your hypothesis.

# Data

Make a data table to record the height of a birthday candle at elapsed burning times of 0, 3, 6, 9, and 12 minutes.

# Materials

* Birthday candle
* Ruler
* Small lump of clay
* Matches
* Glass or ceramic container

# Procedure

* 1. Using a ruler, measure the height of your birthday candle.
  2. Place a small lump of clay on your table. Press the candle into the clay so that it stands securely upright.
  3. Carefully light the candle with a match and allow it to bum for three minutes. Then blow out the candle, remove it from the clay, and measure it. Record the new height of your data table.
  4. Repeat step 3 three more times, for a total burning time of 12 minutes.

# Analysis

1. Graph the height and burning time data from your data table. What is the manipulated variable? Label your axes correctly.
2. Using your graph (show work by marking on the graph itself), estimate the height of the birthday candle at two minutes. How much height did the candle lose in two minutes? How long would it take for the candle to reach 2.5 cm? How long would it take for the candle to burn out?
3. Calculate the rate of burning (in mm/min) for each of your time intervals using the following procedure. First calculate the amount of the candle that burned. For each interval, subtract the final candle height from the previous trial's candle height, and then divide this number by three minutes (the

interval time). This is your rate in mm/min Calculate all four burning rates, and then find their average. Does the birthday candle burn at an approximately constant rate or does the rate vary? Also, calculate a class average.

1. Using proportions, estimate the change in height for two minutes. Estimate how long it would take for the candle to reach 2.5. Estimate how long it would take for the candle to burn out.
2. Compare your proportion calculations to the estimates you previously made using your graph. Are your answers similar?

# Conclusion

State your findings and refer back to the purpose and hypothesis. Did you have any problems? Do you have any suggestions for improving the experiment?

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Part Two

1. Hypothesize how the rate of burning of a tall, thin birthday candle might compare to that of the traditional birthday candle in the previous experiment. Explain.
2. Make an organized data table for this rate-of-burning experiment. Make sure that your data table contains appropriate labels and units (use centimeters for height and minutes for time).
3. Conduct an experiment to determine the rate of burning for the tall, thin candle. Be sure to collect data for three trials.
4. Calculate the rate of burning for each trial in cm/min. Show all work.
5. Calculate the average rate of burning.
6. Convert your average burning rate to mm/min, mm/sec, and cm /sec. Show all work.
7. Using proportions, calculate the final height of the candle after 4 minutes and 30 seconds of burning. Show all work.
8. Make a graph of amount burned (cm) vs time (min). Be sure to use a scale that is large enough to allow you to adequately determine when the candle will completely burn out.
9. Which is the manipulated (independent) variable? Which is the responding (dependent) variable? According to the graph, how long would it take for the candle to burn out completely? How long will it take for the candle" height to decrease by 8 cm . Show relevant marks on the graph.
10. Write a concluding statement about this experiment. Be sure to refer back to your hypothesis.