

Water flea and drugs

Student name _____

Period _____ Date _____



1. Control: Collecting Baseline Data

In this experiment you'll use a simulation to test various drugs on a *Daphnia Pulex* (water flea) to find the effects of drugs on the water flea's heart rate. Different drugs, dosages, gender, body mass, and recent meal status will be studied. Make sure to isolate one factor at a time instead of combining all the factors at once. To begin, note and record the mass (in grams) and the gender of the water flea in the chart below. Locate the heart of the water flea. Count the number of heartbeats of the resting water flea for one minute and record it. This is your **baseline data**.

Status	Data
	<input type="checkbox"/> Male <input type="checkbox"/> Female
Mass of flea	grams
Heart rate	beats/minute



Effects of alcohol. Click on the *Single Dose* button, and then Click the *Alcohol Button*. Wait a few seconds for the effect to occur and record the number of heartbeats in one minute in the *alcohol* row, in the *after drug* column (Use your baseline reading for the *before drug* column). Using the following formula to calculate the percent difference in the water flea's heart rate.

$$\left(\frac{\text{heart rate after the drug} - \text{heart rate before the drug}}{\text{heart rate before the drug}} \right) \times 100\%$$

Record your calculation in the table below. Repeat step 2 for a single dose of the other drugs.

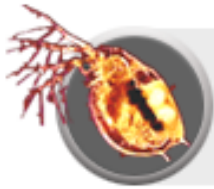
Drug tested	Heart rate before drug (beats/min.)	Heart rate after drug (beats/min.)	% difference
alcohol			
sleeping pills			
caffeine			
nicotine			



Answer the following questions about the effects of drugs in the space provided.

What is the normal heart rate of the water flea?

Describe the effect of each drug on the heart rate of a water flea.



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Dosage effects of alcohol. We will now repeat the above experiment using a double dose of alcohol. Click on double dose and alcohol. Count and record the number of heartbeats. Record your data in the column labeled "Heart rate after dbl. drug." Since the simulator has maintained the same baseline data for your water flea, you may record that in the "Heart rate before drug." Calculate the percent difference between the before and after drug heart rates. Write your answer in the space labeled "% difference" in the table below.

Drug tested	Heart rate before drug (beats/min.)	Heart rate after dbl. drug (beats/min.)	% difference
alcohol			
sleeping pills			
caffeine			
nicotine			

Repeat the experiment to test the other three drugs: sleeping pills, caffeine, and nicotine. Enter your results in the data table above.



Mass and alcohol effects. Begin this experiment by clicking on New Flea. Note and record the mass of the flea as in step 1. Count and record the number of heartbeats/min. of the water flea (this is your baseline data.) Now add a single dose of alcohol and then count and record the heartbeats/min. under the influence of alcohol. Now feed the flea, record the new mass, and count and record the number of heartbeats/minutes once more.

Drug tested	Heart rate before drug (beats/min.)	Heart rate after drug (beats/min.)	Heart rate after feeding (beats/min.)
alcohol			

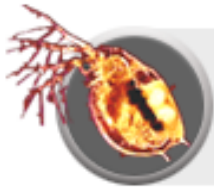


Answer the following questions about your experiments in the space provided:

Now that you have investigated dosage effects, what can you conclude?

Is the effect you observed similar across different drugs? How do you explain that?

Consider your experiment with Mass and alcohol effects. What did the results lead you to believe?



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7.

Gender and alcohol effects. Click on *New Flea*. Note and record the mass and gender of the flea as in step 1. Count and record the number of heartbeats/min. of the water flea. Now add a single dose of alcohol and then count and record the heartbeats/min. under the influence of alcohol. Now repeat the experiment with a flea of the opposite gender. In other words, if your first flea you tested was a female, click on the male button, and collect the same data.

Drug tested	Heart rate before drug (beats/min.)	Heart rate after drug (beats/min.)	Gender
alcohol			Female
alcohol			Male

8.

Answer the following questions about the effects of drugs in the space provided.

Based on your gender experiment, do you think that men or women are more affected by alcohol?

Why?

Now consider your experiment about mass and alcohol effects. Do the results from that investigation support your answer to the previous question?

Sometimes scientists find that when they study more than one factor (or variable) in an experiment, they are surprised by what they find. As you have seen, even a small experiment can have many variables. Also, sometimes the effects they notice when they study water fleas are not duplicated when they study human subjects. Still, experiments are a way of asking questions of nature. Can you think of any other experiments you could do with water fleas?

