Scientific Method Lab 2

Scientific Method Lab

Directions:

Read the following story, then follow the directions that follow. A marine biologist conducted a study of the ability of vertebrate blood to carry oxygen. He believed that a low environmental temperature would cause the organism's blood to carry less oxygen than blood at a higher temperature. The following reflects the scientists experiment and the data he collected.

* Two tanks of salt water, each containing 25 gallons, was set up in the lab.
* Each tank was filled with the same types of organisms (perch).
* The same type of aerators were added to each tank to supply dissolved oxygen to the fish.
* To one of the tanks, marked TANK A, the temperature was decreased at increments of 5 degrees C every 20 minutes.
* The second tank, marked TANK B, the temperature is raised at increments of 5 degrees C every 20 minutes.
* Blood was removed from each of the fish and measured for its oxygen content.
* Below is the results from the above experiment.

|  |  |  |  |
| --- | --- | --- | --- |
| **Temperature in Degrees C** | **Amount of Dissolved Oxygen found in fish in Tank A -ml/g** | **Temperature in Degrees C** | **Amount of Dissolved Oxygen found in fish in Tank B -ml/g** |
| 25 | 35 | 25 | 35 |
| 20 | 30 | 30 | 32 |
| 15 | 23 | 35 | 39 |
| 10 | 12 | 40 | 35 |
| 5 | 8 | 45 | 20 |

1. What is the hypothesis of the above experiment?  
     
   The scientist has predicting (hypothesized) that the temperature of water will influence the amount of oxygen carried by blood.
2. Is the above experiment a controlled experiment? Yes
3. Explain your answer to question 2.  
     
   In this experiment the following variables are fixed:
   * Fish
   * Water Amount
   * Oxygen saturation

The unknown variable amount of oxygen is the old free form variable.

1. What term would be used to denote a person who studies blood?  
     
   Hematologist for 200
2. What is the variable factor in the above experiment?  
     
   The perch are the first variable, with different DNA might have statistically significant resistance. Or perhaps one fish is 2lb and another is 1.5lb. This small difference could influence results.  
     
   The aerators being properly calibrated could influence results as well.

Are the measurement done in close proximity? Or was one done at sea level and the other done at a friend’s house in the mountains.

1. Line Graph the above data and then answer the questions that follow.

A good site to help you to make all different kinds of graphs is, Graphs Made Easy at: [http://nces.ed.gov/nceskids/graphing (Links to an external site.)](http://nces.ed.gov/nceskids/graphing)

**Save the grid below to your computer**  
   PC: Right click > save picture as...  
   Mac: Ctrl + Click > Download Image to Disk  
  
Then import the image to a graphics program, such as Microsoft Paint or Paintbrush for the Mac. You may also use Adobe Photoshop, Adobe Acrobat, Word, Excel or PowerPoint to create the line graph. Use this to create your line graph and include it with the rest of this document that you email to me at: [ksteiner@bellevuecollege.edu](mailto:ksteiner@bellevuecollege.edu)

1. What is the dependent variable?  
     
   Oxygen amount in ml/g
2. What is the independent variable?  
     
   Temperature
3. Based on the above data, is the scientist’s hypothesis correct? Yes.
4. What are the controls used in the above experiment?  
     
   The temperatures are recorded at well-defined intervals.

Metrics Me 2

Metrics Me

scale.gif

Metric Me Measurement Lab Objectives:

* You will learn to make measurements using the metric system.
* Develop valid conclusions from the data received from these measurements.
* You will demonstrate your ability to convert the original measurements to lower and higher values by moving the decimal point the correct number of places in the proper direction.

Materials:

* the measuring tape at the beginning of this exercise

Procedures:

Working in groups of two, **only if you choose to work with another student on this assignment,** use the metric ruler at the beginning of this exercise, and a meter stick to measure the body parts found in Table 1. Complete the table by moving the decimal point in the proper direction to produce the asked value.

1. When measuring the wrist, measure it at its widest point. The tape measure should go over the large knob of the ulna.
2. Measure the circumference of the forearm at its widest point. Measure this area in a relaxed position.
3. The length of the forearm should be measured from the wrist joint to the elbow joint.
4. When measuring the ankle, measure it at the point just above the two large knobs of the tibia
5. Measure the circumference of the calf at its widest point. Measure this area in a relaxed position.
6. The length of the foreleg should be measured from the bottom of the tibial knob to the knee joint.

Table 1: Anatomical Measurements

|  |  |  |
| --- | --- | --- |
| **Circumference of the wrist** | | |
| cm.\_\_\_\_15\_\_\_\_\_\_ | mm.\_\_\_\_150\_\_\_\_\_\_ | M\_\_\_0.15\_\_\_\_\_\_\_ |
| **Circumference of the forearm** | | |
| cm.\_\_17\_\_\_\_\_ | mm.\_\_\_170\_\_\_\_ | M\_\_0.17\_\_\_\_ |
| **Length of the forearm from the wrist joint to the elbow joint.** | | |
| cm.\_\_\_\_29\_\_\_\_ | mm.\_\_\_\_290\_\_\_\_\_\_ | M\_\_\_0.29\_\_\_\_\_\_\_ |
| **Circumference of the ankle** | | |
| cm.\_\_\_21\_\_\_ | mm.\_\_\_210\_\_\_\_\_\_\_ | M\_\_\_0.21\_\_\_\_\_\_\_ |
| **Circumference of the calf** | | |
| cm.\_\_\_40\_\_\_\_\_\_\_ | mm.\_\_\_\_410\_\_ | M\_\_\_\_0.40\_\_\_ |
| **Length of the foreleg from the ankle joint to the knee joint.** | | |
| cm.\_\_42\_\_\_\_ | mm.\_\_\_420\_\_\_\_ | M\_\_\_0.42\_\_\_ |

Bar Graph the Data below: Graph Title:

A good site to help you with graphing is Graphs Made Easy at: [http://nces.ed.gov/nceskids/graphing (Links to an external site.)](http://nces.ed.gov/nceskids/graphing)

**Save the grid below to your computer**  
   PC: Right click > save picture as...  
   Mac: Ctrl + Click > Download Image to Disk  
  
Then import the image to a graphics program, such as Microsoft Paint or Paintbrush for the Mac. You may also use Adobe Photoshoop, Adobe acrobat, Word, Excel, or Powerpoint to make this bar graph. Use this to create your bar graph and include it with the rest of this document that you email to me at: [ksteiner@bellevuecollege.edu (Links to an external site.)](http://vista.bellevuecollege.edu/webct/urw/tp50286639953041.lc50286639867041/RelativeResourceManager/Template/COURSE_0963745_M/my_files/ksteiner@bellevuecollege.edu)

Summary:

1. What is the dependent variable?  
     
   The dependent value is the length of the body part. Its value is dependent on what is being measured.
2. Explain why it is considered dependent.  
     
   The body part is independent part of the equation. It can be swapped out with a different body part to result in a length being found. However measuring the same body part multiple times will result in the same *fixed* value.
3. What is the ratio of:
   1. wrist to ankle measurrnent? 15:21 = 5:7
   2. forearm to calf measurment? 17:40
   3. forearm to leg measurment?17:42
4. Which of the two, the arm or the leg, is best suited for support? leg
5. Explain your answer using the collected data.  
     
   The arm would be less capable of supporting the mass of my body due to a lower size ratio.  
   Having a lower size ration is critical as the body part needs to support its self plus the other object.

Metrics 2

Metrics 2

scale.gif

Here are some sites to visit to help you with this section of the Module 1 Lab.

1. Online Conversion.com at:[http://www.onlineconversion.com  (Links to an external site.)](http://www.onlineconversion.com/)

2. US Metric Association at[: http://lamar.colostate.edu/~hillger (Links to an external site.)](http://lamar.colostate.edu/~hillger)

3. Commonly Used Metric System Units, Symbols, and Prefixes at: [http://lamar.colostate.edu/~hillger/common.html (Links to an external site.)](http://lamar.colostate.edu/~hillger/common.html)

4. Metrics Conversions, Metrics Conversion Chart and Table -- Online at: [http://www.sciencemadesimple.com/conversions.html (Links to an external site.)](http://www.sciencemadesimple.com/conversions.html)

Answer the following questions:

1. How many decimal points do you move if you are changing 50 L. to mL? \_\_\_\_10^-3\_\_
2. What does the prefix Kilo mean? \_\_\_\_\_\_\_\_10^3\_\_\_\_\_\_\_\_
3. What does the prefix milli mean? \_\_\_\_\_\_\_\_10^-3\_\_\_\_\_\_\_
4. How many decimal points must you move to change 23.45 cm to M? \_\_10^-2\_\_\_\_
5. How many decimal points do you move if you are changing 50.8 L. to ml.? \_\_10^3\_\_\_\_\_\_\_\_
6. What does the prefix centi mean? \_\_\_\_\_100\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. What does the prefix deci mean? \_\_\_\_\_\_\_10\_\_\_\_\_\_\_\_\_\_\_\_\_
8. What direction must you move the decimal point to change 23.45 cm to M? \_\_\_<<<<<\_\_\_\_\_\_\_

Change the following:

1. 3.56 cm = \_\_\_0.0000356\_\_\_\_\_\_\_KM.
2. 56.78 mm = \_\_\_ 5.678\_\_\_\_\_\_\_cm.
3. If you purchased a 5 L bottle of coke for $1.50 how much would a 4000 ml bottle of coke cost?  
     
   1.50/5L \* 4L = 1.2$
4. If 2500 ml of gasoline costs $ 3.50, how much will 4 L. of gas cost?  
     
   3.5/2.5L \* 4 = 5.60$
5. A purchasing agent bought 1500 Kilograms of sugar for $35.00. How much did he pay for 100 Kg?  
     
   $35.00/ 1500kg \* 100 kg = 2.34$
6. If you purchased a 3 L bottle of Pepsi for $2.50 how much would a 500 ml. bottle of Pepsi cost?  
     
   $2.50/3L \* 0.5 = 0.42$
7. If 5.5 L of distilled water costs $ 3.50, how much will 1000 ml. of that water cost?  
     
   $3.50/5.5 \* 1.0 = 0.64$
8. A Store owner bought 1500 Kilograms of Wheat for $435.00. How much did he pay for 24,050 Kg?  
     
   $435/1500kg \* 24050kg = 6974.50$
9. What percent of 45 Kg is 25 Kg?  
     
   45/25 = 180%
10. If a man took 35 minutes to run 10,000 meters, how long would it take him to run 10 Km?  
    10,000 m = 10km  
    35min = 35min
11. Fish can swim in depths as deep as 9.5 Km. How many meters is this? \_9500\_\_\_\_; mm? \_\_\_\_9500000\_\_\_\_\_\_.