BIO 110 L Prelab for Name: ____William Johnson_____

LAB 2: Metric Measurement & the Scientific Method Date:_____

The **metric system** is a system of units for measurement developed in late 18th century in France by the chemist Lavoisier. The metric system is based on units of ten, thus simplifying inter-conversions This base-ten system is similar to our monetary system, in which 10 cents equals a dime, The modern metric system (*modern* meaning post-1960) is now widely used throughout the world and is called the International System of Units (SI)("*Système International d'Unités*" in French).

Metric units commonly used in biology include: meter (m) The basic unit of length **liter** (L) The basic unit of volume **gram** (g) The basic unit of mass **degree Celsius** (°C) The basic unit of temperature

Scientific Method The scientific method is a way to ask and answer scientific questions by making observations and doing experiments. The steps of the scientific method are to:

1. Ask a Question 2. Do Background Research (Exploration) 3. Construct a Hypothesis

4. Test Your Hypothesis by doing an Experiment. The experiment will provide evidence to support or disprove the hypothesis. 5. Analyze Your Data and Draw a Conclusion 6. Communicate Your Results

Answer the following **questions:**

Fill in the blank spaces (5x3=15pts)

1. The metric system is based on units of _____**Ten**_____

2. The modern metric system is called the ___**International system of units**_____

3. Metric unit of temperature is _**Degree Celsius**_____

4. A hypothesis can be tested by doing an _____**experiment**_____

5. The experiment provides evidence to _**support**_____ or ____**dispute**_____the hypothesis.

Basic Math in testing a hypothesis

6. The weights of the 3 boys in Group Blue are 70kg, 45kg, and 85kg respectively.

What is their average weight? (10pts) __**67.6 kg**_____ *(Do not forget the units)*

A given hypothesis states that height in cm divided by weight in kg is EXPECTED to be 5cm/kg.

7. Mr. Mosquito's height is 160 cm . He weighs 74 kg. (15pts)

   A. What is the **expected** value when *height in centimeters is divided by weight in kilograms?* ___***5cm/kg***_____ *(Do not forget the units)*
   B. What is the **observed** value when *height in centimeters is divided by weight in kilograms?* ___***2.16/kg***_____ *(Do not forget the units)*
   C. Would you **SUPPORT** or **DISPROVE** the given hypothesis? **(Circle one)**

8. Miss Froggy's height is 110 cm . She weighs 22kg. (15pts)

   A. What is the expected value when *height in centimeters is divided by weight in kilograms?* _____***5cm/kg***_____ *(Do not forget the units)*

B. What is the observed value when *height in centimeters is divided by weight in kilograms?* __*5cm/kg*_____ *(Do not forget the units)*
C. Would you **SUPPORT** or **DISPROVE** the given hypothesis? **(Circle one**)

A hypothesis is a statement that provides a possible answer to a question or an explanation for an observation that can be tested.

Using the hypothesis and data table below, complete questions 9- 12

Hypothesis: *Height in centimeters divided by weight in kilograms is **EXPECTED** to be 5 cm/kg.*

			Height/Weight = cm/kg	
STUDENT	Height in cm	Weight in kg	**Expected**	**Observed**
Mr. X	170 cm	64 kg	5cm/kg	2.66 cm/kg
Ms. Y	155 cm	75kg	5cm/kg	2.7 cm/kg

9. According to the hypothesis what is the **expected** value when *height in centimeters is divided by weight in kilograms? (10pts)*___***5cm/kg***_____*(Do not forget the units)*

10. Is **observed** height in centimeters divided by weight in kilograms for Mr. X **5cm/kg** ? (10pts) **Yes OR No (circle one)**
11. What is the **observed** average relationship between height and weight (Hint: Find the average of the 2 numbers in the observed column) (10pts) __**2.37/kg**_____ cm/kg
12. According to the data, would you **SUPPORT** or **DISPROVE** the hypothesis? (10pts) ***Circle one***

General Biology Lab (BIO 110L) Lab Report

LAB 2: METRIC MEASUREMENT & THE SCIENTIFIC METHOD **Total points:100**

The **Scientific Method** is a way of gaining information about the world by rigorous testing to determine if the proposed solutions are valid. An important part of the scientific method is forming a **hypothesis**. A hypothesis is a statement that provides a possible answer to a question or an explanation for an observation that can be tested.

1. A given hypothesis states that height in cm divided by weight in kg is EXPECTED to be 5 cm/kg.
Mr. Froggy's height is 180 cm. He weighs 90 kg. (3x5=15pts)

A. What is the **expected** value when *height in centimeters is divided by weight in kilograms?*
_____***5***_____ *cm/kg*

B. What is the **observed** value when *height in centimeters is divided by weight in kilograms?* _____**2**_____ cm/kg

C. Would you **SUPPORT** or **DISPROVE** the given hypothesis? **(Circle One)**

Using the hypothesis and data table below, complete questions 2 - 4.

Hypothesis: *Height in centimeters divided by weight in kilograms is equal to 5 cm/kg.*

			Height/Weight = cm/kg	
STUDENT	Height in cm	Weight in kg	Expected	Observed
Mr. X	175 cm	74 kg	5cm/kg	2.36 cm/kg
Ms. Y	160 cm	70kg	5cm/kg	2.28 cm/kg

2. Is **observed** height in centimeters/ weight in kilograms = 5 cm/kg (5pts)
YES or NO (Circle One)
3. What is the **observed average** value when height/weight? (5pts) __**2.36**__ cm/kg
4. Do your data **support** the hypothesis given? (5pts) **Yes or No** ***(Circle One)***

5. What is the metric unit of measurement for temperature? (5pts)
a. Degrees Fahrenheit b. Degrees Celsius c. Either Fahrenheit or Celsius d. Thermometer

6. The best choice among the given metric units to describe the distance between two cities is: (5pts)
a. Meters b. Centimeters c. Kilometers d. Millimeters

Question 7 -9 ask you to use the information you have gained about metric system and make reasonable estimates about the quantities listed. Place a decimal point within the series of numbers so that the statements are reasonable. DO NOT FORGET THE UNITS!

7. Barry is 1545cm tall. (5pts) *Answer*: ___**154.5cm**_____

8. The ambulance sped by at 10000 km per hour. (5pts) *Answer*: __**100.00km per hour**_____

9. The ballpoint pen weighs 99990 g. (5pts) *Answer*: ___**0.99990g**_____

10. What does each unit represent? (6x3=18pts)

(a) mm = _**millimeter**_____ (b) m = _**meter**_____ (c) cm = _**centimeter**_____

(d) kg = __**kilogram**_____ (e) mL= **millimeter**_____ (f) °C ___**degree celsius**_____

11. Choose the BEST **metric unit** for each. (9x3 =27pts)

(a) The length of an eyelash: mm cm m km
(b) The height of a flagpole: mm cm m km
(c) Your mass: mg g kg lb
(d) Mass of 10 pennies: mg g kg lb
(e) Your height: ft km cm in
(f) Dropperful of medicine : fl. oz L mL gal
(g) Mass of an aspirin tablet: mg g kg lb
(h) Mass of a bowling ball: mg g kg lb
(i) Distance from earth to moon mi m km yd