Introduction to Biology Workbook (Lovrien)

Syllabus Assignment Name:_____

You are expected to know the basic rules of my classroom. Below is a review of the most important rules:

1) When is assigned work due?

2) What is the rule on extra credit?

3) What is the rule on late work?

4) From the options below, circle all options that are considered cheating:

    a) copying lab answers, even from a lab partner.

    b) "clip-n-paste" on a computer without providing full sources.

    c) looking at and copying another student's answers.

5) Notes, study guides, assignments, links, my email address, photos, a copy of the syllabus and more can be found at my website. List my web address:

6) If you don't want to be tardy, where should you be when the bell rings?

Once the above questions are answered correctly, explain the basic rules to your parent/ guardian. Sign the sheet to acknowledge that you understand the rules and return it - you will earn 12 points. If it isn't in by the *beginning of class*, you earn your first zero – so get it done and start off the year with 12 easy points!!!

Student - If you understand the above rules, sign here:_____

Parent/Guardian – After your student has explained the above rules,

please sign here:_____

Lab Safety at Brandon Valley - Name:_____
Date:_____

The following quiz covers material related to lab safety. The basic rules listed below must ALWAYS be followed to guarantee a safe classroom laboratory. Violation of the BVHS lab rules are more severe problems than other classroom behavior due to the inherent danger of the lab setting. Violations of any of these rules will result in an office visit and possible prohibition from engaging in future labs, or even removal from class.

1. What are two rules on thermometers at BVHS?

2. What is the rule on broken glass?

3. Describe two situations during which you should wear goggles in class?

4. What is the rule on moving a microscope?

5. Explain two rules regarding heating containers over a flame:

6. Explain the procedure for a spill at your lab table:

7. At which lab table (#) do you sit?
8. If we were doing a microscope lab, what microscope (#) would you grab?

9. Why should you never touch the gas jets in the middle of the lab table?

10. What is a MSDS?

NOTES

I. Lab Safety: see Lab Safety WS/Quiz.

II. Tools of a Biologist

A. Microscope

1. Light Microscope: Uses light to form images.

Advantages: Cheap, easy to use, can see live organisms, see true color.
Disadvantages:

2. Electron Microscope: Uses e- beam to form images.

Advantages: 3D, 1000x as strong as light microscope.
Disadvantages:

Explain a situation where a light microscope would be preferable to an electron microscope?

Label the objective lense, stage, adjustment knob and arm.

Why is this microscope called a compound light microscope?

If an object appears too dark, what can you do to improve the quality of the image?

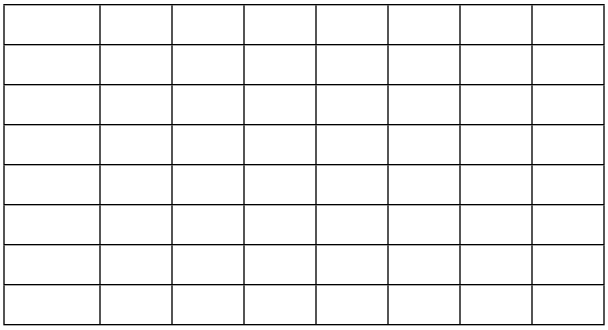
B. Graphs: A visual display of the interaction between two variables, the dependent variable (changes after independent) and independent variable (changes first; doesn't depend on dependent variable). Consider two variables: your height and your age…which changes BECAUSE of the other? Put it in a sentence:

I am now 5'5 because I am 15 OR I am now 15 because I am 5'5?

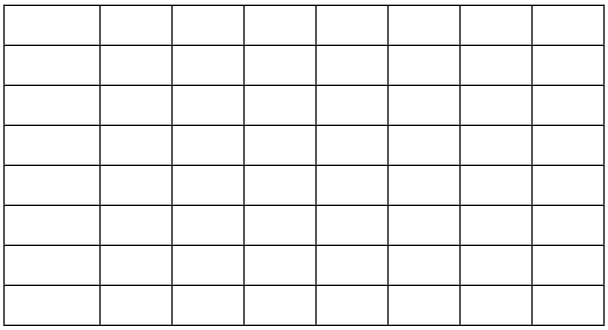
Change in the independent **causes** the dependent to change.

When graphing these variables, there are three major types of graphs:

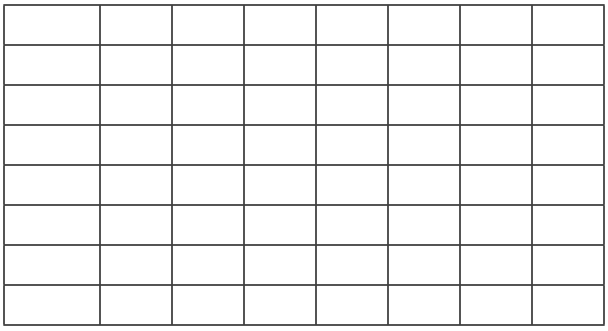
1. Directly Proportional: As independent variable changes, dependent



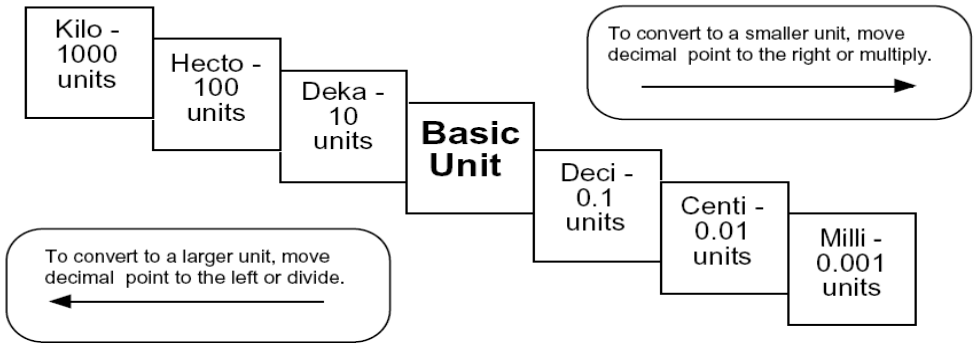
2. Inversely Proportional: As independent variable changes, dependent



3. Exponential: As independent variable changes, dependent



C. Metric



Mass: Amount of Matter. Measured in grams, or kg.
Volume: Amount of space an object occupies. Measured in liters.
Length: Distance between two objects. Measured in meters.

Convert the following:

16 meters = cm

834 cm = m

.954 ml = cl

9 grams = kg

500 mg = g

Section I & II Questions

_____1. The SI system of measurement is based on multiples of
(a) 10s. (b) 20s. (c) 50s. (d) 100s.

_____2. The following are SI base units
(a) meter. (b) kilogram. (c) kelvin. (d) all of the above

_____3. Typical magnification of a light microscope is up to
(a) 500x. (b) 1000x. (c) 1500x. (d) 2000x.

_____4. An ocular lens with a magnification of 10x and an objective lens with a magnification of 50x together will magnify an object by

(a) 60x. (b) 100x. (c) 250x. (d) 500x.

_____5. What are the best kind of shoes to wear in the lab?
(a) enclosed toe shoes (b) sandals (c) flip flops (d) none of the above

Metric WS I Name:_____

1. What is the metric unit for measuring length?
2. What is the metric unit for measuring mass?
3. Convert 25 cm to meters.
4. Convert 2341 ml to liters.
5. Convert 45 km to centimeters.
6. What does the prefix ‘KILO-‘ mean?
7. What does the prefix ‘CENTI-‘ mean?
8. Water freezes at what temperature (STP, Celcius)?
9. Water boils at what temperature (STP, Celcius)?
10. In mm, how long is a meter stick?
11. Convert 14 km to mm.
12. Convert 2.43 g to mg.
13. Convert 29 ml to kl.
14. Convert 24 cm to m.
15. How many mm in 1 meter?
16. Convert 23,563 liters to cm.
17. Convert to .462 g to mg.
18. Which is larger, a milliliter or liter?
19. Convert 590 grams to kg.
20. Which unit is used to measure mass in the metric system?

Biology –Metric WS II Name:_____

Complete the following problems. Show all necessary work!

1) How many grams are in 7.46 kilograms? _____

2) a. Which would hold more water, 502 ml beaker or 2 liter beaker? _____

   b. How much more does the larger beaker hold? _____

3) a. If *city A* is 32,000 *cm* from your home while *city B* is 467 *km* from your home, which city is farther away? _____

   b. How much farther? _____

4) How many *mg* of salt are in a 2.78 *kg* box of salt? _____

5) How many meters are in 8.46 *km?*_____

6) 23,456 cm are equivalent to how many kilometers? _____

7) Convert 45 mm to meters. _____

8) A 2-liter bottle of soda contains how many mL of soda? _____

9) How many mm in one meter? _____

10) Convert 140 grams to kg. _____

11) Convert 140 liters to mL. _____

12) Convert 156.3 km to cm. _____

13) What is the metric unit for measuring mass?

Section III - V Questions

T/F If False, change sentence to make it true.

_____1. Once an idea is accepted as scientific fact, that idea can never be changed.

_____2. Scientific methods are based on gathering observable, empirical and measurable evidence that is critically evaluated.

_____3. Scientific theories are supported by a great deal of data and evidence; they have yet to be proved false.

_____4. In natural experiments, it is difficult to control all variables.

_____5. The goal of science is to understand how everything works.

_____6. A superseded scientific theory is no longer considered the most complete description of reality by mainstream science.

_____7. Scientists accept all claims, regardless of scientific evidence.

_____8. Scientific laws are principles which can be used to predict the behavior of the natural world.

_____9. An observation can only be made in a controlled, experimental environment.

_____10. Science can be used to answer all questions.

____ 1. A scientific experiment must have the following features:
(a) a control, so variables that may affect the outcome are reduced.
(b) the variable being tested reflects the question being asked.
(c) the variable being tested can be measured accurately.
(d) all of the above

_____2. In the general process of a scientific investigation, what comes directly after an observation?
(a) experiment (b) prediction (c) hypothesis (d) theory

_____3. A hypothesis
(a) is a suggested explanation for a phenomena based on evidence that can be tested by observation or experimentation.
(b) is a guess.
(c) is based on what a scientist thinks could happen.
(d) is an explanation of a scientific concept.

_____4. A scientific theory
(a) describes a guess or an opinion.
(b) is supported by a great deal of data and evidence.
(c) is the process of scientific investigation.
(d) is just another name for a hypothesis.

_____5. Which of the following are not true of a scientific law?
(a) Is a principle which can be used to predict the behavior of the natural world.
(b) Is well-supported by observations and/or experimental evidence.
(c) Is the same as a scientific theory.
(d) Usually refers to rules for how nature will behave under certain conditions.

Section V Reading/ Questions

Experiments

A scientific experiment must have the following features:
• a control, so variables that could affect the outcome are reduced
• the variable being tested reflects the phenomenon being studied
• the variable can be measured accurately, to avoid experimental error
• the experiment must be reproducible.

An **experiment** is a test that is used to eliminate one or more of the possible hypotheses until one hypothesis remains. The experiment is a cornerstone in the scientific approach to gaining deeper knowledge about the physical world. Scientists use the principles of their hypothesis to make predictions, and then test them to see if their predictions are confirmed or rejected.
Scientific experiments involve **controls**, or subjects that are not tested during the investigation. In this way, a scientist limits the factors, or variables that can cause the results of an investigation to differ. A **variable** is a factor that can change over the course of an experiment. **Independent variables** are factors whose values are controlled by the experimenter to determine its relationship to an observed phenomenon (the dependent variable). **Dependent variables** change in response to the independent variable. **Controlled variables** are also important to identify in experiments. They are the variables that are kept constant to prevent them from influencing the effect of the independent variable on the dependent variable. For example, if you were to measure the effect that different amounts of fertilizer have on plant growth, the independent variable would be the amount of fertilizer used (the changing factor of the experiment). The dependent variables would be the growth in height and/or mass of the plant (the factors that are influenced in the experiment). The controlled variables include the type of plant, the type of fertilizer, the amount of sunlight the plant gets, the size of the pots you use. The controlled variables are controlled by you, otherwise they would influence the dependent variable.

In summary:
• The independent variable answers the question “What do I change?”
• The dependent variables answer the question “What do I observe?”
• The controlled variables answer the question “What do I keep the same?”

Questions
1. What is an experiment and how does an experiment relate to a hypothesis?

2. What is the difference between a control and a variable in a scientific experiment?

3. Discuss the differences between dependent variables and independent variables.

4. What is a controlled variable? Provide an example.

5. If you were to conduct an experiment measuring the effect that different amounts of fertilizer have on plant growth, what would be the independent variable(s), the dependent variable(s), and the controlled variable(s).

Section VI Reading: Unifying Principles of Biology

The Cell Theory
The cell is the basic unit of life. The Cell Theory states that all living things are made of one or more cells, or the secretions of those cells. For example, shell and bone are built by cells from substances that they secrete into their surroundings. Cells come from cells that already exist, that is, they do not suddenly appear from nowhere. In organisms that are made of many cells (called multicellular organisms), every cell in the organism's body derives from the single cell that results from a fertilized egg.

Gene Theory
A living organism's traits are encoded in their DNA, the large molecule, or macromolecule, that holds the instructions needed to build cells and organisms. DNA makes up the genes of an organism. Traits are passed on from one generation to the next by way of these genes. Information for how the organism appears and how its cells work come from the organism's genes. Although the appearance and cell function of the organism may change due to the organism's environment, the environment does not change its genes. The only way that genes can change in response to a particular environment is through the process of evolution in populations of organisms.

Homeostasis
Homeostasis is the ability of an organism to control its body functions in order to uphold a stable internal environment even when its external environment changes. All living organisms perform homeostasis. For example, cells maintain a stable internal acidity (pH); and warm-blooded animals maintain a constant body temperature.

Homeostasis is a term that is also used when talking about the environment. For example, the atmospheric concentration of carbon dioxide on Earth has been regulated by the concentration of plant life on Earth because plants remove more carbon dioxide from the atmosphere during the daylight hours than they emit to the atmosphere at night.

Questions
1. What do diatoms and whale sharks have in common?

2. What is the only way that genes can change in response to a particular environment?

3. What is homeostasis?

4. How do cells perform homeostasis?

Word or Term	Synonym OR Student Definition	Example/ Showing Sentence
Science		
Evidence	Proof/ Observable event that can be used to prove a claim.	
Scientific Law		
Scientific Theory		
Control		
Independent Variable		In studying the heart rate of Daphnia, the concentration of caffeine was not affected by the heart rate, thus caffeine concentration was the independent variable.
Dependent Variable		
Sexual Reproduction	Recombination; Offspring has genes from two different donors.	
Asexual Reproduction		
Homeostasis		
Hypothesis		