LAMBERT HIGH SCHOOL

Honors Biology

Summer Assignment

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Summer 2014

Please use your past knowledge, the resources embedded within and the internet to complete this assignment. Familiarity with this information is vital to your success as an honors biology student at Lambert High School.

GPS REVIEW
NATURE OF SCIENCE/NATURE OF BIOLOGY

GPS CORRELATION (Standards indicated with an asterisk will be addressed throughout the entire year)

Habits of Mind
SCSh1. Students will evaluate the importance of curiosity, honesty, openness, and skepticism in science.*
SCSh2. Students will use standard safety practices for all classroom laboratory and field investigations.*
SCSh3. Students will identify and investigate problems scientifically.
SCSh4. Students use tools/ instruments for observing, measuring & manipulating scientific equipment /materials.*
SCSh5. Students will demonstrate the computation and estimation skills necessary for analyzing data and developing reasonable scientific explanations.
SCSh6. Students will communicate scientific investigations and information clearly.

The Nature of Science
SCSh7. Students analyze how scientific knowledge is developed.
SCSh8. Students will understand important features of the process of scientific inquiry.
SCSh9. Students will enhance reading in all curriculum areas.*

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1. Write a brief description of these terms used in scientific research (which uses the scientific method):
   a. control group
   b. experimental variable
   c. dependent variable
   d. observation
   e. experimental group
   f. data collection
   g. independent variable
   h. data analysis/representation
   i. controlled experiment
   j. hypothesis
   k. inference
   l. conclusions/implications

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2. Place the steps of the scientific method from #1 above in the correct order for proper research. Then write a story that solves an everyday problem using the scientific method and each step. Identify each step in the process.

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3. Distinguish among laws, theories and hypotheses.

4. Identify the metric units for the following. Give 2 examples for each using a practical application in biology class.
   a. mass b. volume c. length d. density e. temperature

5. Identify the following types of graphs. **Draw** an example of each and explain when it would best be used.
   a. line graph b. bar graph c. pie graph

6. Define science as either a subject or a process. Defend your answer.

7. Identify the following divisions of biology:

a. Botany	e. Genetics	i. Zoology	m. Ecology
b. Anatomy	f. Physiology	j. Biochemistry	n. Cytology
c. Evolution	g. Taxonomy	k. Microbiology	o. Anthropology
d. Archeology	h. Entomology	l. Paleontology	p. Epidemiology

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8. Distinguish between qualitative and quantitative data.

9. List 5 characteristics of living organisms and describe each.

10. Describe "Ethical Issues" involved in biological studies/experiments. Explain a specific example

11. Fill in with information for 5 safety rules: Refer to the safety contract embedded within this document.

State the Rule	Why is it important to follow?	What could happen if you don't follow it?

Honors Biology Safety Contract/Flinn Scientific's Student Safety Contract (© 2004, Flinn Scientific, Inc.)

Flinn Scientific's Student Safety Contract

PURPOSE

Science is a hands-on laboratory class. You will be doing many laboratory activities which require the use of hazardous chemicals. Safety in the science classroom is the #1 priority for students, teachers, and parents. To ensure a safe science classroom, a list of rules has been developed and provided to you in this student safety contract. These rules must be followed at all times. Two copies of the contract are provided. One copy must be signed by both you and a parent or guardian before you can participate in the laboratory. The second copy is to be kept in your science notebook as a constant reminder of the safety rules.

GENERAL RULES

1. Conduct yourself in a responsible manner at all times in the laboratory.
2. Follow all written and verbal instructions carefully. If you do not understand a direction or part of a procedure, ask the instructor before proceeding.
3. Never work alone. No student may work in the laboratory without an instructor present.
4. When first entering a science room, do not touch any equipment, chemicals, or other materials in the laboratory area until you are instructed to do so.
5. Do not eat food, drink beverages, or chew gum in the laboratory. Do not use laboratory glassware as containers for food or beverages.
6. Perform only those experiments authorized by the instructor. Never do anything in the laboratory that is not called for in the laboratory procedures or by your instructor. Carefully follow all instructions, both written and oral. Unauthorized experiments are prohibited.
7. Be prepared for your work in the laboratory. Read all procedures thoroughly before entering the laboratory.
8. Never fool around in the laboratory. Horseplay, practical jokes, and pranks are dangerous and prohibited.
9. Observe good housekeeping practices. Work areas should be kept clean and tidy at all times. Bring only your laboratory instructions, worksheets, and/or reports to the work area. Other materials (books, purses, backpacks, etc.) should be stored in the classroom area.
10. Keep aisles clear. Push your chair under the desk when not in use.
11. Know the locations and operating procedures of all safety equipment including the first aid kit, eyewash station, safety shower, fire extinguisher, and fire blanket. Know where the fire alarm and the exits are located.
12. Always work in a well-ventilated area. Use the fume hood when working with volatile substances or poisonous vapors. Never place your head into the fume hood.
13. Be alert and proceed with caution at all times in the laboratory. Notify the instructor immediately of any unsafe conditions you observe.
14. Dispose of all chemical waste properly. Never mix chemicals in sink drains. Sinks are to be used only for water and those solutions designated by the instructor. Solid chemicals, metals, matches, filter paper, and all other insoluble materials are to be disposed of in the proper waste containers, not in the sink. Check the label of all waste containers twice before adding your chemical waste to the container.
15. Labels and equipment instructions must be read carefully before use. Set up and use the prescribed apparatus as directed in the laboratory instructions or by your instructor.
16. Keep hands away from face, eyes, mouth and body while using chemicals or preserved specimens. Wash your hands with soap and water after performing all experiments. Clean all work surfaces and apparatus at the end of the experiment. Return all equipment clean and in working order to the proper storage area.
17. Experiments must be personally monitored at all times. You will be assigned a laboratory station at which to work. Do not wander around the room, distract other students, or interfere with the laboratory experiments of others.
18. Students are never permitted in the science storage rooms or preparation areas unless given specific permission by their instructor.
19. Know what to do if there is a fire drill during a laboratory period; containers must be closed, gas valves turned off, fume hoods turned off, and any electrical equipment turned off.
20. Handle all living organisms used in a laboratory activity in a humane manner. Preserved biological materials are to be treated with respect and disposed of properly.
21. When using knives and other sharp instruments, always carry with tips and points pointing down and away. Always cut away from your body. Never try to catch falling sharp instruments. Grasp sharp instruments only by the handles.
22. If you have a medical condition (e.g., allergies, pregnancy, etc.), check with your physician prior to working in lab.

CLOTHING

23. Any time chemicals, heat, or glassware are used, students will wear laboratory goggles. There will be no exceptions to this rule!
24. Contact lenses should not be worn in the laboratory unless you have permission from your instructor.
25. Dress properly during a laboratory activity. Long hair, dangling jewelry, and loose or baggy clothing are a hazard in the laboratory. Long hair must be tied back and dangling jewelry and loose or baggy clothing must be secured. Shoes must completely cover the foot. No sandals allowed.
26. Lab aprons have been provided for your use and should be worn during laboratory activities.

ACCIDENTS AND INJURIES

27. Report any accident (spill, breakage, etc.) or injury (cut, burn, etc.) to the instructor immediately, no matter how trivial it may appear.
28. If you or your lab partner are hurt, immediately yell out "Code one, Code one" to get the instructor's attention.
29. If a chemical splashes in your eye(s) or on your skin, immediately flush with running water from the eyewash station or safety shower for at least 20 minutes. Notify the instructor immediately.
30. When mercury thermometers are broken, mercury must not be touched. Notify the instructor immediately.

HANDLING CHEMICALS

31. All chemicals in the laboratory are to be considered dangerous. Do not touch, taste, or smell any chemicals unless specifically instructed to do so. The proper technique for smelling chemical fumes will be demonstrated to you.
32. Check the label on chemical bottles twice before removing any of the contents. Take only as much chemical as you need.
33. Never return unused chemicals to their original containers.

Flinn Scientific's Student Safety Contract

34. Never use mouth suction to fill a pipet. Use a rubber bulb or pipet pump.
35. When transferring reagents from one container to another, hold the containers away from your body.
36. Acids must be handled with extreme care. You will be shown the proper method for diluting strong acids. Always add acid to water, swirl or stir the solution and be careful of the heat produced, particularly with sulfuric acid.
37. Handle flammable hazardous liquids over a pan to contain spills. Never dispense flammable liquids anywhere near an open flame or source of heat.
38. Never remove chemicals or other materials from the laboratory area.
39. Take great care when transporting acids and other chemicals from one part of the laboratory to another. Hold them securely and walk carefully.

HANDLING GLASSWARE AND EQUIPMENT

40. Carry glass tubing, especially long pieces, in a vertical position to minimize the likelihood of breakage and injury.
41. Never handle broken glass with your bare hands. Use a brush and dustpan to clean up broken glass. Place broken or waste glassware in the designated glass disposal container.
42. Inserting and removing glass tubing from rubber stoppers can be dangerous. Always lubricate glassware (tubing, thistle tubes, thermometers, etc.) before attempting to insert it in a stopper. Always protect your hands with towels or cotton gloves when inserting glass tubing into, or removing it from, a rubber stopper. If a piece of glassware becomes "frozen" in a stopper, take it to your instructor for removal.
43. Fill wash bottles only with distilled water and use only as intended, e.g., rinsing glassware and equipment, or adding water to a container.
44. When removing an electrical plug from its socket, grasp the plug, not the electrical cord. Hands must be completely dry before touching an electrical switch, plug, or outlet.
45. Examine glassware before each use. Never use chipped or cracked glassware. Never use dirty glassware.
46. Report damaged electrical equipment immediately. Look for things such as frayed cords, exposed wires, and loose connections. Do not use damaged electrical equipment.
47. If you do not understand how to use a piece of equipment, ask the instructor for help.
48. Do not immerse hot glassware in cold water; it may shatter.

HEATING SUBSTANCES

49. Exercise extreme caution when using a gas burner. Take care that hair, clothing and hands are a safe distance from the flame at all times. Do not put any substance into the flame unless specifically instructed to do so. Never reach over an exposed flame. Light gas (or alcohol) burners only as instructed by the teacher.
50. Never leave a lit burner unattended. Never leave anything that is being heated or is visibly reacting unattended. Always turn the burner or hot plate off when not in use.
51. You will be instructed in the proper method of heating and boiling liquids in test tubes. Do not point the open end of a test tube being heated at yourself or anyone else.
52. Heated metals and glass remain very hot for a long time. They should be set aside to cool and picked up with caution. Use tongs or heat-protective gloves if necessary.
53. Never look into a container that is being heated.
54. Do not place hot apparatus directly on the laboratory desk. Always use an insulating pad. Allow plenty of time for hot apparatus to cool before touching it.
55. When bending glass, allow time for the glass to cool before further handling. Hot and cold glass have the same visual appearance. Determine if an object is hot by bringing the back of your hand close to it prior to grasping it.

QUESTIONS

56. Do you wear contact lenses?
☐ YES ☐ NO
57. Are you color blind?
☐ YES ☐ NO
58. Do you have allergies?
☐ YES ☐ NO

If so, list specific allergies _____

_____

_____

AGREEMENT

I, _____, (student's name) have read and agree to follow all of the safety rules set forth in this contract. I realize that I must obey these rules to ensure my own safety, and that of my fellow students and instructors. I will cooperate to the fullest extent with my instructor and fellow students to maintain a safe lab environment. I will also closely follow the oral and written instructions provided by the instructor. I am aware that any violation of this safety contract that results in unsafe conduct in the laboratory or misbehavior on my part, may result in being removed from the laboratory, detention, receiving a failing grade, and/or dismissal from the course.

_____
Student Signature

_____
Date

Dear Parent or Guardian:

We feel that you should be informed regarding the school's effort to create and maintain a safe science classroom/laboratory environment.

With the cooperation of the instructors, parents, and students, a safety instruction program can eliminate, prevent, and correct possible hazards.

You should be aware of the safety instructions your son/daughter will receive before engaging in any laboratory work. Please read the list of safety rules above. No student will be permitted to perform laboratory activities unless this contract is signed by both the student and parent/guardian and is on file with the teacher.

Your signature on this contract indicates that you have read this Student Safety Contract, are aware of the measures taken to ensure the safety of your son/daughter in the science laboratory, and will instruct your son/daughter to uphold his/her agreement to follow these rules and procedures in the laboratory.

_____
Parent/Guardian Signature

_____
Date

DESIGNING A CONTROLLED EXPERIMENT

http://www.longwood.edu/cleanva/images/sec6.designexperiment.pdf

Design a controlled experiment to determine the effect of acetaminophen (headache medicine) on pain.

PROBLEM	
DEPENDENT VARIALBLES	
INDEPENDENT VARIABLES	
STANDARDIZED VARIABLES	
HYPOTHESIS	
LEVELS OF TREATMENT	
CONTROL TREATMENT	
REPLICATION	

METHOD	
EXPECTED RESULTS	
EXPLANATION OF EXPECTED RESULTS	

Graphing Assignment

Graphing is an important procedure used by scientists to display data that is collected during a controlled experiment. Line graphs must be constructed correctly to accurately portray the data collected. Many times the wrong construction of a graph distracts from the acceptance of an individual hypothesis.

A graph contains five major parts:

- The title: depicts what the graph is about. By reading the title, the reader should get an idea about the graph. It should be a concise statement placed above the graph.
- The Independent Variable: the variable that can be controlled by the experimenter. It usually includes time (dates, minutes, hours), depth (feet, meters), temperature (Celsius). This variable is placed on the X axis (horizontal axis).
- The Dependent Variable: is the variable that is directly affected by the independent variable. It is the result of what happens because of the independent variable. Example: How many oxygen bubbles are produced by a plant located five meters below the surface of the water? The oxygen bubbles are dependent on the depth of the water. This variable is placed on the Y axis (vertical axis).
- The Scales for Each Variable: In constructing a graph one needs to know where to plot representing data, In order to do this a scale must be employed to include all the data points. This must also take up a conservative amount of space. It is not suggested to have a run-on scale making the graph too hard to manage. The scales should start with 0 and climb based on intervals such as: multiples of 2, 5, 10, 20, 25, 50 or 100. The scale of the numbers will be dictated by your data values.
- The Legend: is a short descriptive narrative concerning the graph's data. It should be short and concise and placed under the graph.

Graph 1:

Using the following data, answer the questions below and then construct a line graph.

Depth in Meters	Number of Bubbles/minute Plant A	Number of Bubbles/minute Plant B
2	29	21
5	36	27
10	45	40
16	32	50
25	20	34
30	10	20

1. What is the dependent variable? Why?

2. What is the independent variable? Why?

3. What title would you give the graph?

4. What conclusions can be determined from the data in graph 1?

Graph 2:

Diabetes is a disease affecting the insulin producing glands of the pancreas. If there is not enough insulin being produced by these cells, the amount of glucose in the blood will remain high. A blood glucose level above 140 for an extended period of time is not considered normal. This disease, if not brought under control, can lead to sever complications and even death.

Answer the following questions concerning the data below and then graph it.

Time After Eating, hours	Glucose mL/Liter of Blood Person A	Glucose mL/Liter of Blood Person B
0.5	170	180
1	155	195
1.5	140	230
2	135	245
2.5	140	235
3	135	225
4	130	200

1. What is the dependent variable? Why?

2. What is the independent variable? Why?

3. What title would you give the graph?

4. Which, if any, of the above individuals has diabetes?

5. What data do you have to support your hypothesis?

6. If the time period was extended to six hours, what would be the expected blood glucose level for Person B?

7. What conclusions can be determined from the data in graph 2?

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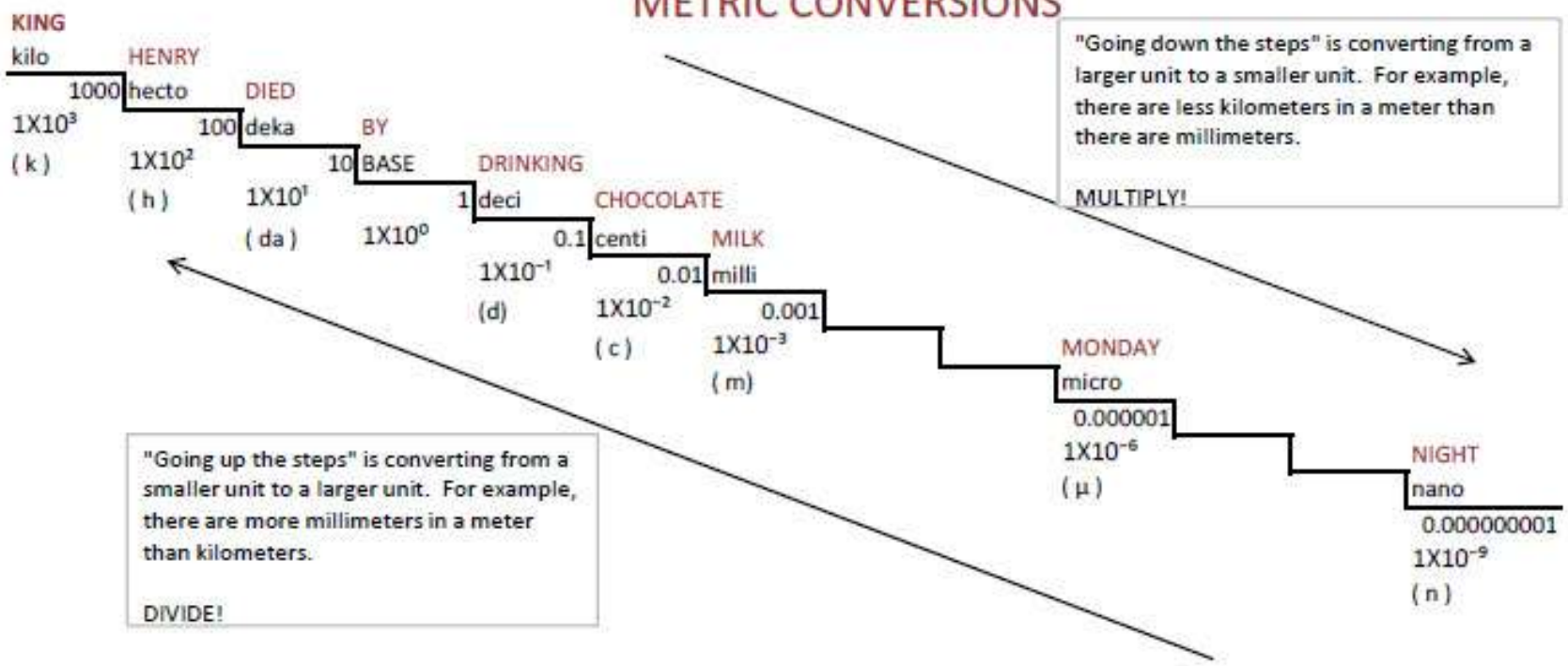
METRIC CONVERSIONS



Each step up or down is the same as dividing or multplying by ten, respectively.

Commit these prefixes and their numerical values to memory.

To use the "steps", count the number of steps you need to move to get from your starting unit to your ending unit.
Example: from milli to kilo you have to make six "steps".
Decide if you need to multiply or divide.
Example: going up the "steps" divide, going down the steps multiply.
Multiply or divide by ten to the power equal to the number of steps.
Example: from milli to kilo - going up - divide by ten to the sixth power or 1,000,000.
If there are 3000 millimeters, there are 3000 ÷ 1,000,000 kilometers or .003 km.

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Metric Conversion Practice

PREFIXES	kilo-	hecto-	deka-	Base Unit	deci-	centi-	milli-	micro-	nano-
SYMBOL	k	h	da	g, m, L	d	c	m	μ	n

Start in the square with the prefix of the unit you are starting with, and count how many squares you move to get to the prefix you are converting to. Do not count the square in which you start. Move the decimal that many places and in the direction you counted (right or left).

Example 5 m = 500 cm

1. What are the two benefits of using the metric system?

2. Is a millimeter more or less than a meter? How do you know?

3. Is a kilogram more or less than a meter? How do you know?

4. What do the following stand for?

(a) dag_____ (b) cg _____ (c) kg _____

(d) dL_____ (e) hL _____ (f) cm _____

(g) mm_____ (h) μm _____ (i) ng _____

5. How many mm are there in one meter?

6. How many milliliters are there per liter?

7. How many milligrams are there per gram?

8. What is the abbreviation for the following?

(a) kilometer_____ (b) gram _____ (c) milligram _____

(d) centimeter_____ (e) millimeter _____ (f) meter _____

9. Is 500 mg more or less than one gram? By how much?

10. Is 100cm more or less than one meter? By how much?

11. Name the base units for the following measurements:

Length/distance = Mass = Volume =

12. Complete the following conversions:

a) 500 mg = _____ g

b) 1.98 m = _____ µm

c) 20 g = _____ mg

d) 50 m = _____ cm

e) 80 mL = _____ L

f) 20 m = _____ km

g) 25 cm = _____ nm

h) 9.75kg = _____ g

Challenge Problems: Hint … These are 2 step conversions.

1.) 456 mL of sugar water is mixed with 0.845 L of water. What is the final volume in dekaliters?

2.) 8.5 m = _____ in

3.) 2.37 kg = _____ lbs