

Marquette Catholic High School

2017 AP Biology Summer Assignment

Welcome to AP Biology! The two main goals of AP Biology are to help you develop a conceptual framework for modern biology and to gain a deeper appreciation of science as a process (as opposed to an accumulation of facts). Because of the rapid pace of discovery in the life sciences our primary emphasis is on developing an understanding of unifying concepts that connect the major topics of biology. The AP Biology Curriculum centers around the four **Big Ideas** and you will need to not only know these but also understand how they all relate:

- **Big Idea 1:** The process of evolution drives the diversity and unity of life.
- **Big Idea 2:** Biological systems utilize free energy and molecular building blocks to grow, to reproduce and to maintain dynamic homeostasis.
- **Big Idea 3:** Living systems store, retrieve, transmit and respond to information essential to life processes.
- **Big Idea 4:** Biological systems interact, and these systems and their interactions possess complex properties.

What to do before the first day of school:

- AP Biology was designed by a select group of college professors and high school science teachers to be equivalent to an introductory college biology course. Visit the below College Board site to explore what an AP Biology course is like: <https://apstudent.collegeboard.org/exploreap?affiliateId=apcentral&bannerId=exploreap1>
- Each year new advances in science are discovered but the length of the school year (and when the test occurs) stays the same. What does this mean? We are short on time. In order to cover ALL of the material, you are responsible for reviewing the Chemistry section on your own. Here is what you are to do:
- Watch the following two YouTube video to review. These two videos are great chemistry reviews.

http://www.youtube.com/watch?v=HVT3Y3_gHGg&list=PL6C159EF1A62143A2&index=11

http://www.youtube.com/watch?v=QnQe0xW_JY4&list=PL6C159EF1A62143A2&index=8

- Print and complete the Chemistry Worksheet. As an AP Biology student, the expectation is that if you don't know it, find it out!! Use all of your resources!!!
- Print and complete the Biology Prefixes and Suffixes. These should have been learned in Honors Biology so this should just be review! It will make life in AP Biology much easier if you KNOW these roots.
- Finally, I included an exercise that reviews the concepts of experimental design that will be needed as we progress through lab experiments this school year.

This summer assignment is due the first day of class and if you have any questions as you work on this, please feel free to email me. I truly am looking forward to working with you next year! Don't procrastinate on this assignment but don't let it keep you from having a wonderful summer!!!

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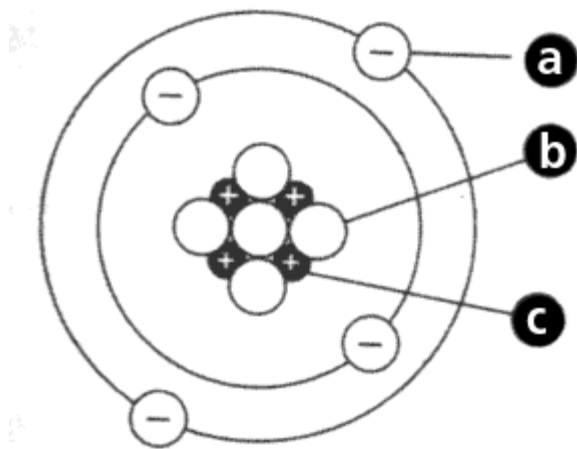
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AP Biology Essential Chemistry

This is a review of basic chemistry – we will not spend any class time on these concepts as they should have been learned in chemistry. Please make sure that you know them and if not, be sure to study through them.

1. Contrast the term element with compound.
2. Know the symbols of the following elements and their charge:
 - a. Carbon
 - b. Hydrogen
 - c. Oxygen
 - d. Nitrogen
 - e. Phosphorus
 - f. Sulfur
3. Label the diagram below and define the terms that you label.



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4. Contrast the terms atomic mass and atomic number

5. What is the difference between the terms atomic mass and atomic weight?

6. What is an isotope and what is “special” about radioactive isotopes?

7. What determines interactions between atoms? Why are valence electrons important?

8. Define the following terms:
 - a. Chemical bond

 - b. Covalent bond

 - c. Single bond

 - d. Double bond

 - e. Electronegativity

 - f. Nonpolar covalent bond

 - g. Polar covalent bond

9. What is the difference between a structural and molecular formula?

10. Know both the molecular and structural formula for the following compounds.

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- a. Oxygen gas
 - b. Carbon dioxide
 - c. Glucose
 - d. Phosphate
 - e. Ammonia
 - f. Water
11. How do ionic bonds compare with covalent bonds?
12. Compare and contrast hydrogen bonds and van der Waals interactions.
13. Define a dynamic chemical equilibrium in terms of quantities of reactants and products.
14. Why is water considered a polar molecule?
15. For each of the below listed properties of water – briefly define the property and then explain how water’s polar nature and polar covalent bonds contribute to the water special property.
- a. Cohesion
 - b. Adhesion

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c. Surface tension

d. High specific heat

e. Heat of vaporization

f. Evaporative cooling

16. What is special about water and density?

17. Explain how these properties of water are related to the phenomena described in the statements below. More than one property may be used to explain a given phenomenon.

a. During the winter, air temperatures in the northern United States can remain below 0°C for months; however, the fish and other animals living in the lakes survive.

b. Many substances—for example, salt (NaCl) and sucrose—dissolve quickly in water.

c. When you pour water into a 25-ml graduated cylinder, a meniscus forms at the top of the water column.

d. Sweating and the evaporation of sweat from the body surface help reduce a human's body temperature.

e. Water drops that fall on a surface tend to form rounded drops or beads.

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f. Water drops that fall on your car tend to bead or round up more after you polish (or wax) the car than before you polished it.

g. If you touch the edge of a paper towel to a drop of colored water, the water will move up into (or be absorbed by) the towel.

18. Define the following terms:

a. Solute

b. Solvent

c. Aqueous solution

d. Hydrophilic

e. Hydrophobic

19. MOLARITY

A. What is the symbol and equation for Molarity?

B. Example Problems (Show how you arrived at your answer)

1. What is the molarity of a solution formed by mixing 10.0 g of H_2SO_4 with enough water to make 0.100 L of solution?

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2. To prepare 10.5 L of a 2.50 M solution of KOH, how many grams of potassium hydroxide must be used?

3. How many moles of LiBr must be added to .650 L of water to make a 2.0 M solution?

4. What is the molarity of the solution produced when 145 g of NaCl is dissolved in sufficient water to prepare 2.75 L of solution?

5. How many grams of KCl are needed to prepare 0.750 L of a 1.50 M solution?

6. What is the molarity of the solution produced when .594 mol of HCl is dissolved in 0.385 L of water?

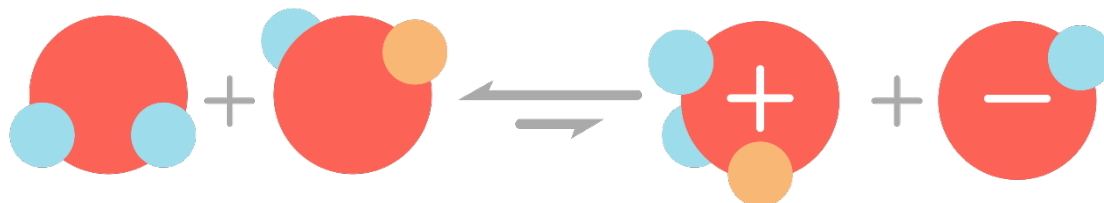
7. To produce 3.00 L of a 1.90 M solution of sodium hydroxide, how many grams of NaOH must be dissolved?

8. If 8.77 g of KI are dissolved in enough water to make 4.75 L of solution, what is the molarity of the solution?

20. Label the diagram below to demonstrate the dissociation of the water molecule and then relate this diagram to the term pH.

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21. What defines an acid and a base?

22. Why are small changes in pH so important in biology?

23. What is a buffer? Give an example on how they would work in a living organism.

24. What is acid precipitation and why is it important to living organisms?

25. Why is organic chemistry so important in the study of biology?

26. What is special about carbon that makes it the central atom in the chemistry of life?

27. Describe and contrast the three types of isomers. Draw a sketch of each

a. Structural –

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b. Geometric –

c. Enantiomers –

28. Be familiar with each of the following functional groups – know it's chemical compound and the functional properties

a. Hydroxyl

b. Carbonyl

c. Carboxyl

d. Amino

e. Sulfhydryl

f. Phosphate

A.P. Biology Prefixes and Suffixes-

The Language of Science The main reason students find it difficult to understand science is because of all the hard to write, spell and read words. Actually, scientific vocabulary is a mix of small words that are linked together to have different meanings. If you learn the meanings of the little words, you'll find scientific vocabulary much easier to understand. Find the meaning to the following Greek/Latin root words.

meso

leuco

aero

anti

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amphi

aqua / hydro

arthro

auto

bi / di

bio

cephal

chloro

chromo

cide

cyto

derm

haplo

ecto

exo

endo

epi

gastro

genesis

herba

hetero

homo

ov

kary

neuro

soma

saccharo

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primi / archea

hemo

hyper

hypo

intra

-itis

lateral

-logy

-lysis

-meter

mono

morph

micro

macro

multi / poly

pod

-phobia

-philia

proto

photo

psuedo

synthesis

sub

troph

therm

tri

zoo, zoa

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-tropism

-taxis

-stasis

zyg / zygos

phago

path / pathy

phyll

sym / syn

Once you have completed the above table, use it to develop a definition, in your own words, for each of the following terms.

1. Hydrology _____

2. Cytolysis _____

3. Protozoa _____

4. Epidermis _____

5. Spermatogenesis _____

6. exoskeleton _____

7. Abiotic _____

8. Pathogen _____

9. pseudopod _____

10. Hemophilia _____

11. Endocytosis _____

12. herbicide _____

13. Anaerobic _____

14. Bilateral _____

15. autotroph _____

16. Monosaccharide _____

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17. Arthropod _____
18. polymorphic _____
19. Hypothermia _____
20. Biogenesis _____

A.P. Biology: A Case Study in Scientific Inquiry

Read the information below and answer the questions that follow.

Beluga Whales in the St. Lawrence River
Passage #1

The Arctic beluga whales are, at maturity, pure white and highly intelligent organisms. They have lived in the St. Lawrence Seaway for millennia. As a resource, beluga whales provided traders, fisheries, and settlers with a livelihood for centuries. But, times change. Scientists estimate that the population of belugas must have been 5,000 to 10,000 near the turn of the 20th century and about 500 in the second half of the century. As the demand for whale products decreased, the beluga were increasingly ignored and almost forgotten. One would assume that the populations would increase. However, by the 1970s the population still was estimated at 500. In 1979 the Canadian government provided the whales complete protection from hunting. Despite this twenty year protection, the population has not increased.

1. Why do you think the number of whales has not increased?

EXPLAIN your answer choice.

- A) Small populations of organisms tend to have low reproductive rates.
- B) The St. Lawrence Seaway has become increasingly polluted.
- C) The whales' habitat has become degraded and modified due to industry and human settlements.
- D) Other (please describe)

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2. What is the question that would best guide a scientific investigation about why the population of whales does not increase?

EXPLAIN your answer choice.

- A) Where do belugas live and reproduce?
- B) What is the cause of death for belugas?
- C) How have the habitats along the St. Lawrence changed?
- D) Other (please describe)

Passage #2

A team of marine biologists headed by Pierre Béland began a series of investigations with one dead beluga beached on the St. Lawrence. Laboratory work showed that the whale died from renal failure. Tissue samples revealed that the whale was heavily contaminated with mercury, lead, PCBs, DDT, MIREX, and other pesticides. Investigations of two other dead belugas revealed similar results. Still curious about why the population remained low, the biologists continued their investigations. During a 15-year period the team recorded 179 deaths and examined 73 carcasses. The entire sample was highly contaminated with an array of chemicals. Results of the study included the following.

- ♣40% of the organisms bore tumors, 14 of which were cancerous.
- ♣The whales had a high incidence of stomach ulcers, including three perforated ulcers.
- ♣45% of females produced smaller than normal amounts of milk due to infections or tumors in their mammary glands.
- ♣Lesions of the thyroid and adrenal glands were common.
- ♣Some whales had compromised immune systems. In comparison, Arctic beluga in other locations did not display any of these conditions, nor did other species of whales or seals living in the St. Lawrence. Both of the latter groups contained the same toxic substances as the belugas, but in lesser amounts. Finally the scientists also found that the toxins were not confined to the fat in blubber. Small amounts were found in other tissues, which might have contributed more readily to the injury of vital organs. In answering the original questions the scientists proposed that the whales were victims of pollution.

When the scientists presented their evidence and explanation suggesting that pollution was the cause of the low numbers and lack of increase in the beluga population, other marine biologists maintained that toxins

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were not at fault. The skeptical scientists argued that although the diseases and lesions observed in belugas matched the known effects of toxic chemicals, the original investigations had not demonstrated a cause-and-effect relationship.

3. Based on your understanding, were the original investigations adequate? Why or why not?

4. Did the scientists use appropriate tools and techniques to gather, analyze and interpret data? Support your answer.

5. What evidence did the scientists use to develop an explanation that the whales died because of pollutants?

6. What would be the best approach to design and conduct a scientific investigation that would demonstrate a cause-and-effect relationship? (Think about the components of experimental design.)