AP ENVIRONMENTAL SCIENCE SUMMER PACKET 2019-2020

Welcome to APES!

APES is not just about learning new material; it's about discovering how and why everything is interconnected. We will revisit a great deal of material that you have already learned in your other classes – especially biology, chemistry and algebra. We move at a quick pace during the year, so being up to speed on these topics will be an immense help to you.

When it comes to math, you need to be comfortable with four topics: scientific notation and calculations with scientific notation, metric prefixes, dimensional analysis/factor label, and percent change. This packet includes practice problems and links to good online resources. **College Board rules state that you may <u>not</u> use a calculator on the AP exam[1], so you will not be using a calculator in class.** It'll be ok, I promise!

The second part of this packet is a brief science and geography review. You will be asked to familiarize yourself with basic map components, continents, some countries, and specific locations within some countries. You will also be reminded of some basic concepts from Matter & Energy, Biology, and Chemistry.

Please go through this packet over the course of the summer. We will have some formal review of what was in the packet when we return from summer break, but not too much time will be spent on it. **I will not collect this packet, only check it for completion on September 11 (A) and September 12 (B). Also, sometime in the first two weeks of school (once we've settled down to a regular schedule), we will have a quiz on the review material.** If there is something you don't understand, please come see me ASAP when school starts. You can also email me at mramstrom@bcps.org; I'll check my email periodically over the summer.

Have a great summer, and I'll see you in the fall!

Ms. Ramstrom

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[1]You are expected to take the AP Environmental Science exam at noon on **<u>MONDAY, May 6, 2019</u>**

SCIENTIFIC NOTATION

Directions: Please complete the following to the best of your ability. No calculators should be used! Please round to the nearest 10th as appropriate.

1. Convert the following numbers into scientific notation.

16, 502 = _____

0.0067 = _____

0.015 = _____

2. Convert from scientific notation or regular notation.

6.96×10^3 = _____

3.46×10^{-5} = _____

2.54×10^4 = _____

9.1×10^{-2} = _____

3. Calculate without using a calculator.

$(8 \times 10^2) + (4 \times 10^3)$ = _____

$(8 \times 10^2) - (4 \times 10^3)$ = _____

$(8 \times 10^{-4}) \times (4 \times 10^9)$ = _____

$(8 \times 10^{-4}) / (4 \times 10^9)$ = _____

> Scientific Notation WITHOUT a calculator
>
> *Adding and Subtracting:*
> *https://www.youtube.com/watch?v=PYTp7 5sryWA&feature=youtu.be&list=PLsUco LGpc8dLqj30QR_8zwzPEeQPN1APl*
>
> http://academic.greensboroday.org/~regest erj/potl/BasicSkills/SciNot/SciNotA.htm
>
> *Multiplying and Dividing:*
> *https://www.youtube.com/watch?v=ciFOli rz4Js&feature=youtu.be*
>
> http://academic.greensboroday.org/~regest

PREFIXES AND CONVERSIONS

Remember: Kilo, Hecto, Deca, Deci, Centi, and Milli - **(King Henry Died Drinking Chocolate Milk)**

There are _____ meters in 1 **kilo**meter.

There are _____ grams in 1 **kilo**gram.

There are _____ **centi**meters in 1 meter.

There are _____ watts in 1 **kilo**watt

> Metric Conversions
>
> https://www.youtube.com/watch?v=o-PJq7PT30w&feature=youtu.be

GRAPHING: Which variable goes on the x-axis? The y-axis? When do you use a line graph vs. a bar graph?

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DIMENSIONAL ANALYSIS

Also called the factor-label method, is a mathematical system using conversion factors to move from one unit of measurement to a different unit of measurement. For example, you can use dimensional analysis to calculate how many seconds are in a day.

The key with dimensional analysis is that each of the conversion factors is equal to one. Using these factors will allow you to move from one unit of measurement to another.

Remember that:

$$\frac{2}{2} = 1 \qquad \frac{520}{520} = 1 \qquad \frac{x}{x} = 1 \cdot \qquad \frac{cm}{cm} = 1$$

Examples of conversion factors:

$$\frac{60 \text{ sec}}{1 \text{ min}} = 1 = \frac{1 \text{ min}}{60 \text{ sec}} \qquad \frac{1 \text{ inch}}{2.54 \text{ cm}} = 1 = \frac{2.54 \text{ cm}}{1 \text{ cm}}$$

Note in these last two examples that the conversion factor can be used in either form and both are equal to 1. Determining which form should be used depends on the units you start with and the units requested for your answer.

If you want to determine how many seconds are in one day, you would set up your dimensional analysis problem as shown below. Note the importance of UNITS! When solving these problems in APES, units are vital! The units help you determine which way you use the conversion factors. Also, if you do not show the units in your set-up *and* answer you do not get credit for your work.

$$\frac{1\,day}{1} \times \frac{24 \text{ hours}}{1 \text{ day}} \times \frac{60 \text{ minutes}}{1 \text{ hour}} \times \frac{60 \text{ seconds}}{1 \text{ minute}} = 86{,}400 \text{ seconds}$$

In this example I can cross out "day" in both the numerator and denominator because day/day=1. This is true for hours and minutes as well and leaves us with the answer we are looking for, which is in seconds. Notice in the example above that day is put over 1. Often problems start with the given value over 1.

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Directions: Solve the following problems using dimensional analysis.

1. How many millimeters are in 8 inches? Please round your answer to the nearest 10th. **1 inch = 2.54 cm.** Please show the set up and work for the problem. Units must be shown throughout the problem!

Using the following conversion factors, answer the questions below.

The biomass of the forest increases at an annual rate of 2.7×10^5 kg/ha
The forest biomass is 50 percent carbon by mass.
Each year the district uses 3.0×10^5 gallons of fuel oil for heating and hot water.
10 kg of CO_2 is produced when 1 gallon of fuel oil is burned.
1.0 kg of CO_2 contains 0.27 kg of carbon.
The cost of putting 1 ha of the forest in conservancy is $12,000.

2. Calculate the mass of carbon, in kg, that is accumulated and stored in 1.0 ha of forest in one year.

3. Calculate the mass of carbon, in kg, that is emitted by the school as a result of its fuel-oil consumption in one year.

4. Calculate the number of hectares (ha) of forest the school district needs to conserve in order to offset the carbon released in one year by the school burning its fuel oil.

5. Calculate the amount of money the school district must raise for the conservation project.

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Use the assumptions in the table below to perform the calculations that follow.

Assume that the total global area of corals growing in reefs is 2.5×10^{11} m².
Assume that corals only grow vertically and that the average vertical growth rate of corals is 3 mm/year.
Assume that the average density of $CaCO_3$ in corals is 2.0×10^3 kg/m³.

6. Calculate the current annual global increase in volume, in m³, of $CaCO_3$ in coral reefs. Show all steps in your calculation.

7. Calculate the current annual global increase in mass, in kg, of $CaCO_3$ in coral reefs. Show all steps in your calculation.

8. Because of ocean acidification, it is expected that in 2050 the mass of $CaCO_3$ deposited annually in coral reefs will be 20 percent less than is deposited currently. Calculate how much less $CaCO_3$, in kg, is expected to be deposited in 2050 than would be deposited if ocean water pH were to remain at its current value.

PERCENT CHANGE: *Always, Always, Always show your work!!*

> % Change
>
> If your answer is a negative number then this is a **percentage decrease.**
>
> $$\text{Percent Increase} = \frac{\text{Final Value - Initial Value}}{\text{Initial Value}} * 100\%$$

Directions: Use equation above to calculate percentage change.

1. Calculate the percent increase in per capita work grain production between 1950 and 2000 using the data at the right.

Year	Per capita world grain production (kg)
1950	200
1970	223
1990	240
2000	250

2. The total fertility rate (TFR) of a country is the average number of births per women in that country. In Madagascar, the TFR went from 6.0 in 1995, down to 5.0 in 2005. What is the percent change in the TFR in Madagascar from 1995 to 2005?

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Physical Science Review

Direction: Answer the questions below.

1. What is matter?

2. What is mass?

3. What is the relationship between atoms and elements?

4. What is the relationship between atoms and molecules?

5. What is a molecule?

6. What is an isotope?

7. What is a half-life?

8. The half-life of Zn-71 is 2.4 minutes. If there is 100.0 g of Zn-71 at the beginning, how many grams would be left after 7.2 minutes has elapsed?

9. What types of elements form ionic bonds? What are some properties of an ionic bond?

10. What types of elements form covalent bonds? What are some properties of a covalent bond?

11. What types of elements for hydrogen bonds? What are some properties of a hydrogen bond?

12. Water has several inherent properties that make it essential to life on Earth. Describe the following properties and explain why they are important to life:

      a. Polarity
      b. Surface tension
      c. Capillary action
      d. High specific heat capacity
      e. Expands as a solid
      f. Less dense as a solid
      g. Acts as a solvent

13. What is pH? What is the pH of an acid? A base? A neutral substance?

14. State the Law of Conservation of Matter.

15. What is the difference between an organic compound and an inorganic compound?

16. Define energy. What are some units of energy?

17. What is the difference between kinetic and potential energy?

18. State the first and second law of thermodynamics.

19. What is entropy?

20. What is LeChatlier's principle? How does it affect a system (reaction) at equilibrium?

Life Science Review

Direction: Answer the questions below.

1. There are four basic types of organic compounds in living organisms. For each one, identify the elements it contains and the function of the compound in living organisms.

      a. Carbohydrates
      b. Lipids
      c. Proteins
      d. Nucleic Acids

2. Define/describe the following terms:

      a. Producer
      b. Autotroph
      c. Consumer
      d. Heterotroph
      e. Decomposer
      f. Detritivore
      g. Scavenger
      h. Food chain (be able to draw)
      i. Food web (be able to draw)

3. What is a trophic level? What is the difference between a primary, secondary, and tertiary consumer?

4. What does an energy pyramid show?

5. Describe the reactants and products of photosynthesis in the chemical formulas and words.

6. Describe the reactants and products of aerobic respiration in the chemical formula and words	.

7. Describe the reactants and products of anaerobic respiration in words.

8. What are the basic processes, sources and sinks found in the water cycle and carbon cycle?

9. What is the relationship between mutations, adaptations, natural selection and evolution?

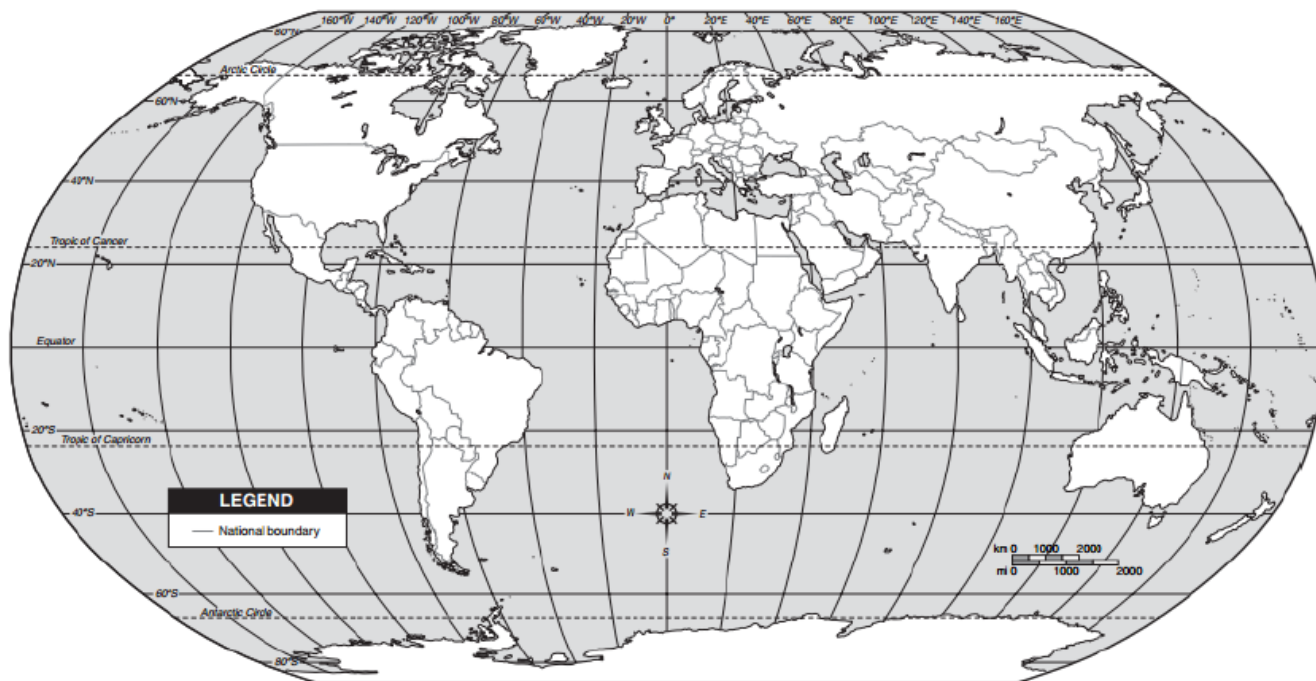10. What is the difference between a niche and a habitat?

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Geography

Directions: Identify the areas below correctly on the map.

Africa	Latitude
Alaska	Longitude
Antarctica	Mediterranean Sea
Artic Ocean	Mexico
Asia	Middle East (the general area)
Atlantic Ocean	Mississippi River
Australia	North America
China	North Atlantic Ocean
England	North Pacific Ocean
Equator	Pacific Ocean
Europe	Rocky Mountains
Everglades	San Andreas Fault
Great Lakes	South America
Greenland	South Atlantic Ocean
Gulf of Mexico	South Pacific Ocean
India	Southern Ocean
Indian Ocean	Tropic of Cancer
Japan	Tropic of Capricorn

You should also have an idea of which states comprise the following regions of the U.S.: Great Plains, Northwest, Southwest, Mid-Atlantic, Midwest, Northeast, and Southeast.

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