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 already learned in your other classes—especially biology, chemistry, algebra, and even middle school social studies. 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 not use a calculator on the AP exam\(^1\), so you will not be using calculators in class most of the time.

The second part of this packet is a brief science and geography review. You need to familiarize yourself with basic map components, continents, some countries, and specific locations within some countries. You will also need to remember some basic concepts from Matter & energy, Biology, and Chemistry. We will be discussing different agencies and organizations, and we usually refer to them by their acronym; this information has been included for you as well.

Please go through this packet over the course of the summer. I will post an answer key to this packet on Classroom on the first day of school, but I will not review the packets in class or collect them. Sometime during the first two weeks of school (once we’ve settled down to a regular schedule), we will have a short assessment on the review material. If there’s something you don’t understand, see me at Lunch & Learn

Have a great summer, and I’ll see you in the fall! If you have any questions, email me at You can also email me at Deborah_p_haase@mcpsmd.org;

Ms. Haase

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\(^1\) All APES students are expected to take the AP Environmental Science exam at noon on **Monday, May 6, 2019**.
Math Refresher

**Scientific Notation**

1. Convert the following numbers into scientific notation.
   - 16,502 = __________________________
   - 0.0067 = __________________________
   - 0.015 = __________________________

2. Convert from scientific notation to regular notation.
   - $6.96 \times 10^3 = __________________________$
   - $3.46 \times 10^{-5} = __________________________$
   - $2.54 \times 10^4 = __________________________$
   - $9.1 \times 10^{-2} = __________________________$

3. Calculate the following without using a calculator:
   - $(8 \times 10^2) + (4 \times 10^3) = __________________________$
   - $(8 \times 10^2) - (4 \times 10^3) = __________________________$
   - $(8 \times 10^{-4}) \times (4 \times 10^9) = __________________________$
   - $(8 \times 10^{-4}) / (4 \times 10^9) = __________________________$

**Graphing:** Which variable goes on the x-axis? The y-axis? When do you use a bar graph vs. a line graph? What is the difference between an independent variable, dependent variable, and a control?

**Dimensional Analysis:** Always always always show your work and include your units.

1. How many millimeters are in 8 inches? Please round your answer to the nearest 10th (1 inch = 2.5 cm.)

2. If you are going 50 miles per hour, how many feet per second are you traveling (1 mile = 5280 feet; you may use 5000 as an approximation)?

**Scientific Notation WITHOUT A CALCULATOR:**

Adding and Subtracting:
- https://youtu.be/PYTp75sryWA

Multiplying & Dividing:
- https://youtu.be/ciFOlirz4Js

**Dimensional Analysis Help**

- https://www.youtube.com/watch?v=7NOIRJLwPl
- https://youtu.be/LdZ00OFAfAQ

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### PREFIXES AND CONVERSIONS

<table>
<thead>
<tr>
<th>Base unit</th>
<th>Prefix/ metric unit</th>
<th>Is it smaller than the base unit or bigger than the base unit? What is your basic relationship? Write the relationship 2 ways (as an equivalence and as a dimensional analysis conversion factor)</th>
<th>Write as a decimal or expanded number (as compared to the base unit)</th>
<th>Write in scientific notation (as compared to the base unit)</th>
</tr>
</thead>
</table>
| METER (m) | Centimeter (cm)     | **Example:** Smaller than a meter  
 1 m = 100 cm, or  
\[
\frac{1 \text{ m}}{100 \text{ cm}}
\]  
100 cm = 1 m, or  
\[
\frac{100 \text{ cm}}{1 \text{ m}}
\] | 1 cm = 0.01 m  
1 cm = 1 x 10\(^{-2}\) m |
|           | Kilometer (km)      |                                                                                                                                   |                                                                  |                                                           |
|           | Millimeter (mm)     |                                                                                                                                   |                                                                  |                                                           |
| GRAM (g)  | Kilogram (kg)       |                                                                                                                                   |                                                                  |                                                           |
| WATT (W)  | Kilowatt (kW)       |                                                                                                                                   |                                                                  |                                                           |
|           | Megawatt (MW)       |                                                                                                                                   |                                                                  |                                                           |

**METRIC CONVERSIONS:**  
https://youtu.be/o-PJq7PT30w
PERCENT, DIMENSIONAL ANALYSIS & METRIC PREFIX COMBO: ALWAYS ALWAYS ALWAYS SHOW YOUR WORK! NO CALCULATORS.

1. How many meters are in 835 centimeters?

2. How many milligrams are in 15 grams?

3. How many kilowatts are in 2000 watts?

4. How many megawatts are in 2000 watts?

5. (2018 FRQ) An offshore wind farm using turbines to generate electricity is built along the Atlantic coast of the U.S. Electrical demand in the area is expected to be $2.0 \times 10^6$ MWh.
   a. Calculate how much electricity (in MWh) the wind farm needs to generate per year in order to provide 80% of the electrical demand in the area.
   
   b. Customers in the service area pay $0.20/kWh for electricity. Calculate how much revenue will be produced if the wind turbines provide 80% of the electrical demand in the area.

PERCENT CHANGE: ALWAYS ALWAYS ALWAYS SHOW YOUR WORK!

<table>
<thead>
<tr>
<th>Year</th>
<th>Per capita world grain production (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>200</td>
</tr>
<tr>
<td>1970</td>
<td>223</td>
</tr>
<tr>
<td>1990</td>
<td>240</td>
</tr>
<tr>
<td>2000</td>
<td>250</td>
</tr>
</tbody>
</table>

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

Locate these areas on the map on the next page.

1. Africa  
2. Alaska  
3. Antarctica  
4. Arctic Ocean  
5. Asia  
6. Atlantic Ocean  
7. Australia  
8. China  
9. England  
10. Equator  
11. Europe  
12. Everglades  
13. Great Lakes  
14. Greenland  
15. Gulf of Mexico  
16. India  
17. Indian Ocean  
18. Japan  
19. Latitude  
20. Longitude  
21. Mediterranean Sea  
22. Mexico  
23. Middle East (the general area)  
24. Mississippi River  
25. North America  
27. North Pacific Ocean  
28. North, South, East, West  
29. Pacific Ocean  
30. Rocky Mountains  
31. San Andreas Fault  
32. South America  
33. South Atlantic Ocean  
34. South Pacific Ocean  
35. Southern Ocean  
36. Tropic of Cancer  
37. 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, Southeast.

AGENCY ALPHABET SOUP

<table>
<thead>
<tr>
<th>ABBREVIATION</th>
<th>AGENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDC</td>
<td>Centers for Disease Control and Prevention</td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protection Agency</td>
</tr>
<tr>
<td>FDA</td>
<td>Food &amp; Drug Administration</td>
</tr>
<tr>
<td>FEMA</td>
<td>Federal Emergency Management Agency</td>
</tr>
<tr>
<td>NASA</td>
<td>National Aeronautics &amp; Space Administration</td>
</tr>
<tr>
<td>NIH</td>
<td>National Institutes of Health</td>
</tr>
<tr>
<td>NOAA</td>
<td>National Oceanic &amp; Atmospheric Administration</td>
</tr>
<tr>
<td>UN</td>
<td>United Nations</td>
</tr>
<tr>
<td>USDA</td>
<td>Department of Agriculture</td>
</tr>
<tr>
<td>BLM</td>
<td>Bureau of Land Management</td>
</tr>
</tbody>
</table>
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 3.5 minutes. If there 100.0 g of Zn-71 at the beginning, how many grams would be left after 7.0 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 form hydrogen bonds? What are some properties of a covalent 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
   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. What is a buffer?
15. State the law of conservation of matter.
16. What is the difference between an organic compound and an inorganic compound?
17. Define energy. What are some units of energy?
18. Define power (in terms of energy). What are some units of power?
19. What is the difference between potential and kinetic energy?
20. State the first law of thermodynamics.
21. State the second law of thermodynamics.
22. What is entropy?
23. What is LeChatlier’s principle? How does it affect a system (reaction) at equilibrium?
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 or describe the following terms:
   a. Producer
   b. Autotroph
   c. Consumer
   d. Heterotroph
   e. Decomposer
   f. Detritivore
   g. Scavenger
   h. Food chain
   i. Food web

3. Be able to draw food web from simple food chains.

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

5. What does an energy pyramid show?

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

7. Describe the reactants and products of aerobic respiration in the chemical formulas and words.

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

9. What is productivity?

10. What is biomass?

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

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

13. What are the basic processes, sources and sinks found in the nitrogen cycle?

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

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

16. What is the function of the following systems in an organism?
   a. Circulatory
   b. Digestive
   c. Endocrine
   d. Excretory
   e. Immune
   f. Integumentary
   g. Muscular
   h. Nervous
   i. Respiratory
   j. Skeletal