Course Title: Honors Chemistry 412

Teacher: Mr. Urban / Mrs. Tarpey

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Estimated Time For Completion (Approximate): 4-6 hrs.

Objectives: Prepare for the first unit and key concepts of Honors Chemistry.

- Students will read and take notes on Chapters 1 and 2 of the textbook, Chemistry: Matter and Change. You should log in to the Ebook using the following information:
  
  Website: https://connected.mcgraw-hill.com/connected/login.do
  Username: myscience4
  Password: 2017sciencesc

- Students will complete the study guides for chapters 1 and 2 found in this packet. This assignment will be collected for credit on the first day of school, and we will be going over solutions in preparation for the quiz on chapters 1 and 2.

- Students will make flash cards for memorization of polyatomic ions and metric units. You will see a list of what needs to be on the flash cards in this packet. For elements and ions, put the symbol on one side and the name on the other. Have only one element or ion per card. These will be turned in with your summer packet for a grade. You will be tested on them throughout the first semester.
  - Use 3x5 index cards, not cut strips of paper, to produce your flash cards.

Method(s) of Assessment:

- Formal grade for summer work packet (notes, study guides, flashcards)
- Formal grade for chapters 1 and 2 exam (to be given at the end of the first week of school)

Impact on 1st Quarter Grade:

- Two formal assignments

Due Date:

- First day of school
Metric Unit Flashcards

Directions: Write the unit name and quantity on one side and the symbol on the other.

Example Flashcard:

| Kilo       | 1 kilo = 1000 base unit = $10^3$ |

Table of Prefixes

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Abbrev.</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tera-</td>
<td>T</td>
<td>$10^{12}$</td>
</tr>
<tr>
<td>Giga-</td>
<td>G</td>
<td>$10^9$</td>
</tr>
<tr>
<td>Mega-</td>
<td>M</td>
<td>$10^6$</td>
</tr>
<tr>
<td>kilo-</td>
<td>k</td>
<td>$10^3$</td>
</tr>
<tr>
<td>hecto-</td>
<td>h</td>
<td>$10^2$</td>
</tr>
<tr>
<td>deca-</td>
<td>da</td>
<td>$10^1$</td>
</tr>
<tr>
<td>Base Units</td>
<td>- meter, liter, gram, or second</td>
<td></td>
</tr>
<tr>
<td>deci-</td>
<td>d</td>
<td>$10^{-1}$</td>
</tr>
<tr>
<td>centi-</td>
<td>c</td>
<td>$10^{-2}$</td>
</tr>
<tr>
<td>milli-</td>
<td>m</td>
<td>$10^{-3}$</td>
</tr>
<tr>
<td>micro-</td>
<td>µ</td>
<td>$10^{-6}$</td>
</tr>
<tr>
<td>nano-</td>
<td>n</td>
<td>$10^{-9}$</td>
</tr>
<tr>
<td>pico-</td>
<td>p</td>
<td>$10^{-12}$</td>
</tr>
</tbody>
</table>
Name: ___________________________________________ Honors Chemistry Summer Assignment

Polyatomic Ion Flashcards

Directions: Write the polyatomic ion symbol on one side and the name on the other.

Example Flashcard:

<table>
<thead>
<tr>
<th>1- Charge</th>
<th>2- Charge</th>
<th>3- Charge</th>
<th>1+ Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formula</td>
<td>Name</td>
<td>Formula</td>
<td>Name</td>
</tr>
<tr>
<td>H₂PO₄⁻</td>
<td>Dihydrogen phosphate</td>
<td>HPO₄²⁻</td>
<td>Hydrogen phosphate</td>
</tr>
<tr>
<td>C₂H₃O₂⁻</td>
<td>Acetate</td>
<td>C₂O₄²⁻</td>
<td>Oxalate</td>
</tr>
<tr>
<td>BrO₃⁻</td>
<td>Bromate</td>
<td>O₂²⁻</td>
<td>Peroxide</td>
</tr>
<tr>
<td>HSO₃⁻</td>
<td>Hydrogen sulfite</td>
<td>SO₃²⁻</td>
<td>Sulfite</td>
</tr>
<tr>
<td>HSO₄⁻</td>
<td>Hydrogen sulfate</td>
<td>SO₄²⁻</td>
<td>Sulfate</td>
</tr>
<tr>
<td>HCO₃⁻</td>
<td>Hydrogen carbonate</td>
<td>CO₃²⁻</td>
<td>Carbonate</td>
</tr>
<tr>
<td>NO₂⁻</td>
<td>Nitrite</td>
<td>CrO₄²⁻</td>
<td>Chromate</td>
</tr>
<tr>
<td>NO₃⁻</td>
<td>Nitrate</td>
<td>Cr₂O₇²⁻</td>
<td>Dichromate</td>
</tr>
<tr>
<td>CN⁻</td>
<td>Cyanide</td>
<td>SiO₃²⁻</td>
<td>Silicate</td>
</tr>
<tr>
<td>OH⁻</td>
<td>Hydroxide</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MnO₄⁻</td>
<td>Permanganate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ClO⁻</td>
<td>Hypochlorite</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ClO₂⁻</td>
<td>Chlorite</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ClO₃⁻</td>
<td>Chlorate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ClO₄⁻</td>
<td>Perchlorate</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Introduction to Chemistry

Section 1.1 A Story of Two Substances

In your textbook, read about the ozone layer.

Use each of the terms below just once to complete the passage.

<table>
<thead>
<tr>
<th>atmosphere</th>
<th>oxygen gas</th>
<th>ozone</th>
<th>ozone hole</th>
</tr>
</thead>
<tbody>
<tr>
<td>stratosphere</td>
<td>troposphere</td>
<td>ultraviolet radiation</td>
<td></td>
</tr>
</tbody>
</table>

Earth’s (1) ___________________ is made up of several layers. The air we breathe makes up the lowest level. This layer is called the (2) _________________. The next layer up is called the (3) _________________. This level contains a protective (4) ________________ layer.

Ozone forms when (5) ________________ is struck by ultraviolet radiation in the upper part of the stratosphere. The ozone forms a layer around Earth, which absorbs (6) _________________. Without ozone, you are more likely to get a sunburn or possibly skin cancer. The thinning of the ozone layer, called the (7) ________________, is worrisome because without ozone all organisms on Earth are subject to harm from too much radiation.

In your textbook, read about chlorofluorocarbons.

For each statement below, write true or false.

8. CFC is another name for a chlorofluorocarbon.
9. CFCs are made up of carbon, fluorine, and cesium.
10. All CFCs are synthetic chemicals.
11. CFCs usually react readily with other chemicals.
12. CFCs were developed as replacements for toxic refrigerants.
Section 1.2 Chemistry and Matter

*In your textbook, read about chemistry and matter.*

**Define each term.**

1. chemistry

   _______________________________________________________________________________________

2. matter

   _______________________________________________________________________________________

3. mass

   _______________________________________________________________________________________

**Write each term below under the correct heading. Use each term only once.**

<table>
<thead>
<tr>
<th>Made of Matter</th>
<th>Not Made of Matter</th>
</tr>
</thead>
<tbody>
<tr>
<td>air</td>
<td>10.</td>
</tr>
<tr>
<td>magnetic field</td>
<td>11.</td>
</tr>
<tr>
<td>car</td>
<td>12.</td>
</tr>
<tr>
<td>feeling</td>
<td>13.</td>
</tr>
<tr>
<td>heat</td>
<td>14.</td>
</tr>
<tr>
<td>human body</td>
<td>15.</td>
</tr>
<tr>
<td>light</td>
<td></td>
</tr>
<tr>
<td>radio</td>
<td></td>
</tr>
<tr>
<td>radio wave</td>
<td></td>
</tr>
<tr>
<td>flashlight</td>
<td></td>
</tr>
<tr>
<td>textbook</td>
<td></td>
</tr>
<tr>
<td>thought</td>
<td></td>
</tr>
</tbody>
</table>

**For each statement below, write true or false.**

16. The mass of an object can vary with the object’s location. __________

17. A mass measurement includes the effect of Earth’s gravitational pull on the object being measured. __________

18. Scientists measure the amount of matter in terms of mass. __________

19. Subtle differences in weight exist at different locations on Earth. __________

20. Your mass on the Moon would be smaller than your mass on Earth. __________
Section 1.2  continued

Identify each branch of chemistry described.

21. The study of the matter and processes of living things

22. The study of carbon-containing chemicals

23. The study of the components and composition of substances

24. The study of matter that does not contain organic chemicals

25. The study of the behavior and changes of matter and the related energy changes

For each branch of chemistry in Column A, write the letter of the item in Column B that pertains to that branch.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>26. Organic chemistry</td>
<td>a. the behavior and changes of matter and the related energy changes</td>
</tr>
<tr>
<td>27. Physical chemistry</td>
<td>b. in general, matter that does not contain carbon</td>
</tr>
<tr>
<td>28. Biochemistry</td>
<td>c. most carbon-containing chemicals</td>
</tr>
<tr>
<td>29. Analytical chemistry</td>
<td>d. matter and processes of living organisms</td>
</tr>
<tr>
<td>30. Inorganic chemistry</td>
<td>e. components and compositions of substances</td>
</tr>
</tbody>
</table>

Answer the following questions.

31. Compare the macroscopic world with the submicroscopic world.

32. Why are chemists interested in the submicroscopic description of matter?
Section 1.3 Scientific Methods

In your textbook, read about a systematic approach that scientists use.

Use the words below to complete the concept map. Write your answers in the spaces below the concept map.

<table>
<thead>
<tr>
<th>conclusions</th>
<th>experiments</th>
<th>hypothesis</th>
<th>scientific law</th>
<th>theory</th>
</tr>
</thead>
</table>

1. ____________________
2. ____________________
3. ____________________
4. ____________________
5. ____________________

For each item in Column A, write the letter of the matching item in Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Refers to physical characteristics such as color, odor, or shape</td>
<td>a. observation</td>
</tr>
<tr>
<td>7. Refers to mass, volume, and temperature measurements</td>
<td>b. qualitative data</td>
</tr>
<tr>
<td>8. A variable controlled by the experimenter</td>
<td>c. quantitative data</td>
</tr>
<tr>
<td>9. The act of gathering information</td>
<td>d. independent variable</td>
</tr>
<tr>
<td>10. Changes in value based on the value of the controlled variable</td>
<td>e. dependent variable</td>
</tr>
</tbody>
</table>
Section 1.3 continued

Circle the letter of the choice that best completes the statement.

11. A constant is a factor that  
   a. changes during an experiment. 
   b. changes from one lab group to another. 
   c. is affected by the dependent variable. 
   d. is not allowed to change during an experiment. 

12. A control is a  
   a. variable that changes during an experiment. 
   b. standard for comparison. 
   c. type of dependent variable. 
   d. type of experiment. 

13. A hypothesis is a(n)  
   a. set of controlled observations. 
   b. explanation supported by many experiments. 
   c. tentative explanation of observations. 
   d. law describing a relationship in nature. 

14. A theory is a(n)  
   a. set of controlled observations. 
   b. explanation supported by many experiments. 
   c. tentative explanation of observations. 
   d. law describing a relationship in nature. 

15. A model is a(n)  
   a. visual, verbal, and/or mathematical explanation of how things occur. 
   b. explanation that is supported by many experiments. 
   c. description of a relationship in nature. 
   d. tentative explanation about what has been observed. 

In the space at the left, write the word or phrase in parentheses that correctly completes the statement.

16. Molina and Rowland used a (model, scientific method) to learn about CFCs in the atmosphere.

17. Their hypothesis was that CFCs break down in the stratosphere due to interactions with (ultraviolet light, oxygen).

18. Molina and Rowland thought that these interactions produced a chemical that could break down (chlorine, ozone).

19. To test their (data, hypothesis), Molina and Rowland examined interactions that occur in the stratosphere.

20. Based on their data, Molina and Rowland developed a (hypothesis, model) that explained how CFCs destroy ozone.

21. Molina and Rowland concluded that (chlorine, radiation) formed by the breakdown of CFCs in the stratosphere reacts with ozone and destroys it.
Section 1.4 Scientific Research

In your textbook, read about types of scientific investigations.

For each description below, write A for applied research or P for pure research.

1. Is undertaken to solve a specific problem
   
2. Seeks to gain knowledge for the sake of knowledge itself
   
3. Is used to find CFC replacements
   
4. Was conducted by Molina and Rowland

In your textbook, read about students in the laboratory and the benefits of chemistry.

Answer the following questions.

5. When should you read the label on a chemical container?

____________________________________________________________________________________________
____________________________________________________________________________________________

6. What do scientists usually do when a scientific problem first arises?

____________________________________________________________________________________________
____________________________________________________________________________________________

7. What kinds of clothing should not be worn in the lab?

____________________________________________________________________________________________

8. What is technology?

____________________________________________________________________________________________
____________________________________________________________________________________________

9. Which type of research would you be more interested in working in—pure research or applied research? Why?

____________________________________________________________________________________________
____________________________________________________________________________________________
____________________________________________________________________________________________
____________________________________________________________________________________________
Analyzing Data

Section 2.1 Units and Measurement

In your textbook, read about SI units.

Complete the following table.

<table>
<thead>
<tr>
<th>SI Base Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity</td>
</tr>
<tr>
<td>1.</td>
</tr>
<tr>
<td>2. Mass</td>
</tr>
<tr>
<td>3.</td>
</tr>
<tr>
<td>4. Length</td>
</tr>
</tbody>
</table>

In your textbook, read about base units and derived units.

For each SI unit in Column A, write the letter of the matching item from Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. second</td>
<td>a. A platinum-iridium cylinder that is stored at constant temperature and humidity</td>
</tr>
<tr>
<td>6. meter</td>
<td>b. The microwave frequency given off by a cesium-133 atom</td>
</tr>
<tr>
<td>7. kilogram</td>
<td>c. A cube whose sides all measure exactly one meter</td>
</tr>
<tr>
<td>8. cubic meter</td>
<td>d. The distance that light travels through a vacuum in 1/299, 792, 458 second</td>
</tr>
</tbody>
</table>

9. Use Table 2.2 in your textbook to arrange the following prefixes in order from largest to smallest.

   centi- giga- kilo- mega- milli- nano- pico-

10. List the symbols and factors that the following prefixes represent.

   a. centi-
   b. kilo-
   c. milli-
Section 2.1  continued

Answer the following questions.

11. Which temperature scale will you use for your experiments in this class? Is this an SI unit?

12. How many grams are in a kilogram?

13. How many liters are in a megaliter?

14. How many centimeters are in a meter?

15. What is the difference between a base unit and a derived unit?

16. What is density?

17. Explain in terms of density why a grocery bag containing all canned goods is harder to lift than a grocery bag containing all paper goods.

18. How can you obtain an object’s volume if you know its density and its mass?

19. What is the three-part process for problem solving?

20. How are degrees Celsius converted to kelvins?
Section 2.2 Scientific Notation and Dimensional Analysis

In your textbook, read about scientific notation.

1. Circle the figures that are written in scientific notation.
   - \(1.61 \times 10^2\)
   - \(1.61 \times 10\)
   - \(161\ km\)
   - \(1.627\ \times 10^{-27}\ kg\)
   - \(9.109\ 39 \times 10^{-31}\ kg\)
   - \(2.8 \times 10^{-8}\)
   - \(1,380,000\)

2. Change the following data into scientific notation.
   - a. \(5,000,000\ \text{km}\)
   - b. \(8,394,000,000\ \text{s}\)
   - c. \(0.000421\ \text{g}\)
   - d. \(0.03\ \text{cm}\)

In your textbook, read about dimensional analysis.

Answer the following questions.

3. What is a conversion factor?
   __________________________________________________________________________________________
   __________________________________________________________________________________________

4. What is dimensional analysis?
   __________________________________________________________________________________________

Complete the following dimensional analysis problems.

5. Convert \(50\) kilograms into grams.
   
   \[
   50 \frac{\text{kg}}{1} \times 1000 \frac{\text{g}}{1} \times 1 \frac{1}{1} = 50,000 \frac{\text{g}}{1}
   \]

6. Convert \(5\) meters into centimeters.
   
   \[
   5 \frac{\text{m}}{1} \times 100 \frac{\text{cm}}{1} \times 1 \frac{1}{1} = 500 \frac{\text{cm}}{1}
   \]

7. Convert \(5\) liters into kiloliters.
   
   \[
   5 \frac{\text{L}}{1} \times 1 \frac{\text{KL}}{1000} \times 1 \frac{1}{1} = 0.0005 \frac{\text{KL}}{1}
   \]

8. Convert \(5\) centimeters into meters.
   
   \[
   5 \frac{\text{cm}}{1} \times 1 \frac{\text{m}}{100} \times 1 \frac{1}{1} = 0.05 \frac{\text{m}}{1}
   \]

9. Convert \(55\) kilometers per hour into meters per second. Use the conversion factor \(1\ \text{km} = 1000\ \text{m}.
   
   \[
   55 \frac{\text{km}}{1} \times 1000 \frac{\text{m}}{1} \times 1 \frac{1}{1} \times 1 \frac{1}{60} \times 1 \frac{1}{60} = 15 \frac{\text{m}}{1}
   \]
Section 2.3 Uncertainty in Data

In your textbook, read about accuracy and precision.

1. Use the terms precise and accurate to describe the following figures. You may use both terms for some figures. If a term does not apply to a figure, leave the space blank.

a. ____________________  b. ____________________  c. ____________________

Circle the letter of the choice that best completes the statement or answers the question.

2. The difference between an accepted value and an experimental value is called a(n)
   a. error.                  c. measured value.
   b. percent error.         d. precise measurement.

3. The ratio of an error to an accepted value is called a(n)
   a. accuracy-to-precision value.  c. percent error.
   b. accuracy.                 d. precision.

4. When you calculate percent error, you can ignore the
   a. accepted values.         c. experimental values.
   b. measured values.         d. plus and minus signs.

5. If two measurements are very close to each other, then they are
   a. accurate.                c. both accurate and precise.
   b. precise.                d. accepted values.

6. Which of the following is most likely to produce data that are not precise?
   a. a balance that is not set to zero
   b. not reading a graduated cylinder at eye level
   c. altering the procedure during an experiment
   d. making the same error with each trial
Section 2.3  continued

In your textbook, read about significant figures.

Use each of the terms below just once to complete the statements.

<table>
<thead>
<tr>
<th>counting numbers</th>
<th>estimated</th>
<th>non-zero</th>
<th>zeros</th>
</tr>
</thead>
<tbody>
<tr>
<td>scientific notation</td>
<td>significant figures</td>
<td>placeholders</td>
<td></td>
</tr>
</tbody>
</table>

7. The digits that are reported in an answer are called _______________________.

8. The numeral 9.66 has three significant figures, two known figures and one _______________________.

9. ______________________ numbers are always significant.

10. All final ______________________ to the right of the decimal place are significant.

11. Zeros that act as ______________________ are not significant.

12. ______________________ have an infinite number of significant figures.

13. When you convert to ______________________, you remove the placeholder zeros.

In your textbook, read about rounding off numbers.

14. Round the following to four significant figures.
   a. 12.555 km ______  
   b. 1.0009 __________
   c. 99.999 ______
   d. 23.342999 ______

15. Round 12.783456 to the requested number of significant figures.
   a. 2 significant figures ______________
   b. 5 significant figures ______________
   c. 6 significant figures ______________
   d. 7 significant figures ______________

16. Round 120.752416 to the requested number of significant figures.
   a. 3 significant figures ______________
   b. 4 significant figures ______________
   c. 5 significant figures ______________
   d. 7 significant figures ______________

17. Complete the following calculations. Round off the answers to the correct number of significant figures.
   a. 51.2 kg + 64.44 kg ______________
   b. 6.435 cm – 2.18 cm ______________
   c. 16 m × 2.82 m × 0.05 m ____________
   d. 3.46 m/1.82 s ______________
Section 2.4 Representing Data

In your textbook, read about graphing.

Label each kind of graph shown.

1. Sources of Chlorine in the Stratosphere


Answer the following questions about the graphs.

3. What percent of the sources of chlorine in the stratosphere are CFCs? ________________________________

4. During which month of the year does Jacksonville usually get the most precipitation? The least? ________________________________________

In your textbook, read about line graphs.

Sequence the following steps. Write 1 beside the first step in plotting a line graph. Write 2 beside the second step, and so on.

5. Give the graph a title.

6. Choose the ranges for the axes.

7. Identify the independent and dependent variables.

8. Plot the data points.

9. Determine the range of the data that needs to be plotted for each axis.

10. Draw the “best fit” line for the data.

11. Number and label each axis.