Chemistry Semester 1 Exam Study Guide

Name: __________
Date:_____ Hr:____

How do I Study For My Chemistry Exam?

Below are some tips that you can use to help guide your studying.

- Read the Exam Study Guide (THIS DOCUMENT!)
    - Read through each learning target. Do you understand what it says? In other words, can you explain what it means using your own words and provide examples?

    - Look through each of the worksheets listed in the resources section, identify how they tie into the learning targets listed in the study guide.
        - What problems did you get wrong, which ones were challenging?
            - Redo those problems on a different sheet of paper, and study these probs
        - Which problems directly tie to one of the learning targets?
            - Redo those problems on a different sheet of paper, and study these probs
- Look through your old tests, quizzes, and labs
        - Which problems were challenging? Which problems did you get wrong?
            - Redo those problems on a different sheet of paper, and study these probs

It is important that you work through old problems. It is very easy to look at an old problem and think that you remember how to do it. This can give you a false sense of understanding.

Do a little studying at a time. Don't set apart one night to do all of your studying for chemistry.

Mr. Klaver and Mr. Cook are available most days after school if you need extra assistance reviewing.

There is an All School Tutorial on a Saturday from 8am-12pm in the CHS Media Center. Mr Klaver and/or Mr. Cook will be there to help answer questions while you are studying.

Unit 1 Physical Properties of Matter

1. Define mass as the measure of atomic "stuff"; contrast with volume - the amount of space an object occupies.

2. When taking measurements, read the instrument being used to the correct estimated place value. When using measurements in calculations, express a final answer to the correct number of significant figures.

3. ~~Represent class data using a histogram; use the histogram to interpret trends in the data.~~

4. Develop, from experimental evidence, the law of conservation of system mass.

5. Relate the volume of a container (in cm^3) to the volume of liquid it contains (in mL).

6. Recognize that instruments have a limit to their precision; relate the data recorded to the quality of the measurement.

7. Given a graph of mass vs. volume of a various substances, relate the slope to the density of the substances.

8. Recognize that density is a characteristic property of matter (i.e., it can be used to help identify an unknown substance).

9. Use density as a conversion factor between mass and volume; apply this to quantitative problems.

10. Use differences in density of solids, liquids and gases as evidence for differences in the structure of matter in these phases.

Resources

- Mass change lab - stations demonstrating the conservation of mass, definition of a system
- Unit 1 WS 1 - particle diagrams demonstration conservation of mass
- Unit 1 WS 2 - reading scales, significant figures
- Mass and Volume lab - calculating density
- Unit 1 WS 3 - particle diagrams representing density, interpreting density on a graph
- Unit 1 WS 4 - interpretation of mass vs volume lab
- Density of a Gas lab - calculating the density of gas given off by Alka Seltzer
- Dimensional Analysis WS - practicing dimensional analysis, significant figures
- Unit 1 Study Guide

Unit 2 Gas Laws

1. Recognize that the model of matter that we use during this unit is essentially that proposed by Democritus.

2. Relate observations of diffusion to particle motion and collision in both liquid and gas phases.

3. Relate observations regarding the addition of energy by warming to increased particle motion.

4. Explain, at the particle level, how a thermometer measures the temperature of the system.

5. Explain the basis for the Celsius temperature scale.

6. State the basic tenets of Kinetic Molecular Theory (KMT) as they relate to gases:

   Particles of a gas:
   *are in constant motion, moving in straight lines until they collide with another particle or a wall of the container in which they are enclosed.
   *experience elastic collisions; i.e., they do not eventually "run down".
   do not stick to other particles.
   *The speed of the particles is related to their temperature.
   *The pressure of a gas is related to the frequency and impact of the collisions of the gas particles with the sides of the container in which they are enclosed.

7. The 3 variables P, V and T are interrelated. Any factor that affects the number of collisions has an effect on the pressure. You should be able to:

   Predict the effect of changing P, V or T on any of the other variables.

8. Explain (in terms of the collisions of particles) why the change has the effect you predicted.

9. Explain the basis for the Kelvin scale. Keep in mind that one must use the absolute temperature scale to solve gas problems.

10. Use factors to calculate the new P, V or T. Make a decision as to how the change affects the variable you are looking for.

Resources

- Eureka Videos 1-5
- Diffusion of Gases Demonstration- describe the movement of gas particles from scented spray
- Food coloring diffusing through hot and cold water - how temperature relates to particle movement
- Build a thermometer - thermal expansion of liquids
- PVT lab - identify relationships between P, V, and T
- Unit 2 WS 1 - movement of particles, celsius temperature scale
- Unit 2 WS 2 - Manometers, barometer, air pressure
- Unit 2 WS 3 - IFE tables for PVTn changes
- Mixed Gas Law problems - more practice with PVTn problems.

Unit 3 Energy Changes and States of Matter

1. Be able to cite evidence that the addition of energy by warming causes an increase in particle motion.

2. Describe the characteristics of solids, liquids and gases in terms of particles and their:

   Arrangement: use particle diagrams to account for motion and density differences; describe the process of how the arrangement of matter particles changes during phase changes.

   Attraction: infer the necessity of an attractive force between particles at close range from observations of differences in cohesiveness of the three phases; in other words, particles in solids and liquids must be attracting each other. Bonds in a solid and liquid at the same temp have different strengths.

   Behavior: describe and contrast particle motion in the three phases singly, and during phase changes.

3. Recognize energy as a conserved, substance-like quantity that is always involved when a system undergoes change.

4. Recognize that energy is stored in an object or system in several ways; for now we restrict our discussion to:

   Thermal – due to the motion of the particles. The thermal energy depends on the mass and the velocity of the particles. The temperature of a system is a measure of its thermal energy.

   Phase – due to the arrangement of the particles in solid, liquid and gaseous phases. Attractions lower the energy of a system; therefore, solids have the lowest phase energy because the particles are bound most tightly, liquids have greater energy because they have more freedom of motion, and gases have the greatest amount of energy because the particles have overcome the attractions that hold solids and liquids together.

5. Describe the ways that energy is transferred between the system and the surroundings. These are:

   Heating – transfer of energy through the collisions of particles

   Working – transfer of energy when macroscopic objects exert forces on each other

   Radiating – transfer of energy by the emission or absorption of "light"

6. Draw energy bar graphs to account for energy storage and transfer in all sorts of changes. Make up a sample situation and sketch the bar graph. (These graphs may also be known as "LOL" diagrams)

7. Given a heating/cooling curve for a substance, identify what phase(s) is/are present in the various portions of the curve, and what the melting and freezing temperatures for the substance are.

8. Given a heating/cooling curve for a substance, identify which energy storage mode (E_{th}, E_{ph}, E_{ch}) is changing for the various portions of the curve.

9. Given a situation in which a substance at a given temperature undergoes a change (in temperature, phase or both), sketch a heating/cooling curve that represents the situation.

10. State the physical meaning of the heat of fusion (H_f) and heat of vaporization (H_v) for a given substance and use these factors to relate the mass of a substance to the energy absorbed or released during a phase change (at the melting or boiling temperature). In other words, can you calculate the energy change for a given phase change for a certain mass of a substance?

11. State the physical meaning of the specific heat capacity (c) of a substance and use this factor to relate the mass and temperature changes to the energy absorbed or released during a change in temperature (with no phase change). In other words, can you calculate the energy change that occurs as a known amount of substance warms up or cools down?

Resources
- Icy Hot Lab - Creation of heat curve, thermal and phase energy changes during heat curve
- Energy Reading Guide
- Unit 3 WS 1 - LOL diagrams
- Unit 3 WS 2 - LOL diagrams
- Unit 3 WS 3 - Quantitative energy calculations
- Unit 4 WS 4 - Quantitative energy calculations
- Unit 3 Review

Unit 4 - Describing Substances - Mixtures and Compounds

1. Distinguish between pure substances and mixtures
    *A pure substance has a definite set of characteristic properties (density, mp, bp), whereas a mixture exhibits various properties that come from the substances they contain.
    *A pure substance is composed of one kind of particle, whereas mixtures contain more than one kind of particle.

2. Describe how one could use differences in characteristic properties to separate the components of a given mixture.

3. Sketch particle diagrams that distinguish compounds, elements and mixtures

4. Distinguish elements from compounds in terms of differences in their properties. Be able to define “element,” and “compound.”

5. Cite the evidence that supports the belief that some pure substances are “compounded” of simpler particles in a definite ratio.

6. Cite evidence for Avogadro’s Hypothesis. Use this with evidence from combining volumes to deduce the formulas of some compounds.

7. State features of Dalton’s model of the atom; use composition by mass data to account for the laws of definite and multiple proportions.

Resources
- Mixtures of Sulfur, Iron, Iron sulfide - differences between mixtures and compounds
- Electrolysis of water lab - proof of compounds, definite proportions
- Unit 4 WS 1 - separation techniques, particle diagrams of elements, compounds, mixtures
- Unit 4 WS 2 - Avogadro’s hypothesis
- Unit 4 WS 3 - mass ratios, deriving proportions of elements in a compound
- Unit 4 WS 4 - percent composition of compounds
- Dalton Reading - Dalton’s atomic theory

Unit 5 Counting Particles

1. Be able to determine relative mass of an object.
2. Be able to determine the number of objects in a collection by massing them, not counting them.
3. Determine molar mass and percent composition from a formula.
4. Be able to interconvert between mass, moles, and number of particles.
5. From percent composition data, determine empirical formula and molecular formula.

Resources:

- Relative Mass Activity
- WS: Scoops, Lumps, Moles
- WS 1: Relative mass, and molar masses
- WS 2: Mole conversions
- Mole Mania Activity
- WS 3: Empirical and Molecular formulas