HOLT MODERN CHEMISTRY -- CHAPTER 2 REVIEW

The following pages contain the bulk (but not all) of the information for the chapter 2 test. Focus on this content, but make sure to review class notes, activities, handouts, questions, etc. If you study this document and NOTHING else, you should at least be able to PASS the test. ***** Test items will be <u>recall</u>, <u>examples</u>, and/or <u>application</u> of this content. ****

OUTCOMES

- 2.1: Describe the scientific method process. (T & R)
- 2.2: Measure length, volume, mass, and time using metric units. (1 mL = 1 cm³ & 1 L = 1 dm³) (T & R)
- 2.2: Use volume and mass to determine density; compare relative densities of solids, liquids, gases; compare relative densities of pure liquids and solutions. (F & PK)
- 2.2: Use density to identify substances in activities involving collection of data and precision and accuracy in measurements. (F & PK)
- 2.3: Distinguish between precision and accuracy. (T & R)
- 2.3: Determine and perform calculations using significant figures. (F & PK)
- 2.3: Convert from numbers to scientific notation and reverse. (F & PK)

2.1 SCIENTIFIC METHOD

- Vocabulary
 - **scientific method** -- a series of steps followed to solve problems, including collecting data, formulating a hypothesis, testing the hypothesis, and stating conclusions
 - system -- a set of particles or interacting components considered to be a distinct physical entity for the purpose of study
 - hypothesis -- an explanation that is based on prior scientific research or observations and that can be tested
 - **model** -- a pattern, plan, representation, or description designed to show the structure or workings of an object, system, or concept
 - **theory** -- an explanation for some phenomenon that is based on observation, experimentation, and reasoning

• Chapter Highlights

- The scientific method is a logical approach to solving problems that lend themselves to investigation.
- A hypothesis is a testable statement that serves as the basis for predictions and further experiments. It is usually written as an if/then statement.
- A theory is a broad generalization that explains a body of known facts or phenomena.
- Communication is a very important aspect of all parts of the scientific method, including successful and/or unsuccessful results.

2.2 UNITS OF MEASUREMENT

• Vocabulary

- o quantity -- something that has magnitude, size, or amount
- SI -- Le Systeme International d'Unites, or the International System of Units, which is the measurement system that is accepted worldwide
- **weight** -- a measure of the gravitational force exerted on an object; its value can change with the location of the object in the universe
- o **derived unit** -- a unit of measure that is a combination of other measurements
- o **volume** -- a measure of the size of a body or region in three-dimensional space
- density -- the ratio of the mass of a substance to the volume of the substance; often expressed as grams per cubic centimeter for solids and liquids and as grams per liter for gases
- **conversion factor** -- a ratio that is derived from the equality of two different units and that can be used to convert from one unit to the other
- o dimensional analysis -- a mathematical technique for studying dimensions of physical quantities

Chapter Highlights

- The result of nearly every measurement is a number and a unit.
- The SI system of measurement is used in science. It has seven base units: the meter (length), kilogram (mass), second (time), kelvin (temperature), mole (amount of substance), ampere (electric current), and candela (luminous intensity).
- Weight is a measure of the gravitational pull on matter.
- o Derived SI units include the square meter (area) and the cubic meter (volume).
- Density is the ratio of mass to volume.
- Conversion factors are used to convert from one unit to another.

2.3 USING SCIENTIFIC MEASUREMENTS

Vocabulary

- accuracy -- a description of how close a measurement is to the true value of the quantity measured
- o **precision** -- the exactness of a measurement
- **percentage error** -- a figure that is calculated by subtracting the accepted value from the experimental value, dividing the difference by the accepted value, and then multiplying by 100
- **significant figure** -- a prescribed decimal place that determines the amount of rounding off to be done based on the precision of the measurement
- **scientific notation** -- a method of expressing a quantity as a number multiplied by 10 to the appropriate power
- o directly proportional -- the relationship between two variables whose ratio is a constant value
- **inversely proportional** -- the relationship between two variables whose product is constant

• Chapter Highlights

- Accuracy refers to the closeness of a measurement to the correct or accepted value. Precision refers to the closeness of values for a set of measurements.
- Percentage error is the difference between the experimental and the accepted value that is divided by the accepted value and then multiplied by 100.
- The significant figures in a number consist of all digits known with certainty plus one final digit, which is uncertain.
 - Significant Figures RULES
 - Every nonzero digit is significant.
 - Zeros between nonzero digits are significant.
 - If there is no decimal point, zeros that follow the last nonzero digit are not significant.
 - Zeros appearing in front of the first nonzero digit are not significant.
 - If there is a decimal point, zeros that follow the last nonzero digit are significant.
 - When measurements are multiplied or divided, the result must be rounded to the same number of significant figures that the measurement with the *smallest* number of significant figures has.
- Exact conversion factors are completely certain and do not limit the number of digits in a calculation.
- A number written in scientific notation is of the form $M \times 10^n$, in which M is greater than or equal to 1 but less than 10 and *n* is an integer.
 - Scientific Notation RULEŠ
 - 1 nonzero number in front of the decimal
 - Always x 10?
 - Will have + or exponent
 - + exponent = large number
 - exponent = decimal number
- Two quantities are directly proportional to each other if dividing one by the other yields a constant value.
 - The graph shows a straight line.
- Two quantities are inversely proportional to each other if their product has a constant value.
 - The graph shows a curved line.

