Chemistry 161 section -02 Winter '19

Unit 1

Study technique recommendations:

- Check the outcomes for the class ahead of time.
- Skim the text sections before class, paying close attention to bold print vocabulary terms, and the figures. This should take no more than 20 minutes and should prepare you for daily quizzes.
- Read the assigned text sections as soon as possible after class.
- Compare the outcomes to your class notes, taking care to review material not covered in class.
- Learn actively by explaining concepts and relationships to someone else.
- Learn collaboratively by solving recommended exercises in a study group.

Part of Chapter 3 (sections 3.3, 3.4, and 3.5) will be taught in Unit 2. A small amount of material from Chapter 4 will be included in Unit 1 to support our laboratory learning.

1/7 Laboratory (CC1-330):

- Safety goggles are required. Please purchase them and bring them to lab; they may be provided for those who need them for this session only. Long pants and closed-toe shoes are required.
- The entire lab manual, including experiments and supplements will only be on Canvas.
- Lab will begin with a safety and waste handling discussion. A signature form (either electronic, or paper if under 18 years of age) will be completed to attest that you have read, understood, and will adhere to the Laboratory Safety Protocol (lab manual, pp. 5 – 6).
- You will carry out **"**An Introduction to the Visible Spectrophotometer**"** from the lab manual, page 26.
- The Prelaboratory Assignment (page 34) is due at the start of lab; late submissions are accepted, with a small deduction, for this lab only.
- The written report pages from the lab manual are due at the start of class the second class session after your lab (due 1/11). We normally review the report the first class after lab.

1/9 Outcomes:

1. (Material in sections 1.1 through 1.7 are assumed to have been covered in your prerequisite course: these outcomes below* should be reviewed on your own. Notes are on Canvas.)
2. To know the procedures, outcomes, and expectations for success in this course.
3. *To use vocabulary by which pure substances are described: atom, element, molecule, compound, composition, chemical formula, and that a molecule *has a definable boundary (not in book)*.
4. *To review definitions of physical and chemical properties and changes and what a reaction is.
5. To describe a chemical bond in terms of structure and energy.
6. *To use the vocabulary by which mixtures are described: heterogeneous, homogeneous, solution.
7. *To give examples of the physical process of separation.
8. *To review and describe changes between states of matter.
9. *To think critically about a structured process of problem-solving using the example of density.
10. *To have an overview of the scientific method and the specific role of a hypothesis.
11. *To know and use units of mass, length, time, the abbreviations g, m, s, the metric prefixes k, c, m, μ and n, and how to combine prefixes with measurements.
12. *To be able to convert between powers of 10 with ease in your head and with a calculator.
13. To learn the source of "uncertainty" in measured quantities, and to relate examples both from personal experience and laboratory measurements.
14. To know the difference between exact numbers (integers, definitions) and measurement-based numbers that contain uncertainty.
15. To review key aspects of lab.

Assignments (see next page):

Read §1.1 through 1.8 (Reading quizzes start 1/11.)
Recommended exercises: From the above sections, all in-chapter Sample and Practice Exercises, and select chapter-end Questions and Problems.

1/11 Outcomes:

1. To assign and communicate uncertainty using absolute and relative "errors", confidence intervals, and know when you are communicating accuracy vs. precision.
2. To grasp how "significant figures" are a useful short-cut for communication of uncertainty.
3. To use uncertainties to assign significant figures and use significant figures in calculations and communications.
4. To build and use conversion factors from definitions and measurement-based values, and use units as algebraic quantities; to think critically about choosing equations or conversion factors for problem-solving.
5. To be able to convert among F, C, and K temperature scales using equations.
6. To prepare for lab on 1/14.

Assignments:

Read §1.8 through 1.10; lab manual Appendix pp. 10 – 19.
Lab report due: pages 28 - 32 from lab manual.
Reading quiz on bold print vocabulary terms in sections 1.8 through 1.10.
Recommended exercises: From the above sections, all in-chapter Sample and Practice Exercises, and select chapter-end Questions and Problems.

1/14 Laboratory: "Measurement and Error…" (p. 35)

Safety goggles and proper attire (closed-toe shoes, long pants and socks covering skin) are required.
Prelaboratory assignment (p.47) due at start of lab; report is due at the start of class on 1/18.

1/16 Outcomes:

1. To review key aspects of lab.
2. To review the Law of Conservation of Mass and understand how it applies to chemical changes.
3. To know the three principal types of sub-atomic particles, their charges, and the three principal types of radioactivity (alpha, beta, gamma particles).
4. To know details of experiments that led to the hypothesis and evidence for the electron, the nucleus, the proton, and the neutron, and the modern understanding of the nuclear atom's structure.
5. To know the number of protons in an atom determines what element it is and defines its atomic number (Z).
6. To know how and why an atom differs from an ion and how ions are symbolized.
7. To know that neutrons determine what isotope of an element an atom is, and the definition of mass number (A). To use isotope notation when necessary to communicate this.
8. To know the modern technique by which mass numbers are determined, and to use atomic mass units.
9. To understand the differences among the mass number, the actual mass of one atom, and the average of all isotopes of an element (average atomic mass).
10. To know the information available in the Periodic Table of the Elements and the nomenclature of its organization: periods, groups, blocks, and metals vs. nonmetals.
11. To know four specific groups by name: alkali metals, alkaline earth metals, halogens, inert gases.
12. To understand and use the Periodic Table group to determine monatomic ion charges.
13. To appreciate the historical implications of the laws of definite composition and multiple proportions, Dalton's Atomic Theory, and how the Law of Combining Volumes led to the concept of molecules.
14. To know that ionic compounds are made from numbers of ions in ratios giving charge balance, and to recognize ionic compounds from their chemical formulas.

15. To know how molecules differ from ionic compounds and from other types of covalent compounds.
16. To use and contrast the terms molecular formula, empirical formula, and formula unit.
17. To review *vocabulary of solutions and describe differences between molecular and ionic solutes.

Assignments:

Read §2.1 through 2.5, 4.1. Reading quiz on bold print vocabulary terms in these sections.
Recommended exercises: From the above sections, all in-chapter Sample and Practice Exercises, and select chapter-end Questions and Problems.
Graded Homework exercises due <u>at start of class</u>: Chapter 1 (pp 36 – 39) #26, 28, 48, 50, 56 (show work), 68 (show work), 90b, d (show).

1/18 Outcomes:

1. To give names from formulas, and determine formulas from names for binary molecular compounds, binary ionic compounds, and ionic compounds of polyatomic ions.
2. To know from memory the polyatomic ions ammonium, acetate, nitrate, hydroxide, carbonate, sulfate, and phosphate, and relate these to the acids that they may come from.
3. To use chemical symbols and drawings to communicate chemical changes described in reaction equations.
4. To define and use the mole as a counting unit.
5. To describe how Avogadro's number conveniently accomplishes counting by weighing.
6. To calculate formula masses for molecular and ionic compounds.
7. To convert between mass of a substance and number of molecules or formula units.
8. To convert among molecules (or formula units), moles, and masses with ease.
9. To identify moles of an atom in a mole of a substance.
10. To interpret and communicate information from chemical equations on a mole basis and on a molecular basis.

Assignments:

Measurement and Error Lab report (pp.41 – 46) due at start of class.
Read §2.6, 3.1, 3.2. Reading quiz on these sections.
Recommended exercises: From the above sections, all in-chapter Sample and Practice Exercises, and select chapter-end Questions and Problems.

1/21: Holiday

(No classes or laboratories.)

1/23 Outcomes:

(Please note that sections 3.3, 3.4, and 3.5 will be covered in Unit 2.)

1. To determine percent composition of pure substances from chemical formulas.
2. To find moles of an atom in a sample of a substance and use this skill to determine percent composition.
3. To use percent composition data to obtain empirical formulas and apply this to the process of combustion analysis.
4. To compare empirical formulas to molecular masses to determine molecular formulas.
5. To express solution concentrations in units of g/L, mg/L, ppm, and molarity, and convert between these units.
6. To perform dilution calculations in any unit system.
7. To review procedures practiced in lab relating transmittance, absorbance and concentration through Beer's Law.

Assignments:

Read §3.6, 3.7, 3.8, 4.2, 4.3. Reading Quiz on these sections.

Recommended exercises: From the above sections, all in-chapter Sample and Practice Exercises, and select chapter-end Questions and Problems.

1/25:

Group Sheet 1 (performed and due in class before the start of the exam)

Success on an hour exam!

Content from the above learning outcomes and pertinent content from lab.

Pick up Unit 2

Please note that since this is an exam date, there will not be time allocated for lab preparation for 1/28. Check Canvas for an announcement about supporting material.