**Honors Chemistry II Unit 3 Tentative Agenda** Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Periodicity & Coordination Compounds

| **Date** | **Agenda** |
| --- | --- |
| Monday 9/30 | * Go over Unit 2 Test |
| Tuesday 10/1 | * Begin Periodicity Notes (Chapter 7) * HW:   + Read Chapter 7   + Mastering Chemistry 1-20 |
| Wednesday 10/2 | * Finish Periodicity Notes (Chapter 7)   + Demonstrate alkali metal-water reactions   + Demonstrate Gummy Bear?   + Videos (We will probably not watch all of these in class)     - Alkali Metals       * <http://www.youtube.com/watch?v=uixxJtJPVXk>     - Alkaline Earth Metals       * <http://www.youtube.com/watch?v=DFQPnHkQlZM>     - Transition metals       * Aqueous Colors: <https://www.youtube.com/watch?v=XE5wJ0ErUj8>       * Colorful Solutions: <https://www.youtube.com/watch?v=ea6p_AU5Dic>       * Lead Balloon: <http://www.youtube.com/watch?v=HZSkM-QEeUg>     - Inner Transition Metals       * Neodynium: <http://www.youtube.com/watch?v=ClkP-QwIOAQ>       * Plutonium: <http://www.youtube.com/watch?v=89UNPdNtOoE>     - Crys­tallo­gens (Carbon Group)       * Carbon Allotropes: <http://www.youtube.com/watch?v=sUqr6Uk29Z8>     - Pnicto­gens (Nitrogen Group)       * Nitrogen Allotropes: <http://www.youtube.com/watch?v=ZWw-jK7XpCo>     - Chalcogens (Oxygen Group)       * Oxygen:       * Sulfur not reacting: <http://www.youtube.com/watch?v=41hqqAdxQ7s>       * Sulfur reacting: <http://www.youtube.com/watch?v=5HtNCdz8X3g>     - Halogens:       * Halogen Reactions: <http://www.youtube.com/watch?v=u2ogMUDBaf4>       * Halogen Displacements: <http://www.youtube.com/watch?v=cbFCWFksYoM>       * Sulfur hexafluoride: <http://www.youtube.com/watch?v=NlJZTTghrDI>     - Noble Gases       * Density: <http://www.youtube.com/watch?v=QLrofyj6a2s>     - Hindenburg (H2 gas and Iron Oxide/Al paint): <http://www.youtube.com/watch?v=CgWHbpMVQ1U> * HW:   + Read 8.1-8.2   + Read Chapter 22     - Take notes from CH 22 PowerPoint or from book, finish by Thursday.   + Mastering Chemistry 20-38 |
| Thursday 10/3 | * Chapter 7 Quiz (Periodicity) * Ionic bonding (CH 8.1-8.2) Notes * Hint of the day: What is the simplest/original definition of oxidation? * HW:   + Finish taking notes from CH 22 PowerPoint or from book.   + Mastering Chemistry 39-48 |
| Friday 10/4 | * Go over CH 22 PowerPoint (The point of this is to build awareness so the focus is on tying the reactions and properties presented to things we already know. Much of this information may seem trivial; however, the reactions highlighted in this section are common and have the possibility of appearing on tests and the AP exam.) * Hint of the day: What happens when hydrogen carbonate is made as a byproduct of a double replacement reaction? * Begin CH 23 Notes (Coordination compounds) * HW:   + Mastering Chemistry 49-66   + Read 12.3-12.4, 12.7 (Focus on substitutional vs. interstitial and electron sea model. Understand that there are different packing arrangements. Understand Si-P doping.) |
| Monday 10/7 | * Finish CH 23 Notes (Coordination compounds)   + Look at geometry with gumdrops & toothpicks. * Hint of the day: Review VSEPR * HW:   + Prelab An Activity Series   + Mastering Chemistry 67-93 (Complete by due date)   + Helpful website for practicing naming (not graded): <http://www.chemistry.wustl.edu/~edudev/LabTutorials/naming_coord_comp.html>   + If we don’t finish notes in class, access CH 23 ppt on mastering chemistry website and finish taking notes. |
| Tuesday 10/8 | * Finish CH 23 Notes (Coordination compounds) if needed. * Hint of the day: Review Half-Life * Lab 20: An Activity Series * Lab 15: Synthesis of a Coordination Compound |
| Wednesday 10/9 | * Chapter 23 Quiz (Coordination Compounds) * Hint of the day: Review Stoichiometry * Lab 20: An Activity Series * Lab 15: Synthesis of a Coordination Compound |
| Thursday 10/10 | * Lab 20: An Activity Series * Lab 15: Synthesis of a Coordination Compound * Hint of the day: Review Catalysts (how to identify and function) * Mastering Chemistry (in class work & question day) |
| Friday 10/11 | * Unit 3 Review * Hint of the day: Review Combustion Reactions * Mastering Chemistry Unit 3 Assignment due 11:59PM   + Adaptive Follow-up counts as extra credit and is due 48 hours after original assignment is due. |
| Monday 10/14 | * Unit 3 Test |
| Tuesday 10/15 | * Go over Unit 3 Test * Start next unit |

**Periodicity**

**Learning Objectives for EK 1.C.1:**

LO 1.9 The student is able to predict and/or justify trends in atomic properties based on location on the periodic table and/or the shell model. [See SP 6.4]

LO 1.10 Students can justify with evidence the arrangement of the periodic table and can apply periodic properties to chemical reactivity. [See SP 6.1]

LO 1.11 The student can analyze data, based on periodicity and the properties of binary compounds, to identify patterns and generate hypotheses related to the molecular design of compounds for which data are not supplied. [See SP 3.1, 5.1]

Enduring understanding 1.C: Elements display periodicity in their properties when the elements are organized according to increasing atomic number. This periodicity can be explained by the regular variations that occur in the electronic structures of atoms. Periodicity is a useful principle for understanding properties and predicting trends in properties. Its modern-day uses range from examining the composition of materials to generating ideas for designing new materials. Although a simple shell model is not the currently accepted best model of atomic structure, it is an extremely useful model that can be used qualitatively to explain and/or predict many atomic properties and trends in atomic properties. In particular, the arrangement of electrons into shells and subshells is reflected in the structure of the periodic table and in the periodicity of many atomic properties. Many of these trends in atomic properties are important for understanding the properties of molecules, and in being able to explain how the structure of the constituent molecules or atoms relates to the macroscopic properties of materials. Students should be aware that the shells reflect the quantization inherent in quantum mechanics and that the labels given to the atomic orbitals are examples of the quantum numbers used to label the resulting quantized states. Being aware of the quantum mechanical model as the currently accepted best model for the atom is important for scientific literacy.

Essential knowledge 1.C.1: Many properties of atoms exhibit periodic trends that are reflective of the periodicity of electronic structure.

a. The structure of the periodic table is a consequence of the pattern of electron configurations and the presence of shells (and subshells) of electrons in atoms.

b. Ignoring the few exceptions, the electron configuration for an atom can be deduced from the element’s position in the periodic table.

✘✘Memorization of exceptions to the Aufbau principle is beyond the scope of this course and the AP Exam.

Rationale: The mere rote recall of the exceptions does not match the goals of the curriculum revision. If given an exception on the AP Exam, students will be responsible for providing possible reasons for the exceptions based on theory.

c. For many atomic properties, trends within the periodic table (and relative values for different atoms and ions) can be qualitatively understood and explained using Coulomb’s law, the shell model, and the concept of shielding/effective nuclear charge. These properties include:

1. First ionization energy

2. Atomic and ionic radii

3. Electronegativity

4. Typical ionic charges

d. Periodicity is a useful tool when designing new molecules or materials, since replacing an element of one group with another of the same group may lead to a new substance with similar properties. For instance, since SiO2 can be a ceramic, SnO2 may be as well.

**Attractions**

**Learning Objective for EK 2.B.2:**

LO 2.14 The student is able to apply Coulomb’s law qualitatively (including using representations) to describe the interactions of ions, and the attractions between ions and solvents to explain the factors that contribute to the solubility of ionic compounds. [See SP 1.4, 6.4]

**Bonding**

**Learning Objective for EU 2.C:**

LO 2.17 The student can predict the type of bonding present between two atoms in a binary compound based on position in the periodic table and the electronegativity of the elements. [See SP 6.4]

Enduring understanding 2.C: The strong electrostatic forces of attraction holding atoms together in a unit are called chemical bonds.

Covalent bonds, ionic bonds, and metallic bonds are distinct from (and significantly stronger than) typical intermolecular interactions. Electronegativity can be used to reason about the type of bonding present between two atoms. Covalent chemical bonds can be modeled as the sharing of one or more pairs of valence electrons between two atoms in a molecule. The extent to which this sharing is unequal can be predicted from the relative electronegativities of the atoms involved; the relative electronegativities can generally be understood through application of the shell model and Coulomb’s law. The Lewis structure model, combined with valence shell electron pair repulsion (VSEPR), can be used to predict many structural features of covalently bonded molecules and ions. Ionic bonding is the phrase used to describe the strong Coulombic interaction between ions in an ionic substance. The bonding in metals is characterized by delocalization of valence electrons.

**Ionic Bonding**

**Learning Objective for EK 2.C.2:**

LO 2.19 The student can create visual representations of ionic substances that connect the microscopic structure to macroscopic properties, and/or use representations to connect the microscopic structure to macroscopic properties (e.g., boiling point, solubility, hardness, brittleness, low volatility, lack of malleability, ductility, or conductivity). [See SP 1.1, 1.4, 7.1, connects to 2.D.1, 2.D.2]

Essential knowledge 2.C.2: Ionic bonding results from the net attraction between oppositely charged ions, closely packed together in a crystal lattice.

a. The cations and anions in an ionic crystal are arranged in a systematic, periodic 3-D array that maximizes the attractive forces among cations and anions while minimizing the repulsive forces.

✘✘Knowledge of specific types of crystal structures is beyond the scope of this course and the AP Exam.

Rationale: The study of crystal structures does not strengthen understanding of the big ideas.

b. Coulomb’s law describes the force of attraction between the cations and anions in an ionic crystal.

1. Because the force is proportional to the charge on each ion, larger charges lead to stronger interactions.

2. Because the force is inversely proportional to the square of the distance between the centers of the ions (nuclei), smaller ions lead to stronger interactions.

**Metallic Bonding**

**Learning Objective for EK 2.C.3:**

LO 2.20 The student is able to explain how a bonding model involving delocalized electrons is consistent with macroscopic properties of metals (e.g., conductivity, malleability, ductility, and low volatility) and the shell model of the atom. [See SP 6.2, 7.1, connects to 2.D.2]

Essential knowledge 2.C.3: Metallic bonding describes an array of positively charged metal cores surrounded by a sea of mobile valence electrons.

a. The valence electrons from the metal atoms are considered to be delocalized and not associated with any individual atom.

b. Metallic bonding can be represented as an array of positive metal ions with valence electrons drawn among them, as if the electrons were moving (i.e., a sea of electrons).

c. The electron sea model can be used to explain several properties of metals, including electrical conductivity, malleability, ductility, and low volatility.

d. The number of valence electrons involved in metallic bonding, via the shell model, can be used to understand patterns in these properties, and can be related to the shell model to reinforce the connections between metallic bonding and other forms of bonding.

**Bond Types based on properties**

**Learning Objective for EU 2.D:**

LO 2.22 The student is able to design or evaluate a plan to collect and/or interpret data needed to deduce the type of bonding in a sample of a solid. [See SP 4.2, 6.4]

Enduring understanding 2.D: The type of bonding in the solid state can be deduced from the properties of the solid state.

In solids, the properties of the material reflect the nature and strength of the interactions between the constituent particles. For this reason, the type of bonding that predominates in a solid material, and the nature of the interactions between the particles comprising the solid, can generally be inferred from the observed macroscopic properties of the material. Properties such as vapor pressure, conductivity as a solid and in aqueous solution, and relative brittleness or hardness can generally be explained in this way. Although recognizing the properties that can be associated with a particular type of bonding is valuable in categorizing materials, relating those properties to the structure of the materials on the molecular scale, and being able to make reasoned predictions of the properties of a solid based on its constituent particles, provides evidence of deeper conceptual understanding.

**Ionic Structure**

**Learning Objectives for EK 2.D.1:**

LO 2.23 The student can create a representation of an ionic solid that shows essential characteristics of the structure and interactions present in the substance. [See SP 1.1]

LO 2.24 The student is able to explain a representation that connects properties of an ionic solid to its structural attributes and to the interactions present at the atomic level. [See SP 1.1, 6.2, 7.1]

Essential knowledge 2.D.1: Ionic solids have high melting points, are brittle, and conduct electricity only when molten or in solution.

a. Many properties of ionic solids are related to their structure.

1. Ionic solids generally have low vapor pressure due to the strong Coulombic interactions of positive and negative ions arranged in a regular three-dimensional array.

2. Ionic solids tend to be brittle due to the repulsion of like charges caused when one layer slides across another layer.

3. Ionic solids do not conduct electricity. However, when ionic solids are melted, they do conduct electricity because the ions are free to move.

4. When ionic solids are dissolved in water, the separated ions are free to move; therefore, these solutions will conduct electricity. Dissolving a nonconducting solid in water, and observing the solution’s ability to conduct electricity, is one way to identify an ionic solid.

5. Ionic compounds tend not to dissolve in nonpolar solvents because the attractions among the ions are much stronger than the attractions among the separated ions and the nonpolar solvent molecules.

b. The attractive force between any two ions is governed by Coulomb’s law: The force is directly proportional to the charge of each ion and inversely proportional to the square of the distance between the centers of the ions.

1. For ions of a given charge, the smaller the ions, and thus the smaller the distance between ion centers, the stronger the Coulombic force of attraction, and the higher the melting point.

2. Ions with higher charges lead to higher Coulombic forces, and therefore higher melting points.

✘✘*The study of the specific varieties of crystal lattices for ionic compounds is* ***beyond the scope*** *of this course and the AP Exam.*

***Rationale:*** *This topic has not been part of AP Chemistry for many years and including the topic in the new course was not viewed as the best way to deepen understanding of the big ideas.*

**Metallic & Alloy Properties**

**Learning Objectives for EK 2.D.2:**

LO 2.25 The student is able to compare the properties of metal alloys with their constituent elements to determine if an alloy has formed, identify the type of alloy formed, and explain the differences in properties using particulate level reasoning. [See SP 1.4, 7.2]

LO 2.26 Students can use the electron sea model of metallic bonding to predict or make claims about the macroscopic properties of metals or alloys. [See SP 6.4, 7.1]

LO 2.27 The student can create a representation of a metallic solid that shows essential characteristics of the structure and interactions present in the substance. [See SP 1.1]

LO 2.28 The student is able to explain a representation that connects properties of a metallic solid to its structural attributes and to the interactions present at the atomic level. [See SP 1.1, 6.2, 7.1]

Essential knowledge 2.D.2: Metallic solids are good conductors of heat and electricity, have a widerange of melting points, and are shiny, malleable, ductile, and readily alloyed.

a. A metallic solid can be represented as positive kernels (or cores) consisting of the nucleus and inner electrons of each atom surrounded by a sea of mobile valence electrons.

1. Metals are good conductors because the electrons are delocalized and relatively free to move.

2. Metals are malleable and ductile because deforming the solid does not change the environment immediately surrounding each metal core.

b. Metallic solids are often pure substances, but may also be mixtures called alloys.

1. Some properties of alloys can be understood in terms of the size of the component atoms:

— Interstitial alloys form between atoms of different radius, where the smaller atoms fill the interstitial spaces between the larger atoms. (Steel is an example in which carbon occupies the interstices in iron.) The interstitial atoms make the lattice more rigid, decreasing malleability and ductility.

— Substitutional alloys form between atoms of comparable radius, where one atom substitutes for the other in the lattice. (Brass is an example in which some copper atoms are substituted with a different element, usually zinc.) The density typically lies between those of the component metals, and the alloy remains malleable and ductile.

2. Alloys typically retain a sea of mobile electrons and so remain conducting.

3. In some cases, alloy formation alters the chemistry of the surface. An example is formation of a chemically inert oxide layer in stainless steel.

| [**#**](http://session.masteringchemistry.com/myct/yui-dt0-href-ordinal) | [**ITEM TYPE**](http://session.masteringchemistry.com/myct/yui-dt0-href-itemType) | | [**TITLEShow Descriptions**](http://session.masteringchemistry.com/myct/yui-dt0-href-title) | | **DIFFICULTY** | | | **MEDIAN TIME** | |
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| [**This Course**](http://session.masteringchemistry.com/myct/yui-dt0-href-courseDifficulty) | [**System**](http://session.masteringchemistry.com/myct/yui-dt0-href-systemDifficulty) | | [**This Course**](http://session.masteringchemistry.com/myct/yui-dt0-href-formattedCourseTime) | [**System**](http://session.masteringchemistry.com/myct/yui-dt0-href-formattedSystemTime) |
| 1 | End-of-Chapter | | [Go Figure 7.3](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268073) | |  | 1 | |  | <1m |
| 2 | Reading Questions | | [Chapter 7 Reading Quiz Question 1](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268035) | |  | 1 | |  | 1m |
| 3 | Test Bank | | [Chapter 7 Question 1 - Bimodal](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268075) | |  | 1 | |  | 1m |
| 4 | Test Bank | | [Chapter 7 Question 1 - Algorithmic](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268076) | |  | 1 | |  | 1m |
| 5 | End-of-Chapter | | [Problem 7.8](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268405) | |  | 1 | |  | 1m |
| 6 | Reading Questions | | [Chapter 7 Reading Quiz Question 2](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268398) | |  | 2 | |  | 1m |
| 7 | Test Bank | | [Chapter 7 Question 2 - Algorithmic](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268411) | |  | 2 | |  | 1m |
| 8 | Tutorial | | [Atomic Radii](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268503) | |  | 2 | |  | 3m |
| 9 | Tutorial | | [Atomic Radii and Effective Nuclear Charge](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268453) | |  | 1 | |  | 5m |
| 10 | Tutorial | | [Ionic Radii](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268458) | |  | 1 | |  | 3m |
| 11 | End-of-Chapter | | [Problem 7.19](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268532) | |  | 1 | |  | 3m |
| 12 | End-of-Chapter | | [Problem 7.3](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268577) | |  | 3 | |  | 8m |
| 13 | Tutorial | | [First Ionization Energy](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268647) | |  | 1 | |  | 3m |
| 14 | Tutorial | | [Ionization Energy](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268651) | |  | 3 | |  | 7m |
| 15 | End-of-Chapter | | [Give It Some Thought: 7.4](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268669) | |  | 1 | |  | 1m |
| 16 | Test Bank | | [Chapter 7 Question 4 - Short Answer](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268661) | |  | 2 | |  | 1m |
| 17 | Test Bank | | [Chapter 7 Question 3 - Short Answer](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268675) | |  | 1 | |  | <1m |
| 18 | Test Bank | | [Chapter 7 Question 2 - Short Answer](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268676) | |  | 1 | |  | 1m |
| 19 | Tutorial | | [Electron Configurations of Ions](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268709) | |  | 3 | |  | 7m |
| 20 | Tutorial | | [Electron Affinity and Electron Configurations](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268697) | |  | 3 | |  | 6m |
| 21 | Tutorial | | [Ionization Energy, Electron Affinity, and Enthalpy](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268743) | |  | 2 | |  | 8m |
| 22 | Tutorial | | [Periodic Trends in Relative Electron Affinity](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268729) | |  | 3 | |  | 6m |
| 23 | End-of-Chapter | | [Problem 7.47](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268735) | |  | 3 | |  | 18m |
| 24 | Tutorial | | [Group 3 to 12 Elements](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268762) | |  | 2 | |  | 4m |
| 25 | End-of-Chapter | | [Give It Some Thought: 7.9](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268751) | |  | 1 | |  | 1m |
| 26 | End-of-Chapter | | [Problem 7.57](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268785) | |  | 1 | |  | 1m |
| 27 | End-of-Chapter | | [Problem 7.61](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268721) | |  | 2 | |  | 1m |
| 28 | End-of-Chapter | | [Problem 7.60](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268766) | |  | 1 | |  | <1m |
| 29 | End-of-Chapter | | [Problem 7.59](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268788) | |  | 1 | |  | <1m |
| 30 | End-of-Chapter | | [Problem 7.69](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268790) | |  | 1 | |  | <1m |
| 31 | End-of-Chapter | | [Problem 7.67](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268757) | | -- | 2 | | -- | 6m |
| 32 | End-of-Chapter | | [Problem 7.64](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268795) | | -- | 4 | | -- | 4m |
| 33 | Tutorial | | [Introduction to the Alkaline Earth Metals](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268760) | | -- | 2 | | -- | 9m |
| 34 | Test Bank | | [Chapter 7 Question 14 - Short Answer](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268773) | | -- | 2 | | -- | 2m |
| 35 | Tutorial | | [Main Group Chemistry](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268810) | |  | 3 | |  | 6m |
| 36 | Tutorial | | [Chemical Families](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268774) | | -- | 1 | | -- | 5m |
| 37 | Tutorial | | [Periodic Trends in Reactivity](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268811) | | -- | 2 | | -- | 4m |
| 38 | Tutorial | | [Properties of Elements](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268813) | | -- | 2 | | -- | 4m |
| 39 | End-of-Chapter | | [Give It Some Thought: 8.2](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268871) | | -- | 2 | | -- | 1m |
| 40 | End-of-Chapter | | [Go Figure 8.1](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268850) | | -- | 1 | | -- | <1m |
| 41 | End-of-Chapter | | [Go Figure 8.2](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268852) | | -- | 1 | | -- | 1m |
| 42 | End-of-Chapter | | [Problem 8.1](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268832) | | -- | 2 | | -- | 2m |
| 43 | End-of-Chapter | | [Problem 8.12](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268854) | | -- | 2 | | -- | 10m |
| 44 | Tutorial | | [Lattice Energy](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268880) | | -- | 2 | | -- | 13m |
| 45 | Tutorial | | [Lewis Structures for Ionic Compounds](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268835) | | -- | 3 | | -- | 16m |
| 46 | Tutorial | | [± Coulomb's Law and Lattice Energy](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268916) | | -- | 5 | | -- | 18m |
| 47 | End-of-Chapter | | [Problem 8.24](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268957) | | -- | 2 | | -- | 5m |
| 48 | End-of-Chapter | | [Problem 8.22](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29268993) | | -- | 1 | | -- | 2m |
| 49 | Tutorial | | [Review of Periodic Trends](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269045) | | -- | 1 | | -- | 6m |
| 50 | Tutorial | | [Bonding in Hydrogen](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269074) | | -- | 2 | | -- | 3m |
| 51 | Tutorial | | [Chemistry of Hydrogen](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269075) | | -- | 2 | | -- | 4m |
| 52 | Test Bank | | [Chapter 22 Question 15 - Multiple-Choice](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269050) | | -- | 2 | | -- | 1m |
| 53 | Test Bank | | [Chapter 22 Question 16 - Multiple-Choice](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269000) | | -- | 2 | | -- | <1m |
| 54 | Tutorial | | [Acids of Group 7A Elements](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269143) | | -- | 3 | | -- | 10m |
| 55 | End-of-Chapter | | [Problem 22.22](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269129) | | -- | 5 | | -- | 2m |
| 56 | End-of-Chapter | | [Problem 22.20](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269100) | | -- | 1 | | -- | <1m |
| 57 | Tutorial | | [Chemistry of Oxygen](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269149) | | -- | 3 | | -- | 4m |
| 58 | End-of-Chapter | | [Give It Some Thought: 22.9](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269113) | | -- | 1 | | -- | 1m |
| 59 | Reading Questions | | [Chapter 22 Reading Quiz Question 6](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269133) | | -- | 3 | | -- | 2m |
| 60 | Tutorial | | [Reactivity of Group 6A Elements](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269118) | | -- | 1 | | -- | 2m |
| 61 | End-of-Chapter | | [Problem 22.39](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269156) | | -- | 3 | | -- | 14m |
| 62 | End-of-Chapter | | [Problem 22.5](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269169) | | -- | 2 | | -- | 10m |
| 63 | Tutorial | | [The Group 5A Elements Nitrogen and Phosphorus](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269189) | | -- | 3 | | -- | 6m |
| 64 | Tutorial | | [Introduction to Elements in Group 14](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269206) | | -- | 1 | | -- | 3m |
| 65 | Tutorial | | [Compounds of Group 3A Elements](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269225) | | -- | 2 | | -- | 7m |
| 66 | Tutorial | | [The p-block elements](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269227) | | -- | 1 | | -- | 5m |
| 67 | Tutorial | | [Electron Configurations and Oxidation Numbers](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269211) | | -- | 5 | | -- | 10m |
| 68 | Tutorial | | [General Trends of Transition Metals](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269181) | | -- | 4 | | -- | 10m |
| 69 | Tutorial | | [Types of Magnetism](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269213) | | -- | 2 | | -- | 7m |
| 70 | Tutorial | | [Properties and Reactions of Selected Vanadium Halides](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269215) | | -- | 3 | | -- | 13m |
| 71 | Tutorial | | [Coordination Complexes](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269250) | | -- | 3 | | -- | 11m |
| 72 | End-of-Chapter | | [Give It Some Thought: 23.4](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269199) | | -- | 1 | | -- | 1m |
| 73 | End-of-Chapter | | [Go Figure 23.9](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269251) | | -- | 1 | | -- | 2m |
| 74 | End-of-Chapter | | [Give It Some Thought: 23.6](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269252) | | -- | 1 | | -- | 1m |
| 75 | End-of-Chapter | | [Problem 23.2](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269265) | | -- | 2 | | -- | 10m |
| 76 | Test Bank | | [Chapter 23 Question 8 - Bimodal](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269255) | | -- | 2 | | -- | 2m |
| 77 | Test Bank | | [Chapter 23 Question 7 - Bimodal](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269306) | | -- | 2 | | -- | 1m |
| 78 | Test Bank | | [Chapter 23 Question 14 - Multiple-Choice](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269285) | | -- | 1 | | -- | 1m |
| 79 | Test Bank | | [Chapter 23 Question 14 - Short Answer](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269258) | | -- | 3 | | -- | 2m |
| 80 | Tutorial | | [Coordination Compounds](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269308) | | -- | 5 | | -- | 4m |
| 81 | End-of-Chapter | | [Problem 23.33](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269275) | | -- | 1 | | -- | 1m |
| 82 | End-of-Chapter | | [Problem 23.30](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269291) | | -- | 2 | | -- | 3m |
| 83 | Tutorial | | [Isomers and Enantiomers](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269296) | | -- | 3 | | -- | 11m |
| 84 | Tutorial | | [Naming Coordination Compounds](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269314) | | -- | 3 | | -- | 16m |
| 85 | Tutorial | | [Visualizing Complexes](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269315) | | -- | 4 | | -- | 9m |
| 86 | End-of-Chapter | | [Problem 23.4](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269297) | | -- | 5 | | -- | 4m |
| 87 | End-of-Chapter | | [Problem 23.37](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269299) | | -- | 1 | | -- | 2m |
| 88 | Tutorial | | [Color of Complexes](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269330) | | -- | 3 | | -- | 7m |
| 89 | End-of-Chapter | | [Go Figure 23.26](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269348) | | -- | 1 | | -- | 1m |
| 90 | End-of-Chapter | | [Problem 23.7](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269369) | | -- | 1 | | -- | <1m |
| 91 | Tutorial | | [Metal Complexes](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269388) | | -- | 3 | | -- | 5m |
| 92 | End-of-Chapter | | [Problem 23.96](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269409) | | -- | 3 | | -- | 5m |
| 93 | End-of-Chapter | | [Problem 23.92](http://session.masteringchemistry.com/myct/itemView?showStatsForCourse=1110976&view=solution&showStats=1&assignmentProblemID=29269414) | | -- | 2 | | -- | 3m |
|  | |  | | **Total:** |  | |
|  | |  | |  | **422m** | |