

| # | Exclusion | Rationale | Essential Knowledge | Specific Statement |
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| 1.C.1.b | Memorization of exceptions to the Aufbau principle is beyond the scope of this course and the AP Exam. | 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. | 1.C.1: Many properties of atoms exhibit periodic trends that are reflective of the periodicity of electronic structure. | b. Ignoring the few exceptions, the electron configuration for an atom can be deduced from the element's position in the periodic table. |
| 1.C.2.e | Assignment of quantum numbers to electrons is beyond the scope of this course and the AP Exam | Assignment of quantum numbers to electrons does not increase students' conceptual understanding of quantum theory. | 1.C.2: The currently accepted best model of the atom is based on the quantum mechanical model. | e. The QM model can be approximately solved using computers and serves as the basis for software that calculates the structure and reactivity of molecules. |
| 2.A.2.g | Phase diagrams are beyond the scope of this course and the AP Exam. | Phase diagrams are standard in all high school chemistry textbooks and therefore are considered prior knowledge. | 2.A.2: The gaseous state can be effectively modeled with a mathematical equation relating various macroscopic properties. A gas has neither a definite volume nor a definite shape; because the effects of attractive forces are minimal, we usually assume that the particles move independently. | g. Observed deviations from ideal gas behavior can be explained through an understanding of the structure of atoms and molecules and their intermolecular interactions. |
| 2.A.3.j | Colligative properties are beyond the scope of this course and the AP Exam and are therefore considered prior knowledge and not directly assessed on the exam. | None given. | 2.A.3: Solutions are homogenous mixtures in which the physical properties are dependent on the concentration of the solute and the strengths of all interactions among the particles of the solutes and solvent. | j. Understanding how to prepare solutions of specified molarity through direct mixing of the components, through use of volumetric glassware, and by dilution of a solution of known molarity with additional solvent is important for performing laboratory work in chemistry. |
| | Calculations of molality, percent by mass, and percent by volume are beyond the scope of this course and the AP Exam. | Molality pertains to colligative properties, which are considered prior knowledge and therefore molality will not be assessed on the exam. | | |
| 2.B.2.b | Other cases of much weaker hydrogen bonding are beyond the scope of the AP Chemistry course and exam. | The hydrogen bonding that occurs when hydrogen is bonded to highly electronegative atoms (N, O, and F) will be emphasized as will the electrostatic versus covalent nature of the bond. We will not include other cases of much weaker hydrogen bonding in the AP Chemistry course. | 2.B.2: Dipole forces result from the attraction among the positive ends and negative ends of polar molecules. Hydrogen bonding is a strong type of dipole-dipole force that exists when very electronegative atoms (N, O, and F) are involved. | b. Hydrogen bonding is a relatively strong type of intermolecular interaction that exists when hydrogen atoms that are covalently bonded to the highly electronegative atoms (N, O, and F) are also attracted to the negative end of a dipole formed by the electronegative atom (N, O, and F) in a different molecule, or a different part of the same molecule. When hydrogen bonding is present, even small molecules may have strong intermolecular attractions. |
| 2.C.2.a | Knowledge of specific types of crystal structures is beyond the scope of this course and the AP Exam. | The study of crystal structures does not strengthen understanding of the big ideas. | 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. |

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| 2.C.4.d | The use of formal charge to explain why certain molecules do not obey the octet rule is beyond the scope of this course and the AP Exam. | Explaining why certain molecules do NOT obey the octet rule is beyond the scope of the course. The scope of the course DOES include the use of formal charge to evaluate different structures that follow the octet rule and the limitations of using Lewis structures for molecules with odd numbers of electrons or expanded octets. | 2.C.4: The localized electron bonding model describes and predicts molecular geometry using Lewis diagrams and the VSEPR model. | d. Formal charge can be used as a criterion for determining which of several possible valid Lewis diagrams provides the best model for predicting molecular structure and properties. |
| 2.C.4.f | Learning how to defend Lewis models based on assumptions about the limitations of the models is beyond the scope of this course and the AP Exam. | Learning how to defend Lewis models does not strengthen understanding of the big ideas. | | f. As with any model, there are limitations to the use of the Lewis structure model, particularly in cases with an odd number of valence electrons. Recognizing that Lewis diagrams have limitations is of significance. |
| 2.C.4.g | An understanding of the derivation and depiction of these orbitals is beyond the scope of this course and the AP Exam. | The course includes the distinction between sigma and pi bonding, the use of VSEPR to explain the shapes of molecules, and the sp, sp ² , and sp ³ nomenclature. Additional aspects related to hybridization are both controversial and do not substantially enhance understanding of molecular structure. | | g. Organic chemists commonly use the terms "hybridization" and "hybrid orbital" to describe the arrangement of electrons around a central atom. When there is a bond angle of 180°, the central atom is said to be sp hybridized; for 120°, the central atom is sp ² hybridized; and for 109°, the central atom is sp ³ hybridized. Students should be aware of this terminology, and be able to use it. When an atom has more than four pairs of electrons surrounding the central atom, students are only responsible for the shape of the resulting molecule. |
| 2.C.4.i | Other aspects of molecular orbital theory, such as recall or filling of molecular orbital diagrams, are beyond the scope of this course and the AP Exam. | As currently covered in freshman college chemistry textbooks, molecular orbital theory is superficially taught and limited to homonuclear molecules in the second period. Algorithmic filling of such MO diagrams does not lead to a deeper conceptual understanding of bonding. The course does include the important distinction between sigma and pi bonding. | | i. Molecular orbital theory describes covalent bonding in a manner that can capture a wider array of systems and phenomena than the Lewis or VSEPR models. Molecular orbital diagrams, showing the correlation between atomic and molecular orbitals, are a useful qualitative tool related to molecular orbital theory. |
| 2.D.1.b | The study of the specific varieties of crystal lattices for ionic compounds is beyond the scope of this course and the AP Exam. | 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. | 2.D.1: Ionic solids have high melting points, are brittle, and conduct electricity only when molten or in solution. | 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. |

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| 3.B.2.b | Lewis acid-base concepts are beyond the scope of this course and the AP Exam. | The definition of Lewis acids is commonly taught in a first-year high school chemistry course and is therefore considered prior knowledge. Note: The formation of complex ions and the qualitative impact on solubility are both part of the AP Chemistry course. | 3.B.2: In a neutralization reaction, protons are transferred from an acid to a base. | b. Acid-base reactions: (1) Only reactions in aqueous solutions are considered (2) The Brønsted-Lowry concept of acids and bases is the focus of the course. |
| 3.B.3.a | Language of reducing agent and oxidizing agent is beyond the scope of this course and the AP Exam. | Understanding this terminology is not necessary for reasoning about redox chemistry. | 3.B.3: In oxidation-reduction (redox) reactions, there is a net transfer of electrons. The species that loses electrons is oxidized, and the species that gains electrons is reduced. | a. In a redox reaction, electrons are transferred from the species that is oxidized to the species that is reduced. |
| 3.C.3.b | Labeling an electrode as positive or negative is beyond the scope of this course and the AP Exam. | The sign on the electrode is different for electrochemical and electrolytic cells, but the most important concept is that oxidation always takes place at the anode in either cell type. Labeling electrodes does not provide a deeper understanding of electrochemistry. | 3.C.3: Electrochemistry shows the interconversion between chemical and electrical energy in galvanic and electrolytic cells. | b. Oxidation occurs at the anode, and reduction occurs at the cathode for all electrochemical cells. |
| 3.C.3.d | The Nernst equation is beyond the scope of this course and the AP Exam. | Qualitative reasoning about the effects of concentration on cell potential is part of the course. However, inclusion of algorithmic calculations was not viewed as the best way to deepen understanding of the big ideas. | | d. Many real systems do not operate at standard conditions and the electrical potential determination must account for the effect of concentrations. The qualitative effects of concentration on the cell potential can be understood by considering the cell potential as a driving force toward equilibrium, in that the farther the reaction is from equilibrium, the greater the magnitude of the cell potential. The standard cell potential, E° , corresponds to the standard conditions of $Q = 1$. As the system approaches equilibrium, the magnitude (i.e., absolute value) of the cell potential decreases, reaching zero at equilibrium (when $Q = K$). Deviations from standard conditions that take the cell further from equilibrium than $Q = 1$ will increase the magnitude of the cell potential relative to E° . Deviations from standard conditions that take the cell closer to equilibrium than $Q = 1$ will decrease the magnitude of the cell potential relative to E° . In concentration cells, the direction of spontaneous electron flow can be determined by considering the direction needed to reach equilibrium. |
| 4.B.3.c | Calculations involving the Arrhenius equation are beyond the scope of this course and the AP Exam. | The conceptual aspects of the Arrhenius equation and the interpretation of graphs is part of the course. However, inclusion of algorithmic calculations was not viewed as the best way to deepen understanding of big ideas. | 4.B.3: A successful collision can be viewed as following a reaction path with an associated energy profile. | c. The Arrhenius equation can be used to summarize experiments on the temperature dependence of the rate of an elementary reaction and to interpret this dependence in terms of the activation energy needed to reach the transition state. |

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| 4.C.3.b | Collection of data pertaining to 4.C.3b is beyond the scope of this course and the AP Exam. | Designing an experiment to identify reaction intermediates often requires knowledge that is beyond the scope of a general chemistry course. | 4.C.3: Reaction intermediates, which are formed during the reaction but not present in the overall reaction, play an important role in multistep reactions. | b. Experimental detection of a reaction intermediate is a common way to build evidence in support of one reaction mechanism over an alternative mechanism. |
| 6.C.1.n | Numerical computation of the concentration of each species present in the titration curve for polyprotic acids is beyond the scope of this course and the AP Exam. | Such computations for titration of monoprotic acids are within the scope of the course, as is qualitative reasoning regarding what species are present in large versus small concentrations at any point in titration of a polyprotic acid. However, additional computations of the concentration of each species present in the titration curve for polyprotic acids may encourage algorithmic calculations and were not viewed as the best way to deepen understanding of the big ideas. | 6.C.1: Chemical equilibrium reasoning can be used to describe the proton-transfer reactions of acid-base chemistry. | n. For polyprotic acids, the use of titration curves to evaluate the number of labile protons is important, as well as knowing which species are present in large concentrations at any region along the curve. |
| 6.C.2.a | Computing the change in pH resulting from the addition of an acid or a base to a buffer is beyond the scope of this course and the AP Exam. | Algorithmic calculations of pH changes are not viewed as the best way to deepen understanding of the big ideas. | 6.C.2: The pH is an important characteristic of aqueous solutions that can be controlled with buffers. Comparing pH to pKa allows one to determine the protonation state of a molecule with a labile proton. | a. A buffer solution contains a large concentration of both members in a conjugate acid-base pair. The conjugate acid reacts with added base and the conjugate base reacts with added acid. The pH of the buffer is related to the pKa and the concentration ratio of acid and base forms. The buffer capacity is related to absolute concentrations of the acid and base forms. These relationships can be used both quantitatively and qualitatively to reason about issues such as the ratio of acid to base forms in a given buffer, the impact of this on the buffer capacity for added acid or base, and the choice of an appropriate conjugate acid-base pair for a desired buffer pH (including polyprotic acids). |
| 6.C.2.a | The production of the Henderson-Hasselbalch equation by algebraic manipulation of the relevant equilibrium constant expression is beyond the scope of this course and the AP Exam. | Reasoning about the protonation states of weak acids in solution and the functioning of buffers is within the scope of the course. However, since the Henderson-Hasselbalch equation is merely a rearrangement of the law of mass action for a weak acid, inclusion of its derivation was not viewed as the best way to deepen understanding of the big ideas. | | |
| 6.C.3.d | Memorization of other "solubility rules" is beyond the scope of this course and the AP Exam. | Memorization of solubility rules does not deepen understanding of the big ideas. | 6.C.3: The solubility of a substance can be understood in terms of chemical equilibrium. | d. All sodium, potassium, ammonium, and nitrate salts are soluble in water. |
| 6.C.3.f | Computations of solubility as a function of pH are beyond the scope of this course and the AP Exam. | Computations of solubility as a function of pH do not deepen understanding of the big ideas. | | f. The solubility of a salt will be pH sensitive when one of the ions is an acid or base. Applications include the iron hydroxides of acid-mine drainage and the effects of acid rain on solubility of carbonates. These effects can be understood qualitatively with Le Chatelier's principle. |
| 6.C.3.f | Computations of solubility in such solutions are beyond the scope of this course and the AP Exam. | Computations of solubility in such solutions do not deepen understanding of the big ideas. | | |