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AP® Chemistry Study Guide: Tips, Strategies, and Common Mistakes To Avoid

Use this study guide to review some of the most difficult concepts on the AP Chemistry exam and some common mistakes to avoid with your students. As you go through the study guide with your class, you can remind students to be mindful of these misconceptions as they prepare.

Instructions:

1. You can either present this guide on a screen and go through each topic with your students or you can share this document with your students and encourage them to use it for self-studying.
2. Click on the links in each topic to review and discuss all the difficult concepts that could show up on the exam.
3. The list has been ordered unit by unit, so it is meant to promote step-by-step exam review in an organized manner.
4. When clicking on the links, each concept can be used as the topic for a mini-lecture, where the content can be reviewed with students. This is the time to allow students to ask last-minute questions if they are still struggling with any of these challenging concepts.
5. Once you have gone through these topics, you can assign practice questions to your students using our Learning Tools for AP Courses or another quality resource that allows them to apply what they have learned to exam-like questions with detailed answer explanations and performance data.

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AP® Chemistry's Most Difficult Concepts

Unit 1: Atomic Structure and Properties

Periodic trends

- Students have difficulty applying trends to compare properties of elements or compounds.

Unit 2: Molecular and Ionic Compound Structure and Properties

Structure and bonding

- Students often do not understand the difference between the formal charge and the oxidation number of an atom in a structure and how to determine each one.
- Students struggle with identifying the type of bonds (i.e., nonpolar covalent, polar covalent, ionic bonds) in a compound based on properties of the compound, such as conductivity, boiling point, and reactivity with water.
- Students struggle using VSEPR and Lewis structures to predict molecular properties, such as bond angles.

Unit 3: Intermolecular Forces and Properties

Particle diagrams

- Particle diagrams can be tricky for students. These diagrams represent the physical state of a molecule based on the placement of the particles in the diagram.
- Students also struggle with identifying different types of solids in a particle diagram based on the packing arrangement of the atoms in the diagram.

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Unit 4: Chemical Reactions

Stoichiometric calculations and the mole concept

- Understanding that the species in a reaction are related to each other by the mole ratios from the balanced chemical reaction is an important concept that students sometimes struggle with.
- Many students struggle with using dimensional analysis to solve problems. This is a key skill to have in chemistry.

Unit 5: Kinetics

Kinetics

- It can be challenging to understand how reaction conditions, such as temperature and reactant concentration, affect the rate of a reaction.
- Given a rate law, students often struggle with identifying the reaction order and the corresponding kinetic data.
- Another difficult concept for students is understanding that sufficient energy and correct collision orientation are required for a reaction to occur.

Unit 6: Thermodynamics

Thermodynamics

- Understanding the distinction between heat and temperature is important but can be a tricky concept.
- Students find it difficult to understand how heat is transferred between two systems at two different temperatures.

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Unit 7: Equilibrium

Equilibrium

- Understanding that at equilibrium, the forward/reverse reactions occur at the same rates but the reactant/product concentrations are not necessarily the same is a challenging concept for students to grasp and visualize graphically.
- Students often find calculating equilibrium concentrations using an ICE (Initial, Change, Equilibrium) table challenging due to the use of more rigorous algebra.
- Understanding how to use Le Chatelier's principle to predict which direction a system at chemical equilibrium will shift in response to a disturbance (i.e., concentration change, temperature change, volume change, ect.) is a tricky concept for students and can often turn into a game of guessing.

Unit 8: Acids and Bases

Acids, bases, and buffers

- Students find it difficult to interpret and identify key points along an acid/base titration curve (buffer region, equivalence point, etc.).
- Students must understand that the capacity of a buffer (i.e., the pH range where the buffer can neutralize added acid or base while resisting changes in pH) is affected by changing the concentration of the weak acid/base and the salt of the corresponding conjugate.
- Students often struggle to both mathematically and conceptually apply the Henderson-Hasselbalch equation to buffer systems. It's important to recognize that the pH of a buffer depends on the pKa of the acid and the ratio of the acid to its conjugate salt.

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Unit 9: Applications of Thermodynamics

Electrochemical cells

- It can be tricky to identify which electrodes in a galvanic (or electrolytic) cell are the anode and cathode given which species are oxidized and reduced or vice versa.
- Students have a hard time using Faraday's law to mathematically relate the mass of a chemical species generated or consumed during a redox reaction to the amount of current passing through the electrochemical cell.

Gibbs free energy

- Relating ΔG° and K_{eq} both conceptually and mathematically can be a hard concept to understand.
- Students struggle to predict how temperature will affect the thermodynamic favorability (i.e., Gibbs free energy) of a reaction.

If you've had the chance to finish this study guide with your students, have them try their hand at one of UWorld's AP Chem sample questions that tests one of the challenging concepts mentioned above.

We hope this study guide has helped to make reviewing for AP Chemistry with your class a bit easier. We wish your students the best of luck in their studies. Please feel free to contact us with any questions, and we will be more than happy to answer them.

Regards,
UWorld's AP Science Team