AP Chemistry Big Ideas

Adapted from: AP Chemistry ■ Course Planning and Pacing Guide 2 © 2012 The College Board.

Big Idea 1: States of Matter- The chemical elements are fundamental building materials of matter, and all matter can be understood in terms of arrangements of atoms. These atoms retain their identity in chemical reactions.

Big Idea 2: Properties of Matter-forces of attractions, characteristics, and states - Chemical and physical properties of materials can be explained by the structure and the arrangement of atoms, ions, or molecules and the forces between them.

Big Idea 3: Chemical Reactions - Changes in matter involve the rearrangement and/or reorganization of atoms and/or the transfer of electrons.

Big Idea 4: Kinetics -Rates of chemical reactions are determined by details of the molecular collisions.

Big Idea 5: Thermodynamics - The laws of thermodynamics describe the essential role of energy and explain and predict the direction of changes in matter.

Big Idea 6: Equilibrium -Any bond or intermolecular attraction that can be formed can be broken. These two processes are in a dynamic competition, sensitive to initial conditions and external perturbations.

Science Practices for AP Chemistry

A practice is a way to coordinate knowledge and skills in order to accomplish a goal or task. The science practices enable students to establish lines of evidence and use them to develop and refine testable explanations and predictions of natural phenomena. These science practices capture important aspects of the work that scientists engage in, at the level of competence expected of AP Chemistry students.

Science Practice 1:The student can use representations and models to communicate scientific phenomena and solve scientific problems.

1.1 The student can *create representations and models* of natural or man-made phenomena and systems in the domain.

1.2 The student can *describe representations and models* of natural or man- made phenomena and systems in the domain.

1.3 The student can *refine representations and models* of natural or man-made phenomena and systems in the domain.

1.4 The student can *use representations and models* to analyze situations or solve problems qualitatively and quantitatively.

1.5 The student can *re-express key elements* of natural phenomena across multiple representations in

the domain.

Science Practice 2: The student can use mathematics appropriately.

2.1 The student can *justify the selection of a mathematical routine* to solve problems.

2.2 The student can *apply mathematical routines* to quantities that describe natural phenomena.

2.3 The student can *estimate numerically* quantities that describe natural phenomena.

Science Practice 3: The student can engage in scientific questioning to extend thinking or to guide investigations within the context of the AP course.

3.1 The student can *pose scientific questions*.

3.2 The student can *refine scientific questions*.

3.3 The student can *evaluate scientific questions*.

Science Practice 4: The student can plan and implement data collection strategies in relation to a particular scientific question.

4.1 The student can *justify the selection of the kind of data* needed to answer a particular scientific question.

4.2 The student can *design a plan* for collecting data to answer a particular scientific question.

4.3 The student can *collect data* to answer a particular scientific question.

4.4 The student can *evaluate sources of data* to answer a particular scientific question.

Science Practice 5:The student can perform data analysis and evaluation of evidence.

5.1 The student can *analyze data* to identify patterns or relationships.

5.2 The student can *refine observations and measurements* based on data analysis.

5.3 The student can *evaluate the evidence provided by data sets* in relation to a particular scientific question.

Science Practice 6: The student can work with scientific explanations and theories.

6.1 The student can *justify claims with evidence*.

6.2 The student can *construct explanations of phenomena based on evidence* produced through scientific practices.

6.3 The student can *articulate the reasons that scientific explanations and theories are refined or replaced*.

6.4 The student can *make claims and predictions about natural phenomena* based on scientific theories and models.

6.5 The student can *evaluate alternative scientific explanations*.

Science Practice 7: The student is able to connect and relate knowledge across various scales, concepts, and representations in and across domains.

7.1 The student can *connect phenomena and models* across spatial and temporal scales.

7.2 The student can *connect concepts* in and across domain(s) to generalize or extrapolate in and/or across enduring understandings and/or big ideas.

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