# Pre-AP Chemistry Instructional Planning Guide Teacher Sample

The goal of the instructional planning guide is to help you create a roadmap of the key instructional activities and assessments   
you will use to design your course in alignment with the Pre-AP course framework and instructional principles. This sample   
illustrates one way in which you might use the guide. Pre-AP National Faculty and educators with experience teaching Pre-AP   
provided ideas for additional activities and resources that they might use alongside Pre-AP model lessons and formative   
assessments to build their full course.

**Using and Customizing Your Own Instructional Planning Guide:**

* When planning additional lessons, consider how they support the Pre-AP course framework, areas of focus,   
  and shared principles. These three elements represent the key ingredients of aligning to Pre-AP.
* Take time to capture your reflections as you move through the course.

## Unit 1 Structure and Properties of Matter

| **Pacing in Minutes** | **Date(s)** | **Key Concepts** | **Materials/Resources/Tasks**  *Pre-AP Model Lessons, Additional Lessons, Labs, Textbooks,  Performance Tasks, Assessments* | **Learning Objectives** | **Essential Knowledge** | **State Standards** | **Reflections on  Areas of Focus & Shared Principles** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 30 |  | 1.1 Particle View of States of Matter | Pre-AP Model Lesson 1.1: Launch Lesson – States of Matter Card Sort | 1.1.A.1 | 1.1.A.a, b | HS-PS1-3 |  |
| 60 |  | 1.1 Particle View of States of Matter | Pre-AP Model Lesson 1.2: Developing a Model of Matter | 1.1.A.1, 2, 3 | 1.1.A.a–d | HS-PS1-3 |  |
| 25 |  | 1.1: Particle View of States of Matter | Group Measurement Activity: Students measure the length of large objects with an unconventional tool (i.e. their hand). Discuss how each group recorded their measurements and the challenges they faced when using the tool to construct “rules” for making measurements. | 1.1.B.1, 2 |  |  |  |
| 45 |  | 1.1 Particle View of States of Matter | Pre-AP Model Lesson 1.3: Confidence in Measurement | 1.1.B.1, 2 | 1.1.B.a, b |  |  |
| 60 |  | 1.1 Particle View of States of Matter | Pre-AP Model Lesson 1.4: Relating Mass and Volume Lab | 1.1.C.1–3 | 1.1.C.a, b, c |  |  |
| 60 |  | 1.1 Particle View of States of Matter | Density Practice: Graphing, calculations, particulate reps in small groups. | 1.1.C.1–3 | 1.1.C.a, b, c |  |  |
| 45 |  | 1.1 | **Learning Checkpoint 1**  *This learning checkpoint can assess any of the learning objectives from its associated Key Concepts.* |  |  |  |  |
| 45 |  | 1.1 Particle View of States of Matter | Review Learning Checkpoint 1: Students individually correct each missed question. If time allows, conduct conferences with each student. |  |  |  |  |
| 90 |  | 1.2 Phase Changes and Particle Interactions | Pre-AP Model Lesson 1.5: Heat Transfer | 1.2.A.1, 2 | 1.2.A | HS-PS3-1  HS-PS3-4 |  |
| 45 |  | 1.2 Phase Changes and Particle Interactions | Heat Calculations Review: Students will rotate through stations in small groups. | 1.2.A.2 | 1.2.A | HS-PS1-3  HS-PS3-4 |  |
| 45 |  | 1.1, 1.2 | **Practice Performance Task**  Determining Properties of an Unknown Substance  *This practice performance task assesses learning objectives and essential knowledge statements addressed up to this point in the unit.* |  |  | HS-PS1-3  HS-PS3-1  HS-PS3-4 |  |
| 45 |  | 1.1, 1.2 | Review of Practice Performance Task: Students complete the practice performance task again in groups of 3–4. Return student responses and have students compare their answers to the group answers. Provides time for questions and discussion of appropriate responses. |  |  | HS-PS1-3  HS-PS3-1  HS-PS3-4 |  |
| 30 |  | 1.2 Phase Changes and Particle Interactions | Endothermic Demo: Apply rubbing alcohol on skin to demonstrate cooling from evaporation. Use a whiteboard and conduct a whole group discussion. | 1.2.B.1 | 1.2.B.a, b | HS-PS3-1 |  |
| 60 |  | 1.2 Phase Changes and Particle Interactions | Pre-AP Model Lesson 1.6: Phase Diagrams—What’s So Dry About Dry Ice? | 1.2.C.1, 2  1.2.D.1 | 1.2.C  1.2.D.d | HS-PS1-3 |  |
| 135 |  | 1.2 Phase Changes and Particle Interactions | Pre-AP Model Lesson 1.7: Investigating Heating Curves | 1.2.D.1, 2 | 1.2.D.a–d | HS-PS1-3  HS-PS3-1 |  |
| 45 |  | 1.2 Phase Changes and Particle Interactions | Review and Reinforcement: Review heating curves and phase diagrams | 1.2.D.1, 2 | 1.2.D.a–d | HS-PS1-3  HS-PS3-1 |  |
| 45 |  | 1.3 Kinetic Molecular Theory | Pre-AP Model Lesson 1.8: Launch Lesson—Introduction to Properties of Gases | 1.3.A.1 | 1.3.A.a |  |  |
| 20 |  | 1.3 Kinetic Molecular Theory | Pressure Demo: Use an online simulation or a group movement activity to show how volume and temperature affect the number of collisions occurring in a gas sample. | 1.3.A.2 | 1.3.A.a, b |  |  |
| 135 |  | 1.3 Kinetic Molecular Theory | Pre-AP Model Lesson 1.9: Exploring and Measuring Gas Properties Lab | 1.3.B.1, 2  1.3.C.1, 2 | 1.3.B  1.3.C |  |  |
| 60 |  | 1.3 Kinetic Molecular Theory | Practice: Have students practice Gas Laws calculations, particulate reps, and conceptual questions. | 1.3.B.1, 2  1.3.C.1, 2 | 1.3.B  1.3.C |  |  |
| 45 |  | 1.2, 1.3 | **Learning Checkpoint 2**  *This learning checkpoint can assess any of the learning objectives from its associated Key Concepts.* |  |  |  |  |
| 45 |  | 1.2, 1.3 | Review Learning Checkpoint 2: Use an online review site (i.e. Quiziz, Socrative) to conduct a class review of the most commonly missed questions. |  |  |  |  |
| 45 |  | 1.1, 1.2, 1.3 | Unit Review: Students rotate through stations to review concepts from Unit 1 | 1.2.A.1, 2  1.2.B.1  1.2.C.1, 2  1.2.D.1, 2  1.3.A.1, 2  1.3.B.1, 2  1.3.C.1, 2 | 11.2.A  1.2.B. a, b  1.2.C  1.2.D. a–d  1.3.A. a, b  1.3.B  1.3.C | HS-PS1-3  HS-PS3-1  HS-PS3-4 |  |
| 45 |  | 1.1, 1.2, 1.3 | **Performance Task**  Cooling an Alcohol  *This performance task assesses learning objectives and essential knowledge statements addressed in the unit.* |  |  | HS-PS1-3  HS-PS3-1  HS-PS3-4 |  |
| 45 |  | 1.1, 1.2, 1.3 | Review Performance Task: Students complete the performance task in small groups on large whiteboards. Conduct a share out periodically to evaluate and revise responses as needed. |  |  | HS-PS1-3  HS-PS3-1  HS-PS3-4 |  |

[add or remove rows as needed]

### Reflections

What went well in this unit?

When were students most engaged during this unit?

How have students grown? What opportunities for growth stand out at this time?

What needs modification or differentiation next time?

## Unit 2 Chemical Bonding and Interactions

| **Pacing in Minutes** | **Date(s)** | **Key Concepts** | **Materials/Resources/Tasks**  *Pre-AP Model Lessons, Additional Lessons, Labs, Textbooks,  Performance Tasks, Assessments* | **Learning Objectives** | **Essential Knowledge** | **State Standards** | **Reflections on  Areas of Focus & Shared Principles** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 105 |  | 2.1 Classification and Interactions of Matter | Pre-AP Model Lesson 2.1: Launch Lesson—Mixing and Unmixing | 2.1.B.1, 2 | 2.1.B.a, b |  |  |
| 45 |  | 2.1 Classification and Interactions of Matter | Pre-AP Model Lesson 2.2: Atoms, Molecules, and Particles | 2.1.A.1, 2 | 2.1.A.a–c | HS-PS1-1 |  |
| 20 |  | 2.1 Classification and Interactions of Matter | Particulate Representations: Students draw diagrams of pure substances and mixtures in small groups. | 2.1.A.2  2.1.B.1 | 2.1.B.a, b | HS-PS1-1 |  |
| 60 |  | 2.1 Classification and Interactions of Matter | Pre-AP Model Lesson 2.3: Chromatography Lab – Who Forged the Hall Pass? | 2.1.B.1, 2 | 2.1.B.a, b |  |  |
| 45 |  | 2.1 Classification and Interactions of Matter | Pre-AP Model Lesson 2.4: Partial Pressure | 2.1.B.1  2.1.C.1 | 2.1.B.a  2.1.C.a, b |  |  |
| 90 |  | 2.1 Classification and Interactions of Matter | Pre-AP Model Lesson 2.5: Distillation and Electrolysis Lab | 2.1.D.1 | 2.1.D.a, b | HS-PS1-3 |  |
| 45 |  | 2.2 Molecular Structure and Properties | Pre-AP Model Lesson 2.6: Launch Lesson—Comparing Methane and Butane | 2.2.A.1, 2  2.2.B.1 | 2.2.A.a–c  2.2.B | HS-PS1-3 |  |
| 90 |  | 2.2 Molecular Structure and Properties | Pre-AP Model Lesson 2.7: Exploring Intermolecular Forces | 2.2.A.1, 2  2.2.B.1 | 2.2.A.a–c  2.2.B | HS-PS1-3 |  |
| 60 |  | 2.2 Molecular Structure and Properties | Pre-AP Model Lesson 2.8: Evaporation and Intermolecular Forces Lab | 2.2.A.1, 2  2.2.B.1 | 2.2.A.a–c  2.2.B | HS-PS1-3 |  |
| 45 |  | 2.2 Molecular Structure and Properties | Practice and Wrap-up IMFs. Students identify types of intermolecular forces present in samples of different compounds and then make predictions of their physical properties. | 2.1.D.1 | 2.1.D.a, b | HS-PS1-3 |  |
| 45 |  | 2.1, 2.2 | **Learning Checkpoint 1**  This learning checkpoint can assess any of the learning objectives from its associated Key Concepts. |  |  |  |  |
| 45 |  | 2.1, 2.2 | Review Learning Checkpoint 1: In small groups, students will retake the Learning Checkpoint. This will provide an opportunity to for discussion, peer teaching, and review. Scores on the assessment should be given only after a whole group review. |  |  |  |  |
| 100 |  | 2.2 Molecular Structure and Properties | Lewis Structures: Provide direct instruction and student practice. | 2.2.D.1 | 2.2.D.a | HS-PS1-1 |  |
| 60 |  | 2.2 Molecular Structure and Properties | Pre-AP Model Lesson 2.9: Molecular Geometry | 2.2.D.1  2.2.E.1 | 2.2.D.a  2.2.E | HS-PS1-1 |  |
| 45 |  | 2.2 Molecular Structure and Properties | Pre-AP Model Lesson 2.10: Spicy Chemistry—The Flavors of Isomers | 2.2.D.1, 2  2.2.E.1 | 2.2.D.a, b  2.2.E | HS-PS1-1 |  |
| 90 |  | 2.2 Molecular Structure and Properties | Pre-AP Model Lesson 2.11: Solubility and Laundry Detergents Lab | 2.2.A.2  2.2.B.1  2.2.F.1  2.2.G.1 | 2.2.A.a–c  2.2.B  2.2.F  2.2.G | HS-PS1-3 |  |
| 45 |  | 2.2 Molecular Structure and Properties | What Makes Something Polar: Students will complete a card sort to identify characteristics of polar compounds. | 2.2.F.1 | 2.2.F | HS-PS1-3 |  |
| 45 |  | 2.1, 2.2 | **Practice Performance Task** Properties of Limonene  *This practice performance task assesses the learning objectives and essential knowledge statements addressed up to this point in the unit.* |  |  | HS-PS1-1  HS-PS1-3 |  |
| 45 |  | 2.1, 2.2 | Review Practice Performance Task: Remove student names from responses and allow students to peer grade each other’s work. Facilitate a discussion about the correct answers. | 2.1.A.1, 2  2.1.C.1  2.2.A.1, 2  2.2.B.1  2.2.D.1  2.2.G.1 | 2.1.A.a–c  2.1.C.a, b  2.2.A.a–c  2.2.B  2.2.D.a  2.2.G | HS-PS1-1  HS-PS1-3 |  |
| 45 |  | 2.3 Covalent and Ionic Bonding | Pre-AP Model Lesson 2.12: Classifying Solids Lab | 2.3.A.1  2.3.B.1 | 2.3.A  2.3.B.a, b | HS-PS1-1 |  |
| 90 |  | 2.3 Covalent and Ionic Bonding | Ionic and Covalent Nomenclature: Students will use a card sort to identify naming structure patterns and develop ‘rules’ for naming compounds. Follow this activity with group and individual practice. | 2.3.D.1 | 2.3.D | HS-PS1-1 |  |
| 90 |  | 2.3 Covalent and Ionic Bonding | Pre-AP Model Lesson 2.13: The Structure of Ionic Compounds | 2.3.C.1  2.3.D.1 | 2.3.C.a––c  2.3.D | HS-PS1-1 |  |
| 90 |  | 2.3 Covalent and Ionic Bonding | Basic Atomic Structure Including Electron Shells: Use an online simulation to review concepts from prior coursework. | 2.2.C.1 | 2.2.C a, b | HS-PS1-1 |  |
| 135 |  | 2.3 Covalent and Ionic Bonding | Periodic Table and Trends: Use a card sort to identify patterns in the periodic table. Students will connect these patterns to properties of different elements. | 2.2.C.1 | 2.2.C a, b | HS-PS1-1 |  |
| 45 |  | 2.2, 2.3 | **Learning Checkpoint 2**  *This learning checkpoint can assess any of the learning objectives from its associated Key Concepts.* |  |  |  |  |
| 45 |  | 2.2, 2.3 | Review Learning Checkpoint 2: Review most commonly missed questions in small groups. |  |  |  |  |
| 45 |  | 2.1, 2.2, 2.3 | Unit Review: Wrap up—Have students break into small groups to predict the type of IMFs found in the chemical formula. Students should write their findings on a whiteboard. | 2.2.D.1, 2  2.2.E.1  2.2.F.1  2.3.B.1  2.3.D.1 | 2.2.D.a, b  2.2.E  2.2.F  2.3.A  2.3.B.a, b  2.3.D | HS-PS1-1 |  |
| 45 |  | 2.2, 2.3 | **Performance Task**  Ionic and Covalent Compounds  *This performance task assesses learning objectives and essential knowledge statements addressed in the unit.* |  |  | HS-PS1-1  HS-PS1-3 |  |
| 45 |  | 2.2, 2.3 | Review Performance Task: Have students complete the alternate option from what they completed for Part 1. For Part 2, give students sample data and have them identify the type of bonding in small groups. |  |  | HS-PS1-1  HS-PS1-3 |  |

[add or remove rows as needed]

### Reflections

What went well in this unit?

When were students most engaged during this unit?

How have students grown? What opportunities for growth stand out at this time?

What needs modification or differentiation next time?

## Unit 3 Chemical Quantities

| **Pacing in Minutes** | **Date(s)** | **Key Concepts** | **Materials/Resources/Tasks**  *Pre-AP Model Lessons, Additional Lessons, Labs, Textbooks,  Performance Tasks, Assessments* | **Learning Objectives** | **Essential Knowledge** | **State Standards** | **Reflections on  Areas of Focus & Shared Principles** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 105 |  | 3.1 Counting Particles in Substances | Pre-AP Model Lesson 3.1: Relative Mass and the Mole | 3.1.A.1, 2 | 3.1.A.a, b | HS-PS1-7 |  |
| 90 |  | 3.1 Counting Particles in Substances | Mole Conversions Practice: Students practice individually and in small groups | 3.1.A.2 | 3.1.A.a, b | HS-PS1-7 |  |
| 45 |  | 3.1 Counting Particles in Substances | Pre-AP Model Lesson 3.2: Moles, Molecules, and Mass Card Sort | 3.1.A.1, 2 | 3.1.A.a, b | HS-PS1-7 |  |
| 90 |  | 3.1 Counting Particles in Substances | Lab: Determining Molar Mass, Molar Volume, or Avogadro’s Number | 3.1.A.1, 2 | 3.1.A.a, b | HS-PS1-7 |  |
| 45 |  | 3.1 | **Practice Performance Task**  Molar Challenges  *This practice performance task assesses learning objectives and essential knowledge statements addressed up to this point in the unit.* |  |  | HS-PS1-7 |  |
| 45 |  | 3.1 | Review Practice Performance Task: Students work through the practice performance task in small groups on large whiteboards. |  |  | HS-PS1-7 |  |
| 45 |  | 3.1 | **Learning Checkpoint 1**  *This learning checkpoint can assess any of the learning objectives from its associated Key Concepts.* |  |  |  |  |
| 45 |  | 3.1 Counting Particles in Substances | Review Learning Checkpoint 1: Students individually correct each missed question. |  |  |  |  |
| 45 |  | 3.1 Counting Particles in Substances | Ideal Gas Law Reinforcement: Students practice calculations in small groups or individually. | 3.1.B.1–3 | 3.1.A a, b  3.1.B a–c |  |  |
| 90 |  | 3.1 Counting Particles in Substances | Lab: Determining R. Students—use the reaction between magnesium and hydrochloric acid to experimentally determine the value of the ideal gas constant. | 3.1.B.1–3 | 3.1.A a, b  3.1.B a–c |  |  |
| 60 |  | 3.2 Counting Particles in Chemical Reactions | Balancing equations: Students will complete online simulations and practice in small groups. | 3.2.A.1 | 3.2.A a, b | HS-PS1-7 |  |
| 60 |  | 3.2 Counting Particles in Chemical Reactions | Lab: Chemical Reactions—Students observe a variety of chemical reactions and practice writing balanced equations for the reactions. | 3.2.A.1 | 3.2.A a, b | HS-PS1-7 |  |
| 105 |  | 3.2 Counting Particles in Chemical Reactions | Stoichiometry: Provide direct instruction to support small group or individual practice using calculations and particle representations. | 3.2.B.1, 2 | 3.2.B | HS-PS1-7 |  |
| 105 |  | 3.2 Counting Particles in Chemical Reactions | Pre-AP Model Lesson 3.3: Candy That Pops —  A Stoichiometry Lab | 3.1.A.2  3.2.A.1  3.2.B.2  3.2.D.1 | 3.1.A.b  3.2.A.a, b  3.2.B  3.2.D | HS-PS1-7 |  |
| 45 |  | 3.2 Counting Particles in Chemical Reactions | Pre-AP Model Lesson 3.4: Limiting Reactants | 3.2.C.1 | 3.2.C | HS-PS1-7 |  |
| 105 |  | 3.2 Counting Particles in Chemical Reactions | Lab: Determining Percent Yield—Students will determine the percent yield of a reaction between copper (II), chloride, and sodium carbonate. | 3.2.D.1 | 3.2.D | HS-PS1-7 |  |
| 45 |  | 3.2 | **Learning Checkpoint 2**  *This learning checkpoint can assess any of the learning objectives from its associated Key Concepts.* |  |  |  |  |
| 45 |  | 3.2 Counting Particles in Chemical Reactions | High and Low Review Learning Checkpoint 2: In groups of 3 or 4, have students estimate whether answers to calculations should be higher or lower than the original value given without a calculator. |  |  |  |  |
| 45 |  | 3.1, 3.2 | Unit Review: Mole Races—Use a game to review molar relationships. | 3.1.A.2  3.1.B.2  3.2.A.1  3.2.B.1, 2  3.2.C.1 | 3.1.A.b  3.1.B.a–c  3.2.A.a, b  3.2.B  3.2.C | HS-PS1-7 |  |
| 45 |  | 3.1, 3.2 | **Performance Task**  The Chemistry of Respiration  *This performance task assesses learning objectives and essential knowledge statements addressed in the unit.* |  |  | HS-PS1-7 |  |
| 45 |  | 3.1, 3.2 | Review Performance Task: Students work through the performance task in small groups on large whiteboards |  |  | HS-PS1-7 |  |

[add or remove rows as needed]

### Reflections

What went well in this unit?

When were students most engaged during this unit?

How have students grown? What opportunities for growth stand out at this time?

What needs modification or differentiation next time?

## Unit 4 Chemical Transformations

| **Pacing in Minutes** | **Date(s)** | **Key Concepts** | **Materials/Resources/Tasks**  *Pre-AP Model Lessons, Additional Lessons, Labs, Textbooks,  Performance Tasks, Assessments* | **Learning Objectives** | **Essential Knowledge** | **State Standards** | **Reflections on  Areas of Focus & Shared Principles** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 90 |  | 4.1 Precipitation Chemistry | Pre-AP Model Lesson 4.1: Introduction to Precipitation Reactions | 4.1.A.1  4.1.B.1 | 4.1.A  4.1.B | HS-PS1-2 |  |
| 60 |  | 4.1 Precipitation Chemistry | Predicting Products of Reactions: In pairs, students will use cards with chemical formulas to “build” reactions and ultimately predict the outcome of precipitation reactions. | 4.1.A.1  4.1.B.1 | 4.1.A  4.1.B | HS-PS1-2 |  |
| 105 |  | 4.1 Precipitation Chemistry | Pre-AP Model Lesson 4.2: Molarity and Precipitation Reactions | 4.1.B.1  4.1.C.1, 2  4.1.D.1, 2 | 4.1.B  4.1.C  4.1.D | HS-PS1-2 |  |
| 90 |  | 4.1 Precipitation Chemistry | Molarity Practice and Reinforcement: Students will complete practice problems on large whiteboards in groups of 3 or 4. The problems involve conceptual questions, particulate representations, and calculations. | 4.1.C.1, 2 | 4.1.C |  |  |
| 135 |  | 4.1 Precipitation Chemistry | Lab: Gravimetric Analysis—Students will calculate the percentage by mass of SO42- in an unknown sulfate salt using a stoichiometric analysis of a collected precipitate. They will then use the percentage to identify the metal “M” present in the sulfate salt. | 3.1.A.2  4.1.D.1, 2 | 3.1.A.b  4.1.D | HS-PS1-7 |  |
| 45 |  | 4.2 Oxidation−Reduction Chemistry | Pre-AP Model Lesson 4.3: The Chemistry of Rusting—An Introduction to Redox Reactions | 4.2.A.1, 2  4.2.C.1 | 4.2.A.a–c  4.2.C | HS-PS1-2 |  |
| 75 |  | 4.2 Oxidation−Reduction Chemistry | Pre-AP Model Lesson 4.4: Redox Reactions—Rusting Nails and Tarnishing Silver | 4.2.A.1, 2  4.2.C.1 | 4.2.A.a–c  4.2.C | HS-PS1-2 |  |
| 90 |  | 4.2 Oxidation-Reduction Chemistry | Activity Series Lab: Students will collect data to rank metals in terms of reactivity. | 4.2.B.1, 2 | 4.2.B | HS-PS1-2 |  |
| 45 |  | 4.1, 4.2 | **Learning Checkpoint 1**  *This learning checkpoint can assess any of the learning objectives from its associated Key Concepts.* |  |  |  |  |
| 45 |  | 4.1, 4.2 | Review Learning Checkpoint 1: Students will work in small groups to retake the Learning Checkpoint. Allow time for discussion, peer teaching, and review. Scores on the assessment should be given only after the group review. |  |  |  |  |
| 45 |  | 4.1, 4.2 | **Practice Performance Task**  Reactions of Copper and Aluminum  *This practice performance task assesses learning objectives and essential knowledge statements addressed up to this point in the unit.* |  |  | HS-PS1-2  HS-PS1-7 |  |
| 45 |  | 4.1, 4.2 | Review Practice Performance Task: Students will write the net ionic equations in groups of 4 on large whiteboards. Create a gallery walk of sample responses for the particle diagrams and have students evaluate each diagram in their small groups. |  |  | HS-PS1-2  HS-PS1-7 |  |
| 90 |  | 4.3: Acid−Base Chemistry | Pre-AP Model Lesson 4.5: Acids, Bases, and PH | 4.3.A.1–3  4.3.B.1 | 4.3.A  4.3.B |  |  |
| 60 |  | 4.3 Acid-Base Chemistry | pH Calculations: Students will work in pairs to practice calculating pH, [H+], and [OH-] for acidic and basic solutions. | 4.3.B.2 | 4.3.B |  |  |
| 45 |  | 4.3: Acid−Base Chemistry | Pre-AP Model Lesson 4.6: Classifying Reactions | 4.1.A.1  4.1.B.1  4.2.A.1  4.2.C.1  4.3.C.1  4.3.D.1 | 4.1.A  4.1.B  4.2.A.a–c  4.2.C  4.3.C  4.3.D | HS-PS1-2 |  |
| 60 |  | 4.4 Thermochemistry | Lab: Endothermic and Exothermic Reactions—Students are given temperature probes and two sets of reactants. They will determine which reaction is endothermic and which reaction is exothermic. Individually, students will write evidence-based claims to summarize their findings. | 4.4.A.1 | 4.4.A a, b | HS-PS1-4 |  |
| 45 |  | 4.4: Thermochemistry | Pre-AP Model Lesson 4.7: Bond Energy and Fuel Reactions | 4.4.B.1 | 4.4.B | HS-PS1-4 |  |
| 60 |  | 4.4 Thermochemistry | Hot/Cold Packs Simulation: Students will work in pairs using an online simulation of a hot/cold pack to associate an increase or decrease in temperature with absorbing and releasing energy. | 4.4.A.2 | 4.4.A a, b | HS-PS1-4 |  |
| 60 |  | 4.4 Thermochemistry | Lab: Heat of Solution—Students will observe a temperature change when dissolving an ionic solid in water. | 4.4.A.2 | 4.4.A a, b | HS-PS1-4 |  |
| 45 |  | 4.4 Thermochemistry | Thermo Review: Students work through stations in small groups. | 4.4.A.1–3  4.4.B.1 | 4.4.A a, b  4.4 B | HS-PS1-4 |  |
| 45 |  | 4.5 Reaction Rates | Kinetics Simulation: Students will use an online simulation to observe changes to the rate of a reaction on the particulate level. | 4.5.A.1 | 4.5.A a–c | HS-PS1-5 |  |
| 90 |  | 4.5 Reaction Rates | Collision Theory Stop Motion: Students will create stop motion videos to demonstrate effective collisions between reactants. | 4.5.A.1 | 4.5.A a–c | HS-PS1-5 |  |
| 105 |  | 4.5: Reaction Rates | Pre-AP Model Lesson 4.8: Antacid Rate of Reaction Lab | 4.5.A.2 | 4.5.A.a–c | HS-PS1-5 |  |
| 45 |  | 4.3, 4.4, 4.5 | **Learning Checkpoint 2**  *This learning checkpoint can assess any of the learning objectives from its associated Key Concepts.* |  |  |  |  |
| 45 |  | 4.3, 4.4, 4.5 | Review Learning Checkpoint 2: Students (individually or in small groups) will use an online polling app to review the most commonly missed items. Rotate and have each group defend their answer. |  |  |  |  |
| 45 |  | 4.1, 4.2, 4.3, 4.4, 4.5 | Unit Review: Students rotate through stations in small groups to review the learning objectives for this unit. | 3.1.A.2  3.2.A.1  3.2.B.2  3.2.D.1  4.1.A.1  4.1.B.1  4.1.C.1, 2  4.2.A.1, 2  4.2.B.1  4.1.B.2  4.2.C.1 | 3.1.A.b  3.2.A.a, b  3.2.B  3.2.D  4.1.A  4.1.B  4.1.C  4.2.A.a–c  4.2.B  4.2.C | HS-PS1-2  HS-PS1-4  HS-PS1-5  HS-PS1-7 |  |
| 45 |  | 4.1, 4.2, 4.3, 4.4, 4.5 | **Performance Task**  Applications of Chemical Transformations  *This performance task assesses learning objectives and essential knowledge statements addressed in the unit.* |  |  | HS-PS1-2  HS-PS1-4  HS-PS1-5  HS-PS1-7 |  |
| 45 |  | 4.1, 4.2, 4.3, 4.4, 4.5 | Review Performance Task: Students will work in groups of 3 or 4 to review selected portions of the Performance Task. For Part 1, have students complete the card sort as a small group followed by a whole group discussion. For Parts 2 and 3, select sample responses from the class (without names) and have the small groups evaluate the responses. Vary the completeness or correctness of the responses chosen. |  |  | HS-PS1-2  HS-PS1-4  HS-PS1-5  HS-PS1-7 |  |

[add or remove rows as needed]

### Reflections

What went well in this unit?

When were students most engaged during this unit?

How have students grown? What opportunities for growth stand out at this time?

What needs modification or differentiation next time?