Lesson Walk-Through

Introduction

Chemistry © 2012 offers opportunities for teaching chemistry that fully integrate text, inquiry, and digital resources. The Teacher's Edition offers a variety of tools to assist teachers in planning for understanding, setting assessment goals, and teaching the concepts.

com and the Classroom Resource DVD-ROM offer engaging digital content, assessments, and editable instructional and lab materials. This guide provides teachers with suggestions on using these materials to teach a typical lesson from the program.

Planning for Instruction and Assessment

The Teacher's Edition provides tools that give teachers guidance in planning instruction for chapters and lessons. Teachers can use the Pacing Guide and Planning Guide as at-a-glance references for planning.

Pacing Guide

The Pacing Guide is located on p. T16 in the front matter of the Teacher's Edition. This year-at-a-glance table breaks the chapters and lessons down into thirty-six weeks. It offers pacing suggestions for basic students, average students, and enriched students. Basic Students are those that struggle to learn science concepts or have deficiencies in math or reading. The Pacing Guide suggests a slower pace for these students. Ideally, these students will complete all of the chapters by week thirty-six. The pacing suggestions for Average Students provide coverage for thirty-five weeks, with an additional week devoted to a chemistry project. Enriched Students will need to have additional time for challenging content and projects. These students are projected to finish the chapters in thirty-four weeks, with time built in for two additional chemistry projects.

Planning Guide

The Planning Guide is located at the beginning of each chapter. This table is broken down by overall chapter activities and lesson resources. Columns provide information about the Lessons and Objectives, Print Resources, and Digital Resources. Print resources for students include workbook pages, lab activities, and lesson assessments. Teacher print resources include class activities, teaching resources, and teacher demonstrations. Digital resources include editable blackline masters for lesson activities and labs and interactive digital content. The bottom row of the table lists the assessment resources for the chapter. The left margin of the Planning Guide contains a Materials List for lab activities and an Additional Digital Resources section for supplementary digital resources.

Chapter Opener

The Chapter Opener is used to highlight the Big Ideas and Essential Questions that students will need to know for each chapter. The Big Ideas are the overall concepts addressed in the chapter, and the Essential Questions address the concepts they must understand by the end of the chapter. To learn more about the Big Ideas and Essential Questions, please refer to the Applying the Understanding by Design® Framework tutorial guide.

The Chapter Opener photo and CHEMystery help students connect to the Big Ideas and Big Questions. On pp. 382–383, students relate the Big Ideas and Essential Questions to process of baking. The CHEMystery introduces scenarios that help students build background, activate prior knowledge, and relate the chapter concepts to realistic situations. The CHEMystery on p. 383 is about the result of changing the amounts of ingredients in a cookie recipe. Throughout the chapter, students consider the facts of the mystery and use their knowledge of balanced chemical equations and calculations of reactants and products to solve the mystery.

Untamed Science

Use the Untamed Science feature to build additional background and set a purpose for the chapter. The Untamed Science Crew introduces the concepts through engaging videos that feature the team in realistic scenarios, on-location science investigations, and relatable chemistry demonstrations. These video clips are available at SavvasChem.com and on the Classroom Resource DVD-ROM.

The Untamed Science video for Chapter 12, Avogadro's Cookies, is found on SavvasChem.com in the Chapter Level Activities folder for Chapter 12. Teachers can show this video to an entire class or they can assign it to individual students.

Lesson Overview

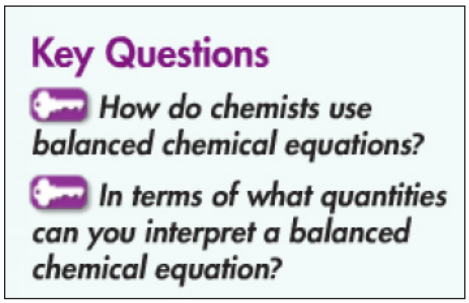
Each lesson is arranged so that there are plenty of opportunities to engage, explain, explore, and evaluate the content. This pattern is established for the lesson topic and each Key Question.

Engage

The Teacher's Edition introduces each lesson with an Engage section. This section provides opportunities to build background, activate prior knowledge, and set the purpose for learning the lesson's concepts. Key Questions, Vocabulary, and Chemistry & You are features that are available in the Engage section.

Key Questions

Key Questions provide students with a focus and a purpose for learning the chapter's concepts.

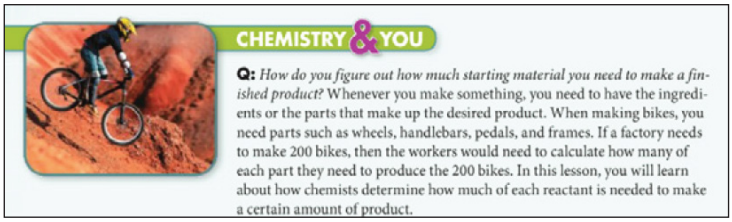


Vocabulary

Vocabulary is presented during the Engage section of lesson. During this section teachers introduce and preteach the vocabulary words that the students will need to know during the lesson. The Focus on ELL notes provide vocabulary tips that can be used for English Language Learner, but they may also be used to assist all learners. For instance Lesson 12.3 on p. 400 suggests discussion the word reagent, and discussing the word's Latin derivative "react."

Chemistry & You

Chemistry & You is part of the Engage section for each lesson. This feature presents an engaging question that relates to a problem that students can understand in their everyday lives.


CHEMISTRY & YOU

Q: *How do you figure out how much starting material you need to make a finished product?* Whenever you make something, you need to have the ingredients or the parts that make up the desired product. When making bikes, you need parts such as wheels, handlebars, pedals, and frames. If a factory needs to make 200 bikes, then the workers would need to calculate how many of each part they need to produce the 200 bikes. In this lesson, you will learn about how chemists determine how much of each reactant is needed to make a certain amount of product.

Explain

The Explain section helps teachers explain the main concept of the lesson and address the content needed to answer the Key Questions for the lesson. Depending on the lesson, there may be two to four Explain sections per lesson. This section contains samples problems and activities to start a conversation, use visuals, address misconceptions, and make connections to prior concepts. An example for Lesson 12.3 on p. 401 is a section on using visuals on pp. 401–402.

In addition to using the images in the book to explain the concept of limiting and excess reagents, teachers and students are alerted to digital content by the Kinetic Art icon. This digital feature provides an animated look at these concepts in action.

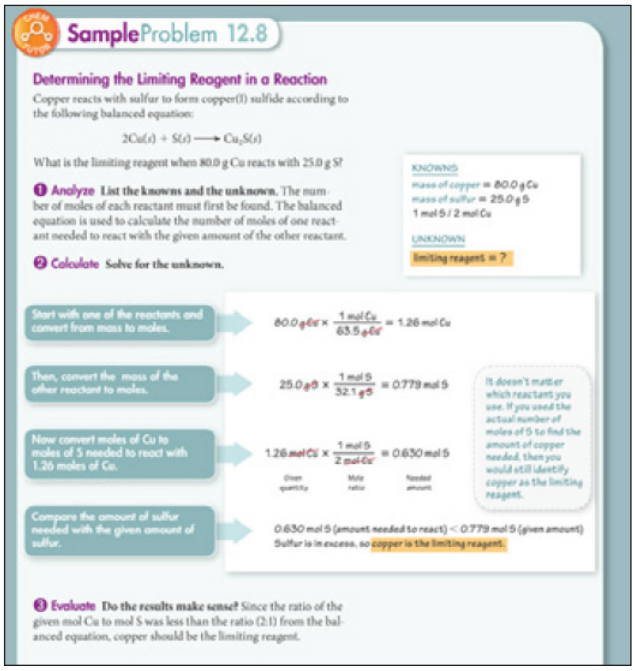
Explore

The Explore section appears several times during a lesson. During this section, sample problems, hands-on activities, demonstrations are conducted. Activities may include teacher demonstrations, Quick Labs, Small-Scale Labs, and other class activities. The Explore sections for Lesson 12.3 offer a Teacher Demo that illustrates the concept of a limiting reagent (p. 401), using simple molecular models to demonstrate a limiting reagent in a chemical reaction (p. 403), and a Quick Lab where students observe the effect that changing the amount of a limiting reagent in a reaction has on the amounts of products (p. 404).

Some of the hands-on activities in the Explore section have Virtual Labs that may be used as stand-alone activities or in addition to the hands-on activity. For instance, the Small-Scale Lab for Lesson 12.2 on p. 399, Analysis of Baking Soda, can be done as a class lab activity. However, the Virtual Lab icon indicates that it may be also conducted as a virtual activity.

Sample Problems

Sample Problems are located in the Explain and Explore sections of the lesson. These problems demonstrate chemical concepts in the context of mathematical equations. Each problem walks students through a three-step process of solving the problem. First, students analyze the problems for known and unknown variables. Second, students use calculations to solve for the unknown variables. Third, students evaluate their solutions and determine if their results make sense.



Sample Problem 12.8

Determining the Limiting Reagent in a Reaction

Copper reacts with sulfur to form copper(I) sulfide according to the following balanced equation:

$$2Cu(s) + S(s) \longrightarrow Cu_2S(s)$$

What is the limiting reagent when 80.0 g Cu reacts with 25.0 g S?

1 Analyze **List the knowns and the unknown.** The number of moles of each reactant must first be found. The balanced equation is used to calculate the number of moles of one reactant needed to react with the given amount of the other reactant.

KNOWNS
mass of copper = 80.0 g Cu
mass of sulfur = 25.0 g S
1 mol S / 2 mol Cu

UNKNOWN
limiting reagent = ?

2 Calculate **Solve for the unknown.**

Start with one of the reactants and convert from mass to moles.

$$80.0\ g\ Cu \times \frac{1\ mol\ Cu}{63.5\ g\ Cu} = 1.26\ mol\ Cu$$

Then, convert the mass of the other reactant to moles.

$$25.0\ g\ S \times \frac{1\ mol\ S}{32.1\ g\ S} = 0.779\ mol\ S$$

It doesn't matter which reactant you use. If you used the actual number of moles of S to find the amount of copper needed, then you would still identify copper as the limiting reagent.

Now convert moles of Cu to moles of S needed to react with 1.26 moles of Cu.

$$1.26\ mol\ Cu \times \frac{1\ mol\ S}{2\ mol\ Cu} = 0.630\ mol\ S$$

Given quantity · Mole ratio · Needed amount

Compare the amount of sulfur needed with the given amount of sulfur.

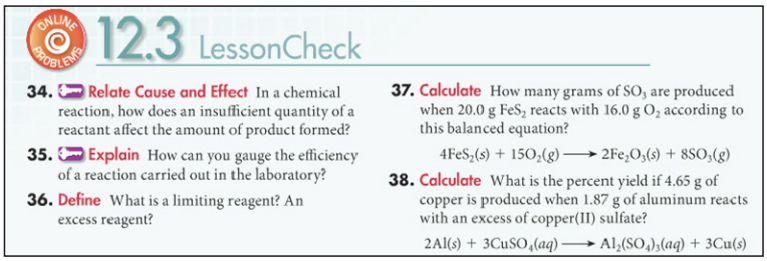
0.630 mol S (amount needed to react) < 0.779 mol S (given amount)
Sulfur is in excess, so copper is the limiting reagent.

3 Evaluate **Do the results make sense?** Since the ratio of the given mol Cu to mol S was less than the ratio (2:1) from the balanced equation, copper should be the limiting reagent.

Many Sample Problems offer students additional digital help. For example, Sample Problem 12.8 on p. 402 features a Chem Tutor icon. This icon indicates that students may do a step-by-step tutorial using the Chem Tutor feature online.

Evaluate

The Evaluate section features informal assessments that evaluate student understanding of the lesson concepts. These assessments make connections back to the chapter's Big Ideas. Each lesson concludes with a Lesson Check.



12.3 LessonCheck

34. Relate Cause and Effect In a chemical reaction, how does an insufficient quantity of a reactant affect the amount of product formed?

35. Explain How can you gauge the efficiency of a reaction carried out in the laboratory?

36. Define What is a limiting reagent? An excess reagent?

37. Calculate How many grams of SO_3 are produced when 20.0 g FeS_2 reacts with 16.0 g O_2 according to this balanced equation?

$$4FeS_2(s) + 15O_2(g) \longrightarrow 2Fe_2O_3(s) + 8SO_3(g)$$

38. Calculate What is the percent yield if 4.65 g of copper is produced when 1.87 g of aluminum reacts with an excess of copper(II) sulfate?

$$2Al(s) + 3CuSO_4(aq) \longrightarrow Al_2(SO_4)_3(aq) + 3Cu(s)$$

The Lesson Check for Lesson 12.3 displays the Online Problems icon. This icon signifies that additional problems are available online. These problems offer continued practice for the lesson concepts.

Chapter Wrap-Up

The Assessments section at the end of each chapter allow opportunities for students to complete items related to each lesson, apply overall chapter concepts, and solve the CHEMystery.

The Lesson by Lesson icon on p. 411 indicates questions that are specifically targeted to the concepts presented in each lesson.

The Understand Concepts icon on p. 412 indicates problems that target the overall concepts of the chapter.

Finally, on p. 415 students must apply what they have learned to solve the CHEMystery and relate it back to the chapter's Essential Questions and Big Ideas.

Review

This guide provided a lesson walk-through of Savvas Chemistry © 2012. It explained the planning tools available for each chapter. It explained how to launch the study of a chapter. This guide also introduced the Engage, Explain, Explore, and Evaluate phases of each chapter. Finally, it described the assessment items included in the Chapter Wrap-Up for each chapter.