Lesson 2.4: Physical Science – Chemical Compounds

Weekly Focus: Comprehension
Weekly Skill: Reading for Understanding

Lesson Summary: This week students will focus on reading for comprehension in the context of chemical compounds. This lesson incorporates a lot of material to read and comprehend that will be foundational knowledge for students taking the GED 2014 science module.

Materials Needed:

- Boyle's Perfect Mixtures (Reading for Comprehension) **Unit 2.4 Handout 1** (Spectrum Science, Grade 6, pages 40-41)
- Everyday Compound or Poison? (Reading for Comprehension) **Unit 2.4 Handout 2**
- Number of Atoms by Formula (Extension Activity/Homework) **Unit 2.4 Handout 3**

Objectives: Students will be able to…

- Read for comprehension with a multi-paragraph passage in physical science.
- Apply knowledge gained in reading passages to answer comprehension questions with vocabulary related to physical science

College and Career Readiness Standards: RI, RST, WHST, SL

ACES Skills Addressed: EC, LS, ALS, CT, SM, N

Notes: Please review and be familiar with classroom routine notes for: reading for fluency strategies (**Routine 2**) and summarizing techniques (**Routine 4**). The classroom routine notes will help with making a smooth transition to each activity.

GED 2014 Science Test Overview – For Teachers and Students

The GED Science Test will be 90 minutes long and include approximately 34 questions with a total score value of 40. The questions will have focus on three content areas: life science (~40%), physical science (~40%), and Earth and space science (~20%). Students may be asked to read, analyze, understand, and extract information from a scientific reading, a news brief, a diagram, graph, table, or other material with scientific data and concepts or ideas.

The online test may consist of multiple choice, drop down menu, and fill-in-the-blank questions. There will also be a short answer portion (suggested 10 minutes) where students may have to summarize, find evidence (supporting details), and reason or make a conclusion from the information (data) presented.

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The work students are doing in class will help them with the GED Science Test. They are also learning skills that will help in many other areas of their lives.

Activities:

Warm-Up: KWL Chart	**Time: 10 - 15 minutes**

- As students enter the class, have the following written on the board or overhead **"In chemistry, mixtures and compounds are ways of combining substances. What do you know about mixtures and compounds?"** Have students create a **"KWL"** chart on a piece of notebook paper (below). This helps to activate students' prior knowledge by asking them what they already **K**now (column 1); students (collaborating as a classroom unit or within small groups) set goals specifying what they **W**ant to learn (column 2); and after reading students discuss what they have **L**earned (column 3).
- Students apply higher-order thinking strategies which help them construct meaning from what they read and help them monitor their progress toward their goals.

KWL Chart:

K - What (else) do I KNOW?	**W - What do I WANT to know?**	**L - What did I LEARN?**

Activity 1: Reading for Comprehension (Unit 2.4 Handout 1)	**Time: 30 - 40 minutes**

1) Distribute **Unit 2.4: Handout 1** to students.
2) Discuss with students that when reading for comprehension, there are many strategies to use: read the title to predict what the reading is about; look at the words in bold and their definitions on the left side of page; if there are images, look at them to get a better understanding; while reading remember to ask "What is this all about?"
3) Have students read the passage and answer the questions independently.
4) Circulate class while they are reading to make sure they understand the information presented and see if there are any questions.
5) Review answers as a whole class – Note: some answers may vary – ask students with different answers to discuss theirs with the class.
6) Have students fill in the "**L**" part of their KWL chart to reinforce what was learned from the passage.
7) If there is extra time, have students read the passage in pairs to promote reading fluency (**Routine 2**).

Break: 10 minutes

Activity 3: Main Idea Reading (Unit 2.4 Handout 2)	**Time: 45 - 55 minutes**

1) Hand out **Unit 2.1 Handout 2** to students.
2) Discuss with students that when reading, they should pay close attention to what all of the passage is about. Inform students the passage will continue with compounds, but it focuses on one compound.

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3) Ask students to read the passage and answer the questions that follow. Circulate the class while students are working independently to help as needed. Remind students to check for comprehension while reading. They should ask themselves at the end of every paragraph if they understood what they just read. If not, they may need to reread the paragraph.
4) When students are finished, review answers as a whole class.
5) Ask for students to share their answers if they would like. Ask students to point out the evidence from the passage that helped them determine the correct answer. If there is time, you may have students practice reading for fluency and read the passage to each other in pairs (**Routine 2**).

Wrap-Up: Summarize	**Time: 5 minutes**
Have students turn to a partner (or write in their journals) about what they have learned today about chemical compounds. Ask them to tell a partner about chemical compounds in one or two sentences. *Note: Use Routine 4 Handout: Summarizing*	

Extra Work/Homework: Unit 2.4 Handout 3	**Time: 30 minutes outside of class**
Students need to refer to the Periodic Table from lesson 2.3 to work on this activity. Teachers may want to show students how to use their background knowledge to complete the worksheet. Many of the basic elements are important to know and understand for GED 2014.	

Differentiated Instruction/ELL Accommodation Suggestions	**Activity**
If some students finish early, they can turn their paper over and summarize the reading passage, or write a statement for the main idea of the passages. These are excellent opportunities to practice skills will need for GED 2014.	**Handout 1 and Handout 2**
Teachers should be aware that students could have some difficulty with some vocabulary during Activities 1 & 2. Make sure dictionaries are available for students to look up words. Teachers can also help students with vocabulary by discussing the importance of taking notes or highlighting vocabulary. You can also ask students about vocabulary while circulating in the classroom.	**Handout 2**

Online Resources:

Chem4kids.com - http://www.chem4kids.com/files/atom_compounds.html

ReadWorks: http://www.readworks.org/passages/everyday-compound-or-poison

Suggested Teacher Readings:

- GED Testing Service – GED Science Item Sample (to get an idea of what the test *may* be like)

  http://www.gedtestingservice.com/itemsamplerscience/

- Assessment Guide for Educators: A guide to the 2014 assessment content from GED Testing Service:

http://www.riaepdc.org/Documents/ALALBAASSESSMENT%20GUIDE%20CHAPTER%203.pdf

- Minnesota is getting ready for the 2014 GED test! – website with updated information on the professional development in Minnesota regarding the 2014 GED.

  http://abe.mpls.k12.mn.us/ged_2014_2

Unit 2.4 Handout 1

TEACHER ANSWER KEY

1. a
2. b
3. Answers may vary, but should be similar to: **They both contain the atoms of two or more elements.**
4. Answers may vary, but should be similar to: **A compound contains two or more elements that have combined chemically to form molecules. Mixtures contain two or more substances that have not combined chemically.**
5. Answers may vary, but should be similar to: **Table salt is a compound.**
6. Answers may vary, but should be similar to: **Alchemy was an ancient art that worked with metals. Chemistry is the modern, scientific study of chemicals and elements that grew out of alchemy.**

Unit 2.4 Handout 3 (4 pages total)

Everyday Compound or Poison?

All elements found on the periodic table have certain distinct properties. Elements are single types of atoms, while atoms are the fundamental building blocks of all matter. Gold, for instance, is a soft, naturally occurring metal known for being beautiful and desired. Gold is malleable, and while it is found naturally in the environment, it is often reworked and incorporated into fine jewelry. Oxygen is a necessary and naturally occurring element. It's an invisible, odorless gas that's a crucial part of the air we breathe and necessary for our bodies to function properly. Often, elements like those noted are combined in varying ways to create new chemical substances.

Chemical substances react in certain ways and also have certain discernible properties. For instance, when an oxygen atom and two hydrogen atoms come together they form water, which is essential to life. When the atoms of a specific substance are regrouped, a new substance is formed with often vastly different properties from the original substance. Occasionally something completely harmless, or even necessary, can become dangerous or lethal when its molecules (a grouping of two or more atoms) are regrouped.

The components of table salt are a good example of how different substances can look when their atoms are rearranged. Common table salt, also known as sodium chloride, is an interesting chemical compound because, while it is commonly consumed by humans, when you separate its elements—sodium and chlorine—you are left with something quite different from the edible seasoning known as salt.

The components of salt are sodium and chlorine, both of which are harmful for human consumption and even contact. Sodium requires great care when being handled. If it comes into contact with water, the reaction can be flammable, while powdered sodium has the potential to be combustible (explosive) in oxygen or air.

Chlorine, meanwhile, is an extremely caustic and dangerous substance. Chlorine is used primarily as a cleaning agent; it is commonly used in swimming pools to render them sanitary, but is mixed with other chemicals and diluted for these purposes. This is what makes it safe for people to swim in swimming pools.

Chlorine has also had other, more dangerous uses in the past. Chlorine is a toxic gas that is extremely harmful to the respiratory system and may also react with certain flammable materials. When chlorine reacts with the mucous of the lungs, it can create a potentially lethal compound known as hydrochloric acid. During World War I, chlorine gas was used by Germany as a chemical weapon. It only takes a few deep breaths of the gas, at a certain potency, to cause death.

Hydrochloric acid, a clear solution of hydrogen and chlorine in water, has other uses, however, including household cleaning and food processing. It's also found naturally in the body's gastric acid. Hydrochloric acid is found in food-grade purification levels in products such as aspartame, fructose and citric acid, as well as in gelatin production.

Another, perhaps more familiar, example of atoms being regrouped to form a different compound is carbon monoxide and carbon dioxide. These gases are mentioned often and frequently mistaken for one another, but each serves very different purposes. The scientific difference between the two compounds is the number of oxygen atoms bonded with the carbon atom. But the general difference—the one we notice as humans—is quite significant.

Both carbon monoxide and carbon dioxide are colorless, odorless gases. Carbon monoxide occurs naturally in animal metabolism, plant photosynthesis, volcano eruption, forest fires and other combustion. It also comes from manmade processes like operating a stove. When carbon monoxide accumulates in a contained area, it can become lethal to humans. People who directly inhale enough carbon monoxide will lose consciousness and eventually die.

Carbon dioxide, on the other hand, occurs naturally in the atmosphere. One way carbon dioxide is produced is through the breathing processes of humans and animals. Carbon dioxide is also emitted in the burning of fossil fuels. Additionally, carbon dioxide can be found in lakes and at the bottom of the ocean.

While carbon dioxide occurs naturally and is not known to be as harmful as carbon monoxide, it can still be dangerous to humans when inhaled in certain quantities.

Slight chemical changes can radically modify the characteristics of a compound, and we don't have to look to radically different elements to find enormous differences. Sometimes only a small difference in chemical composition results in a very important alteration.

Reformatted from ReadWorks (http://www.readworks.org/passages/everyday-compound-or-poison)

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Name: _____ Date: _____

1. What happens when the atoms of a substance are regrouped?

A. gold becomes malleable
B. the atoms break apart and disappear
C. a new substance is formed
D. the substance stays the same

2. The creation of carbon monoxide is an effect. What is one cause?

A. the regrouping of the atoms in table salt
B. the burning of fossil fuels
C. cleaning swimming pools
D. operating a stove

3. Table salt can be separated into sodium and chlorine. Sodium is explosive. Chlorine is a gas that can kill people. What can be concluded from the statements above?

A. A harmful compound can become harmless when its elements are separated.
B. A harmless compound can become harmful when its elements are separated.
C. Breaking a compound into its separate elements has no noticeable effects.
D. Breaking a compound into its separate elements can create carbon dioxide.

4. Based on the information in the passage, what is true of gases?

A. Some, but not all, gases are harmful to humans.
B. Any gas with carbon in it is not harmful to humans.
C. All gases are harmful to humans.
D. No gases are harmful to humans.

5. What is this passage mainly about?

A Germany's use of chlorine in World War I as a chemical weapon
B hydrochloric acid, aspartame, fructose, citric acid, and gelatin production
C the similarities and differences between carbon dioxide and carbon monoxide
D changes in chemical compounds and the effects of those changes

6. Choose the answer that best completes the sentence below.

Oxygen by itself is not harmful; _____, it can become harmful when combined with carbon.

A. however
B. for instance
C. in summary
D. namely

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7. Read the following sentences: "When the atoms of a specific substance are regrouped, a new substance is formed with often vastly different **properties** from the original substance. Occasionally something completely harmless, or even necessary, can become dangerous or lethal when its molecules (a grouping of two or more atoms) are regrouped."

What does the word **properties** mean above?

A. extremely large amounts
B. places where experiments are done
C. qualities or characteristics
D. elements or compounds

8. What is hydrochloric acid?

_____

_____

_____

_____

9. What is hydrochloric acid used for?

_____

_____

_____

_____

10. Should people make changes to chemical compounds? Support your answer with ***evidence*** from the passage.

_____

_____

_____

_____

What wonderings do you have about chemical compounds?

_____

_____

_____

Unit 2.4 Handout 2

TEACHER ANSWER KEY

1. C
2. D
3. B
4. A
5. D
6. A (shows contrast)
7. C
8. **Answers may vary, suggested answer:** Hydrochloric acid is a solution of hydrogen and chlorine in water.
9. **Answers may vary, suggested answer:** Hydrochloric acid is used for household cleaning and food processing.
10. **Answers may vary, but make sure their answers are supported with evidence from the passage.** Students arguing that people should not make changes to chemical compounds may point out the dangers of doing so. For example, breaking salt into its component elements, sodium and chlorine, creates two harmful substances. On the other hand, students may argue that combining elements can be helpful. One example is hydrochloric acid, a combination of hydrogen, chlorine, and water that is used for household cleaning and food processing.

Unit 2.4 Handout 3 (1 page) *(you may want to refer to the Periodic Table for this activity)*

Name _____ Date _____

Number of Atoms by Formula

Use the formulas to determine how many atoms are in each molecule. Use the terms in the word box to label each molecule.

iron oxide	hydrogen peroxide	sodium chloride
mercurous chloride	sulfuric acid	phosphoric acid
potassium carbonate	calcium chloride	ammonium bromide
copper sulfate	sodium sulfite	silver nitrate

Example: CO_2
Atoms: 1 atom of carbon and two atoms of oxygen = 3 atoms
Name: carbon dioxide

1 $NaCl$ Atoms: _____ Name: _____	2 H_2O_2 Atoms: _____ Name: _____	3 Hg_2Cl_2 Atoms: _____ Name: _____
4 Fe_2O_3 Atoms: _____ Name: _____	5 H_3PO_4 Atoms: _____ Name: _____	6 K_2CO_3 Atoms: _____ Name: _____
7 $CaCl_2$ Atoms: _____ Name: _____	8 NH_4Br Atoms: _____ Name: _____	9 $CuSO_4$ Atoms: _____ Name: _____
10 H_2SO_4 Atoms: _____ Name: _____	11 Na_2SO_3 Atoms: _____ Name: _____	12 $AgNO_3$ Atoms: _____ Name: _____

Unit 2.4 Handout 3 (1 page)

TEACHER ANSWER KEY

1. 2; sodium chloride
2. 4; hydrogen peroxide
3. 4; mercurious chloride
4. 5; iron oxide
5. 8; phosphoric acid
6. 6; potassium carbonate
7. 3; calcium chloride
8. 6; ammonium bromide
9. 6; copper sulfate
10. 7; sulfuric acid
11. 6; sodium sulfite
12. 5; silver nitrate