Name _____

1

GASES, LIQUIDS, AND SOLIDS

from the *Elements of Chemistry Series*

Pre-Test

Directions: This will help you discover what you know about the subject of matter before you begin this lesson. Answer the following true or false.

1. Many substances can exist as a gas, a liquid, or a solid but maintain their same chemical composition. T_____ F_____
2. Gases have no mass. T_____ F_____
3. Gases can never be compressed. T_____ F_____
4. The pressure of a gas depends on its temperature. T_____ F_____
5. Only three variables influence the behavior of gases: pressure, volume, and amount of the gas. T_____ F_____
6. The volume of gas is directly proportional to its temperature. T_____ F_____
7. When matter is in the form of a gas, the particles move more slowly than when it is in a solid state. T_____ F_____
8. Temperature is the primary variable that determines whether a substance is a gas, a liquid, or a solid. T_____ F_____
9. Water is a unique substance because it is denser when it is a solid than when it is a liquid. T_____ F_____
10. Most solids have a crystalline structure. T_____ F_____

Name _____

2a

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Vocabulary Definitions

The following words and terms used in the program may be unfamiliar to you. Try to listen for these terms while viewing the program, pay close attention so you can later include them in your scientific descriptions, observations, and creative writing assignment activities.

amorphous solids - Solids that lack a crystalline structure such as plastic, rubber, and glass.

atom - The fundamental unit of matter in the universe, made up of a nucleus of protons and neutrons and orbiting electrons

Avogadro, Amedeo - Italian chemist, 1776 - 1856.

Avogadro's Law - Equal volumes of gases at the same temperature and pressure contain an equal number of particles.

barometer - An apparatus that measures atmospheric pressure.

Boyle, Robert - English chemist, 1627 -1691. Boyle is often called the father of modern chemistry.

Boyle's Law - If the temperature and amount of a gas remains constant, the volume varies inversely as the pressure changes.

Charles, Jacques - French chemist, 1746 - 1823.

Charles's Law - The volume of a gas is directly proportional to its temperature.

chemical reaction - A change in the chemical composition of a substance.

compounds - When valence electrons of elements are lost, gained, or shared between different atoms to create substances with unique chemical properties.

crystalline structure - Having an internal molecular structure that resembles crystals.

Dalton, John - English chemist, 1766 - 1844.

Dalton's Law - The sum of the pressures of all the components in a gas mixture is equal to the total pressure of the gas mixture.

density - The ratio of the mass of an object to its volume. (Example: If two objects have the same volume and one is heavier than the other, then the heavier object is said to have the greater density.)

elastic movement - Constant, rapid, random movement in which the particles do not slow down or lose energy. Gas particles move with elastic motion.

electrons - Negatively charged particles that orbit the nucleus of atoms.

element - An atom with a unique number of protons.

kinetic energy - Form of energy that results in the movement of an object, or the energy of movement.

Kinetic-Molecular Theory - Explains the behavior of all matter by examining the inter-molecular forces between the particles and the energy they possess.

ion - Atoms with more electrons than protons or less electrons than protons.

ionic bonds - Two or more ions held together by the electrical attractions between them.

inter-molecular attractions - The electrical attraction between molecules and atoms.

mass - The total quantity of an object's matter.

matter - Material that makes up objects. Matter cannot be created or destroyed.

molecules - When electrons are shared between atoms. Molecules are covalent bonds.

periodic table - The arrangements of elements according to their atomic number.

pressure - The force exerted against an opposing body. All gases have pressure. When gases are compressed the pressure increases.

proton - Positively charged part of the nucleus of atoms.

surface tension - Tension at the surface of liquids which is the result of the imbalance of molecular forces.

temperature - A form of kinetic energy that is the result of the movement of particles.

viscosity - The inter-molecular attraction of a substance that makes it resist the tendency to flow.

volume - An amount of space occupied in three dimensions.

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2b

GASES, LIQUIDS, AND SOLIDS

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Use the Right Word

Directions: Find the right word from the vocabulary list that completes the following sentences.

1. Constant, rapid, random movement in which the particles do not slow down or lose energy is called _____movement.

2. An apparatus that measures atmospheric pressure is called a _____.

3. "If the temperature and amount of a gas remains constant, the volume varies inversely as the pressure changes" is called _____ Law.

4. "The volume of a gas is directly proportional to its temperature" is called _____ Law.

5. "Equal volumes of gases at the same temperature and pressure contain an equal number of particles" is called _____ Law.

6. _____ energy is the energy of movement.

7. When gases are compressed, the _____ rises.

8. Liquids that flow slowly are said to have _____.

9. Most solids have an internal _____ structure.

10. Solids that lack a crystalline structure such as plastics, rubber, and glass are called _____ solids.

Name _____

2c

GASES, LIQUIDS, AND SOLIDS
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Word Match

Directions: Connect the word with the proper definition.

amorphous	force exerted against an opposing body
barometer	resists tendency to flow
crystalline	amount of space
elastic	the result of imbalance of molecular forces
kinetic	measures atmospheric pressure
inter-molecular	constant, rapid, random movement
pressure	molecular structure of most solids
surface tension	attraction between molecules and atoms
viscosity	energy of movement
volume	solids lacking crystalline structure

Name _____

3

GASES, LIQUIDS, AND SOLIDS

from the *Elements of Chemistry Series*

Connected/Not Connected

Directions: Place the following words in the proper sentences.

amorphous	crystalline	inter-molecular	solids
atoms	density	kinetic	surface
Avogadro	electrical	particles	temperature
barometer	electrons	pressure	viscosity
Charles	gases	protons	volume

1. _____ is connected to _____ because the law named after him states that equal volumes of gases, at the same temperature and pressure, contain the same number of them.

2. _____ is NOT connected to _____ because one is a fundamental unit of matter and the other is a ratio of mass to volume.

3. A _____ is connected to atmospheric _____ because it is an instrument that takes this atmospheric measurement.

4. _____ are NOT connected to _____ because one is a particle in the nucleus of atoms and the other is a particle that circles the nucleus in orbitals.

5. _____ Law is connected to _____ because his law states it is directly proportion to temperature.

6. _____ tension is NOT connected to _____ because one is the result of the imbalance of molecular forces at the surface of liquids, and the other results from inter-molecular forces that resists the tendency of liquids to flow.

7. _____ attractions are connected to _____ attractions because both attractions are the same.

8. _____ are NOT connected to _____ because they are different states of matter.

9. _____ is connected to _____ energy because it is a measurement of the energy within substances.

10. _____ solids are NOT connected to _____ structures because these types of solids lack this structure.

Name _____

4

GASES, LIQUIDS, AND SOLIDS

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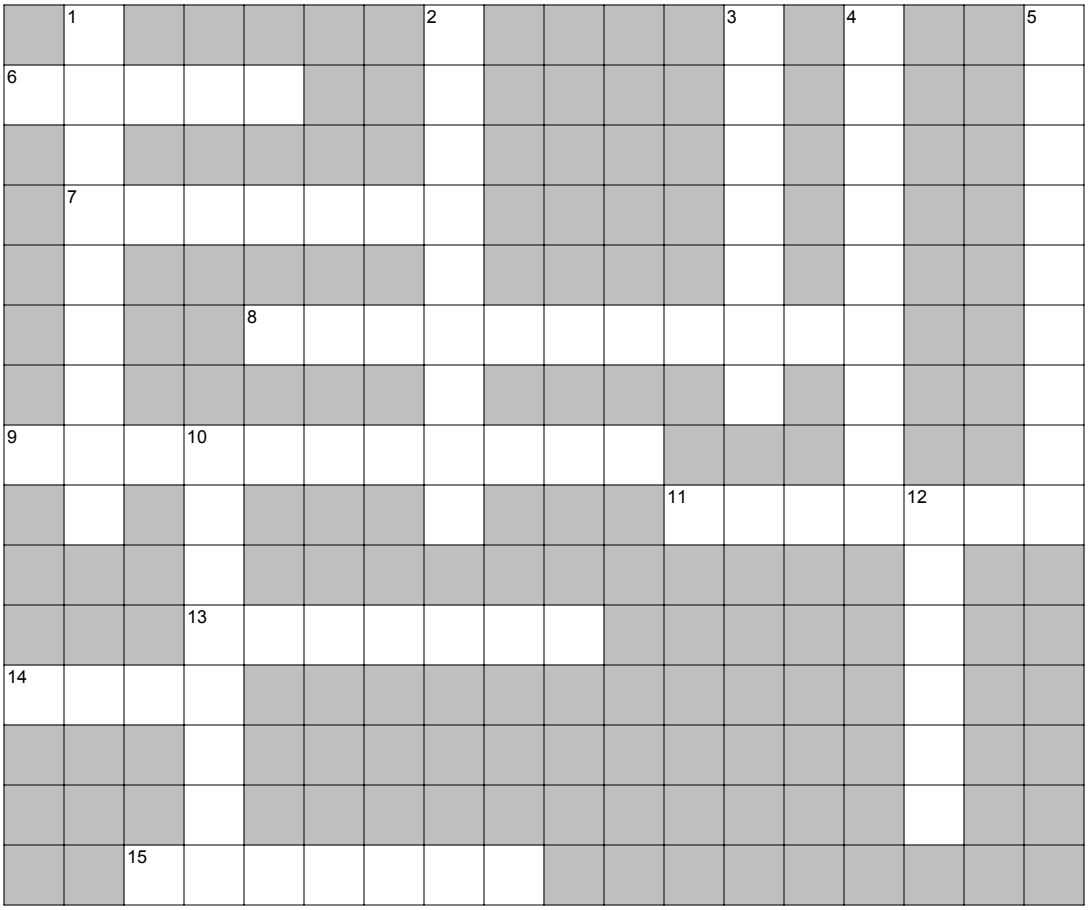
Crossword Puzzle



Across

6. Father of modern chemistry.
7. Constant, rapid, random movement.
8. Resembles crystals in strcture.
9. Kinetic energy resulting from the movement of particles.
11. Stated volume of a gas is proportional to its temperature.
13. _____ tension.
14. Total quantity of an object's matter.
15. Ratio of mass to volume.

Down:

1. Type of covalent bond.
2. Resists the tendency to flow.
3. Energy of movement.
4. Measures atmospheric pressure.
5. Solids lacking a crystalline structure.
10. Force exerted against an opposing body.
12. Flows.

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5

GASES, LIQUIDS, AND SOLIDS
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Creative Writing Story Ideas

Directions: Choose from one of the ideas listed below and write a story or dramatization. Include plot lines that follow scientific principles and key vocabulary terms.

1. Jacques Charles, the early French chemist, is experimenting with the notion that the temperature of a gas increases its volume. Two enterprising young people decide to use his conclusions to establish a ballooning business. Write a story, set in the era in which Charles lived, describing what happens.

2. A group of high school students is inside an inflatable sports dome when the pressure is suddenly lost. Write a film script that features not only what happens to the students but shows what innovative ways they develop to solve the emergency.

3. A large steel-making company has hired you to research the conversion of iron ore to pig iron and then to steel. What principles of chemistry are involved in this process? Research the steel-making process and write a report addressed to the president of the company describing your findings.

4. On a far off planet, a group of space travelers have discovered a new substance that is not a gas, a liquid, or a solid. Is this some new type of material that could have enormous consequences for humans? Write a science-fiction story that explores these themes.

5. One of the most unusual properties of water is that it is less dense when it is in the form of a solid than when it is in the form of a liquid. Write a story, using your understanding of chemistry, that describes what might happen if one day we woke up and found that water had similar properties as other substances. Humor might make the story more interesting.

Name _____

6

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Video Quiz

Directions: Answer the following either true or false, or fill in the blank with the correct word to make it true.

1. When matter changes from one state to another, it changes its chemical composition.
   T_____ F_____.

2. Gases fill containers completely.
   T_____ F_____

3. The pressure of a gas depends on its temperature.
   T_____ F_____

4. The kinetic energy of gas depends primarily on pressure.
   T_____ F_____

5. Boyle's Law states: "If the temperature and amount of a gas remains constant, the volume varies inversely as the pressure changes."
   T_____ F_____

6. The Kinetic-Molecular Theory of Matter only explains the behavior of matter when it is in a solid state.
   T_____ F_____

7. It is temperature that is the primary variable that determines whether a substance is a gas, a liquid, or a solid.
   T_____ F_____

8. Heat makes it more difficult to break the attractions between the particles of molecules and atoms.
   T_____ F_____

9. Water is a unique substance because when it is a solid its density is less than when it is a liquid.
   T_____ F_____

10. All solids have a crystalline structure.
    T_____ F_____

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7

GASES, LIQUIDS, AND SOLIDS

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Post-Test

amorphous	Dalton's Law	molecular	states
atmospheric	density	kinetic	surface
atoms	elastic	liquids	temperature
Avogadro	forces	pressure	viscosity
Boyle	gases	solids	volume

1. Most substances can exist as a gas, a liquid, or a solid. These are called different _____ of matter.

2. The _____ Molecular Theory explains the behavior of all matter by examining the inter-molecular forces between the particles and the energy they possess.

3. Solids that lack a crystalline structure are called _____ solids.

4. _____ tension is the result of the imbalance of forces.

Directions: Fill in the blank with True or False. If the statement is false, change it to make the statement true. Rewrite the true statement in the space provided.

5. _____ Most substances can exist as a gas, a liquid, or a solid, but when they change state they change their chemical composition.

6. _____ Gases fill containers completely.

7. _____ The Kinetic-Molecular Theory only applies to gases.

8. _____ Dalton's Law explains how hot air balloons rise.

9. _____ All substances at a given temperature have the same amount of energy.

Essay Section

Directions: Answer the following questions in complete sentences. Use the back of this page or a separate sheet of paper if you need more space to complete your answer.

10. Explain how hot air can lift balloons.

11. Explain the Kinetic-Molecular Theory of Matter.

12. Why are some liquids more viscous than others?