Name _____ Section _____ Date _____

Chapter 2: Basic Review Worksheet

1. What is *matter*? Of what is matter composed?
2. What is an *element* and what is a *compound*? Give examples of each.
3. Explain the differences among a *gas*, a *liquid*, and a *solid*.
4. What is meant by the term *chemical property*? What is meant by the term *physical property*?
5. What is meant by the term *chemical change*? What is meant by the term *physical change*?
6. What are *alloys*? Provide an example.
7. What is a *mixture*? Provide an example.
8. What is a *solution*? Provide an example.
9. What is meant by the term *pure substance*?
10. What is the difference between a *homogeneous mixture* and a *heterogeneous mixture*?
11. What are some of the techniques by which mixtures can be resolved into their components?

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Chapter 2: Review Worksheet

1. What are some of the different types of matter? How do these types of matter differ and how are they the same?

2. What is the difference between a chemical property and a physical property?

3. What is the difference between a chemical change and a physical change?

4. Classify each of the following as a chemical or physical property or change.
   a. Table salt dissolves in water.
   b. Water boils at 100°C.
   c. You bake a cake.
   d. A tree is struck by lightning.

5. Explain the difference between an *element* and a *compound*.

6. What is the difference between a *mixture* and a *solution*?

7. Are all elements pure substances? Are all compounds pure substances?

8. Are mixtures pure substances? Are solutions pure substances?

9. Explain the processes of *filtration* and *distillation* in your own words.

Name _____ Section _____ Date _____

Chapter 2: Challenge Review Worksheet

1. List three physical properties and three chemical properties that are not in your text.

2. List three physical changes and three chemical changes that are not in your text.

3. Are all physical changes accompanied by chemical changes? Are all chemical changes accompanied by physical changes? Explain.

4. Are all compounds composed of molecules? If so explain why. If not, provide an example.

5. What does it mean to say that a compound has a *constant composition*?

6. Would samples of a particular compound here and in another part of the world have the same composition and properties?

7. Mixtures do not have constant composition. Give an example of a mixture you encounter often that has a variable composition.

8. Are all solutions mixtures? Are all mixtures solutions? Explain.

9. Provide an example of each of the following mixtures and state whether it is a homogeneous or heterogeneous mixture. Support your answer.
   a. A mixture of a solid and a liquid.
   b. A mixture of two gases.
   c. A mixture of two liquids.
   d. A mixture of two solids.

10. Are methods used to separate mixtures physical or chemical changes? Explain.

Chapter 2: Basic Review Worksheet

1. Defining what scientists mean by "matter" often seems circular to students. Scientists say that matter is something that "has mass and occupies space", without ever really explaining what it means to "have mass" or to occupy space"! The concept of matter is so basic and fundamental, that it becomes difficult to give a good textbook definition other than to say that matter is the "stuff" of which everything is made.

2. Chemists tend to give a functional definition of what they mean by an "element": an element is a fundamental substance that cannot be broken down into any simpler substances by chemical methods. Compounds, on the other hand, can be broken down into simpler substances (the elements of which the compound is composed). Examples include water as a compound, and gold as an element.

3. A gas is a substance that has no fixed volume or shape; in addition, the particles making up a gas are spread relatively far apart. A liquid is a substance that has a definite volume but takes the shape of its container; also, the particles making up a liquid are relatively close together. A solid is a substance that has a fixed shape and volume and is rigid; the particles making up a solid are generally packed together and orderly.

4. The chemical properties of a given substance indicate how that substance reacts with other substances. The physical properties of a substance are the inherent characteristics of the substance, which result in no change in the composition of the substance when we measure or study these properties.

5. A chemical change for a substance results in the substance being converted into another substance or substances. A physical change for a substance is a change in the substance that does not alter the identity or composition of the substance; physical changes typically represent changes in only the physical state (solid, liquid, vapor) of the substance.

6. An alloy is a substance that contains a mixture of elements and has metallic properties. Brass and steel are examples of alloys.

7. A mixture is a combination of two or more substances that may be varied in its composition. Most commonly in chemistry, a mixture is a combination of two or more pure substances (either elements or compounds). Dirt is an example of a mixture.

8. A solution is a particular type of mixture that appears completely homogeneous throughout. A solution can be made by dissolving sugar in water, for example.

9. Pure substances are either elements or compounds. A pure substance always has the same composition. A pure substance cannot be a mixture.

10. A homogeneous mixture is a mixture that is the same throughout; a homogeneous mixture is also called a solution. A heterogeneous mixture is a mixture that contains regions with different properties.

11. Mixtures can be resolved into their components by distillation or filtration.

Chapter 2: Review Worksheet

1. On the most fundamental basis, all matter is composed of tiny particles called atoms. Atoms may be combined to form molecules. Matter can be classified as to the physical state a particular substance happens to take. Some are gases, some liquids, and some solids. Matter can also be classified as to whether it is a pure substance or a mixture. If it is a mixture, it can be further classified as homogeneous or heterogeneous.

2. Physical properties include color, odor, physical state, density, solubility, melting point, boiling point, etc. For example, when we say that sodium is a grayish-white, soft, low-density metal, we are describing some of sodium's physical properties. When we say that sodium metal reacts with chlorine gas to form sodium chloride, we are describing a chemical property of sodium.

3. For example, when we heat a piece of sodium metal in a sealed tube in a burner flame, the sodium melts and then vaporizes: the liquid and vapor are still sodium, however, and only physical changes have occurred. On the other hand, if we heat a piece of sodium in an open flame, the sodium reacts with oxygen in the air and is converted to a mixture of sodium oxides. The pure elemental substance sodium is converted into compounds and has undergone a chemical change.

4. a. physical; b. physical; c. chemical; d. chemical

5. For example, sulfur and oxygen are both elements (sulfur occurs as S_8 molecules and oxygen as O_2 molecules). When sulfur and oxygen are placed together and heated, the compound sulfur dioxide (SO_2) forms.

6. Although a solution is homogeneous in appearance, a solution is a mixture of two or more pure substances: If it were possible to see the individual particles of a solution, we would notice that there were different types of molecules present.

7. Yes to both. Pure substances contain only one type of atom or molecule. Thus, elements (composed of one type of atom) or compounds (composed of one type of molecule) will always be pure substances.

8. No to both. Pure substances contain only one type of atom or molecule. Mixtures contain more than one type of atom or molecule. Solutions are homogeneous mixtures. Thus, we cannot say that a sugar/water solution is pure because it contains two types of molecules (sugar molecules and water molecules).

9. In filtration, a mixture is poured onto a mesh (such as filter paper) that allows the liquid to pass through but leaves the solid material behind. In distillation, the liquid is boiled off and collected in a separate container.

Chapter 2: Challenge Review Worksheet

1. Answers will vary.

2. Answers will vary.

3. No, physical properties are not necessarily accompanied by chemical changes. However, chemical changes are always accompanied by physical changes.

4. No. Some elements can be composed of molecules. For example, the oxygen that we breathe is made of diatomic oxygen molecules (O_2).

5. When we analyze sulfur dioxide, for example, we notice that each and every molecule consists of one sulfur atom and two oxygen atoms, and on a mass basis, consists of 50% each of sulfur and oxygen. Thus, sulfur dioxide has a constant composition. The reason the mass percent of all sulfur dioxide is constant is because of a constant number of atoms of each type present in the compound's molecules.

6. Yes. For example, if a scientist anywhere in the universe analyzed sulfur dioxide, he or she would find the same composition: if a scientist finds something that does not have the same composition, then the substance cannot be sulfur dioxide.

7. Answers will vary. Examples may include dirt, sand, paper, and chunky peanut butter.

8. All solutions are mixtures but not all mixtures are solutions. Only homogeneous mixtures are solutions.

9. Answers will vary. Examples include: a. a sugar water solution, homogeneous; b. air, homogeneous (although air consists of more than two gases, it is mainly oxygen and nitrogen); c. rubbing alcohol, homogeneous; d. brass, homogeneous.

10. Filtration and distillation are both physical methods. They do not involve a change in the chemical makeup of the substances that are separated.

Chapter 3: Basic Review Worksheet

1. An element is a pure substance that cannot be broken down into simpler substances by chemical means. There are presently more than 110 elements recognized, of which 88 occur in nature (the remaining have been synthesized by nuclear processes). The most abundant elements (by mass) on the earth are oxygen (49.2%), silicon (25.7%), and aluminum (7.50%), with less than 5% of each the other elements present.

2. The three fundamental particles from which atoms are composed are electrons, protons, and neutrons. The properties of these particles are summarized below:

Particle	*Relative Mass*	*Relative Charge*	*Location*
proton	1836	1+	nucleus
neutron	1839	none	nucleus
electron	1	1-	outside of nucleus