7th grade

Name: _____ **Date:** _____

1. What is the name of the process in which the nucleus of an atom of one element is changed into the nucleus of an atom of a different element?

   A. decomposition B. transmutation

   C. substitution D. reduction

2. All chemical reactions have a conservation of

   A. mass, only

   B. mass and charge, only

   C. charge and energy, only

   D. mass, charge, and energy

3. Which process represents a chemical change?

   A. melting of ice

   B. corrosion of copper

   C. evaporation of water

   D. crystallization of sugar

4. Which list includes three types of chemical reactions?

   A. condensation, double replacement, and sublimation

   B. condensation, solidification, and synthesis

   C. decomposition, double replacement, and synthesis

   D. decomposition, solidification, and sublimation

5. Which type of reaction converts one element to another element?

   A. neutralization B. polymerization

   C. substitution D. transmutation

6. Atoms of one element are converted to atoms of another element through

   A. fermentation B. oxidation

   C. polymerization D. transmutation

7. Which statement describes electrolysis?

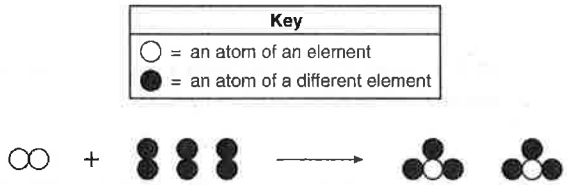
A. Chemical energy is used to produce an electrical change.

B. Chemical energy is used to produce a thermal change.

C. Electrical energy is used to produce a chemical change.

D. Thermal energy is used to produce a chemical change.

8. Given the balanced particle-diagram equation:



Which statement describes the type of change and the chemical properties of the product and reactants?

A. The equation represents a physical change, with the product and reactants having different chemical properties.

B. The equation represents a physical change, with the product and reactants having identical chemical properties.

C. The equation represents a chemical change, with the product and reactants having different chemical properties.

D. The equation represents a chemical change, with the product and reactants having identical chemical properties.

9. A gas is most likely to change to the liquid phase when the pressure on the gas

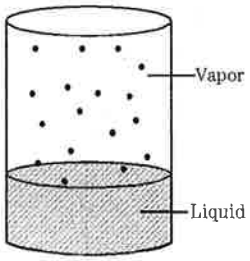
A. decreases and its temperature increases

B. decreases and its temperature decreases

C. increases and its temperature increases

D. increases and its temperature decreases

10. A closed system is shown in the diagram. The rate of vapor formation at equilibrium is

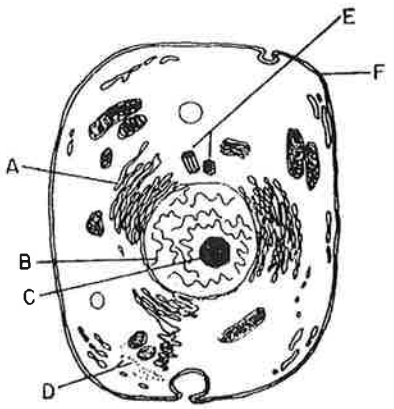


A. less than the rate of liquid formation

B. greater than the rate of liquid formation

C. equal to the rate of liquid formation

11. Which structures function mainly in transport?



A. *A* and *F*
B. *B* and *D*
C. *C* and *F*
D. *C* and *D*

12. Which organelle is primarily concerned with the conversion of potential energy of organic compounds into suitable form for immediate use by the cell?

A. mitochondria
B. centrosomes
C. ribosomes
D. vacuoules

13. Which organelle aids in the maintenance of cell homeostasis by selectively regulating the passage of materials into and out of the cell?

A. plasma membrane
B. ribosome
C. lysosome
D. nuclear membrane

14. Which structure, composed mainly of proteins and lipids, aids in maintaining homeostasis in a cell?

A. chromosome
B. centrosome
C. cell membrane
D. nucleolus

Oxygen O_2

The Most Reactive Gas in the Atmosphere

O=O

(1) The atmosphere consists of a mixture of gases including nitrogen, oxygen and carbon dioxide molecules. Of the three, nitrogen is by far the most common as approximately 78% of the atmosphere is made of this gas. Nitrogen gas called an inert gas since it barely reacts with any other molecules in the environment. On the other hand, molecules of oxygen gas (21% of the atmosphere) are highly reactive and will chemically react with other molecules. Composed of two atoms of oxygen bonded by their electrons together, O_2 is the most reactive gas in the atmosphere.

(2) The oxygen molecule is highly reactive because it has room for two electrons in its outer orbital. Typically in a chemical reaction, oxygen will steal two electrons from other atoms. In chemistry, these atoms that lose electrons are often metal atoms. For example, in the formation of tarnish on a copper penny, oxygen steals electrons from atoms of copper. The reaction between copper and oxygen produces a product called copper oxide. Copper oxide that forms on pennies is commonly called tarnish. While there are several different kinds of tarnish, the most common type is a dark film that forms on the surface of the penny. The chemical formula for this reaction is below.

$$\underset{\textit{copper}}{Cu} + \underset{\textit{oxygen}}{O_2} \longrightarrow \underset{\textit{copper oxide}}{CuO}$$

(Equation is unbalanced)

(3) Another metal atom that oxygen gas will steal electrons from is the iron atom. Over time, objects that are made of iron will react with oxygen molecules on the surface of the metal. The reaction between iron and oxygen produces a product commonly called rust. The reaction is very similar to the formation of tarnish, as oxygen steals electrons from atoms of iron and together form an iron oxide.

$$\underset{\textit{iron}}{Fe} + \underset{\textit{oxygen}}{O_2} \longrightarrow \underset{\textit{iron oxide}}{Fe_2O_3}$$

(Equation is unbalanced)

Iron oxide is very brittle and easily flakes off the surface of structures made of iron or steel (steel is mostly iron with a little carbon). Over time, the formation of rust weakens any metal made out of iron.

(4) Since iron and steel are used to build many large structures in human society, it is important to protect these structures from the decaying effects of rust over time. Eventually iron structures gradually weaken and could even collapse. When one considers the cost of bridges and the safety issues associated with collapsing bridges, it's no wonder engineers have worked out methods of rust proofing bridges. At the heart of rust proofing are atoms of the metal zinc.

(5) Oxygen molecules cannot react with zinc atoms at all. An atom of zinc will not give away any of its electrons to oxygen and is thus completely non-reactive with the gas. Engineers take advantage of this chemical characteristic to prevent the rusting of iron structures such as bridges. These structures are always painted with paint that contains zinc (called galvanizing). The thin coat of zinc prevents oxygen and water molecules in the atmosphere from coming into contact with the iron atoms on the surface of the iron. Other iron structures used in human society such as steel wire fences are always galvanized so that they will last longer in the environment.

Name_____

1 The second paragraph in this article is about:
(1) the properties of metals such as iron, copper and zinc
(2) the ability of oxygen to steal electrons from atoms of zinc
(3) the properties of oxygen and its reaction with copper
(4) the mixture of gases that makes up the atmosphere

2 Which are the reactants in the equation for the formation of copper oxide?
(1) oxygen and copper
(2) iron and oxygen
(3) water and iron
(4) oxygen and water

3 Which statement is true about the number of electrons in iron and the iron atom in iron oxide?
(1) they have the same number of electrons
(2) iron has two more electrons compared to the iron in iron oxide
(3) iron has two less electrons compared to the iron atom in iron oxide
(4) rust has two more electrons compared to the iron atom in iron oxide

4 Which is the correct formula for oxygen gas?
(1) O (3) O_3
(2) 2O (4) O_2

5 In paragraph 5, what is the best meaning of "galvanizing"?
(1) a reaction between zinc and oxygen
(2) metals conducting electricity or heat
(3) to coat iron with a zinc paint
(4) when iron reacts with oxygen and rusts

6 If an oxygen atom gains two electrons from another atom, it will become
(1) negative (3) radioactive
(2) positive (4) neutral

7 What is a chemical characteristic of carbon dioxide?
(1) carbon dioxide is a reactive gas
(2) carbon dioxide has no chemical characteristics
(3) cannot be determined from the article
(4) contains covalent bonds between oxygen and carbon

8 Rust is to iron as tarnish is to
(1) Fe (3) O_2
(2) H_2O (4) Cu

Answer question 9 from the equation below.

$$Fe + O_2 \longrightarrow Fe_2O_3$$
iron *oxygen* *iron oxide*

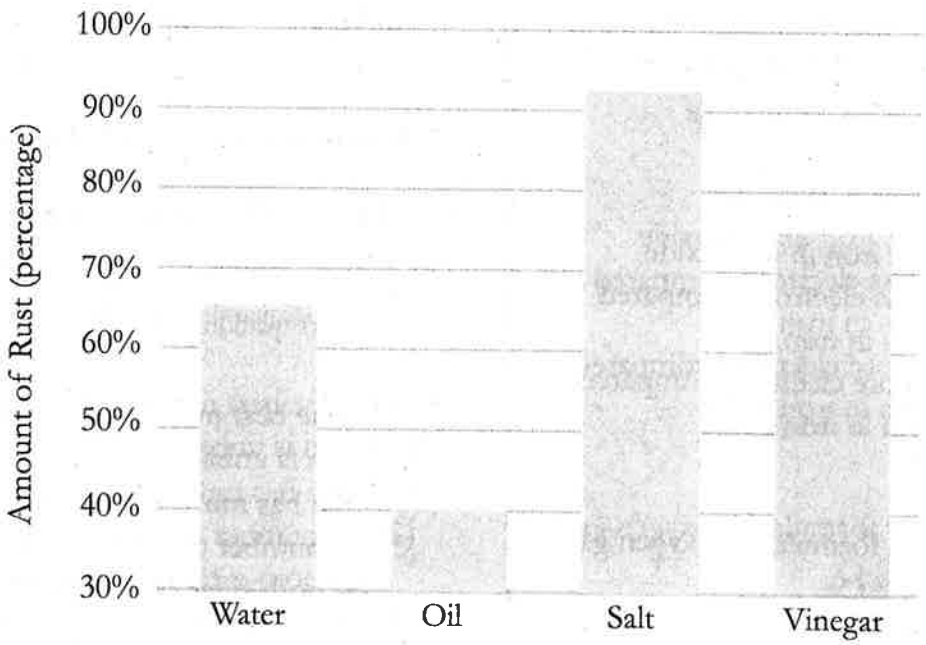
(Equation is unbalanced)

9 What is the best meaning of the phrase, "equation is unbalanced"?
(1) iron has more electrons than iron oxide
(2) the number of atoms is different on both sides of the equation
(3) there is more oxygen reacting than is shown in the formula
(4) this chemical reaction can be reversed

10 Which metals are important to build bridges?
(1) copper and zinc (3) copper and zinc
(2) steel and zinc (4) copper and iron

11 Why is zinc used to paint bridges that are made out of iron and steel?

Answer questions 12-13 from the graph below. A student measured the amount of rust that formed on four iron nails that were exposed to different liquids and then allowed to rust over two days.



12 What percent of the nail that was in the salt solution rusted after 48 hours?

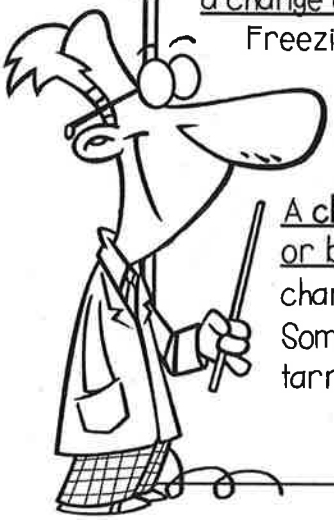
(1) 25%
(2) 8%
(3) 92%
(4) 95%

13 How much more did the nail in water vinegar rust compared to the nail in the oil?

(1) 10%
(2) 35%
(3) 40%
(4) 50%

Name _____ Date _____ Section _____

Introduction to Physical and Chemical Changes



A **physical change** is a change in a substance that does not change its identity, such as a change of state. Matter can change state when it loses or gains thermal energy. Freezing, melting, and boiling are all examples of changes of state. Some other physical changes include breaking, tearing, cutting, or crushing. Tip- a physical change is only a change in appearance, not chemical identity!

A **chemical change** is a change in which one or more substances combine or break apart to form new substances. Whenever a chemical change (or reaction) occurs, a new substance is ALWAYS formed! Some common examples of chemical changes are rusting, tarnishing, cooking, burning, and sugar caramelizing.

True or False

If the answer is true, write "true" on the line. If the answer is false, replace the underlined word or phrase with one that will make the sentence correct. Write the new word(s) on the line.

1. _____ A substance that undergoes a physical change, like melting, is still the same substance.

2. _____ During a chemical change, atoms are lost or gained to make the new substance(s).

3. _____ Dissolving, bending, crushing, breaking, and chopping are all examples of physical changes.

4. _____ A change of state, such as boiling, is an example of a chemical change.

5. _____ Most physical and chemical changes in matter include a change in energy.

6. _____ When hydrogen peroxide is poured on skin, it breaks down into water and oxygen gas. This is an example of a chemical change.

Physical or Chemical?

Identify the following examples as either a physical change or chemical change. Write "physical" or "chemical" on the line.

7. _____ Baking chocolate cupcakes

8. _____ Rust forming on an iron nail

9. _____ Breaking a glass bottle

10. _____ Grilling a piece of fish

11. _____ Tearing out a picture from a magazine

12. _____ Dissolving sugar in hot water

13. _____ Combining vinegar and baking soda

14. _____ Sawing a board in half

15. _____ Toasting a piece of bread

16. _____ Sharpening a pencil

17. _____ Cooking hot, cheesy, pizza in the oven

18. _____ Painting a wall blue

19. _____ Frost forming on grass in the morning

20. _____ Sewing together fabric to make a shirt

21. _____ Heating sugar until it forms into caramel

22. _____ Boiling a pot of water on the stove

23. _____ Digesting a sandwich into nutrients for the body

24. _____ A silver fork that is starting to turn black

25. _____ Dry ice sublimating into carbon dioxide vapor