

حل تجميعية أسئلة وفق الهيكل الوزاري منهج انسابير المسار المتقدم



تم تحميل هذا الملف من موقع المناهج الإماراتية

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المزيد من مادة
علوم:

إعداد: يوسف

التواصل الاجتماعي حسب الصف الثامن



صفحة المناهج
الإماراتية على
فيسبوك

الرياضيات

اللغة الانجليزية

اللغة العربية

التربية الاسلامية

المواد على تلغرام

المزيد من الملفات بحسب الصف الثامن والمادة علوم في الفصل الثالث

نموذج اختبار تجريبي القسم الورقي

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حل تدريبات الأسئلة الكتابية المتوقعة وفق الهيكل الوزاري

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مع الأستاذ يوسف



معهد رواد التعليمية

و

مركز النخبة المتميزة

	SLO	No	Example
1	Define chemical reactions as processes involving the rearrangement of atoms to form new substances.	1.	Describe what happens to atoms in a chemical reaction
		2.	<p>Which of these is NOT evidence of a chemical reaction?</p> <p><input type="radio"/> An iron nail changes to a brownish-orange color.</p> <p><input type="radio"/> A piece of zinc raises the temperature of an acid as it reacts with it.</p> <p><input checked="" type="radio"/> An ice cube melts into liquid water.</p> <p><input type="radio"/> An antacid tablet produces bubbles of gas when placed in water.</p>

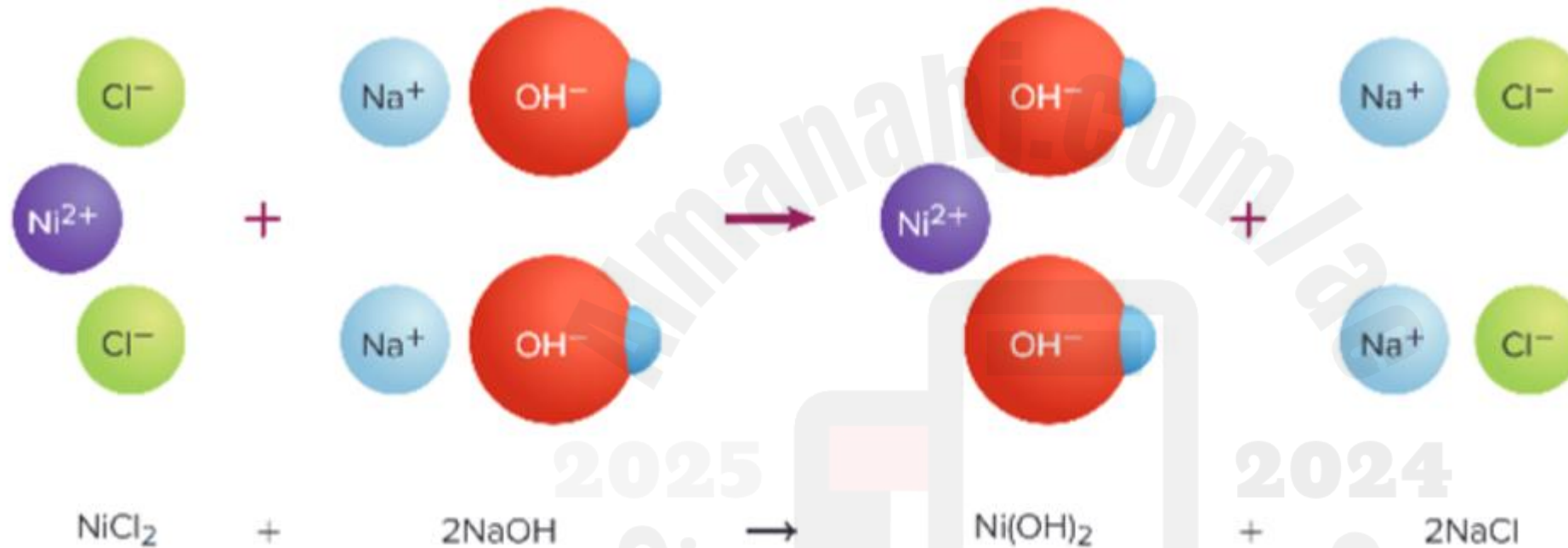


Figure 3 There are equal numbers of each type of atom on both sides of the arrow.

The Atoms in chemical reaction Rearrange


Chemical reactions take place all around you, and even within you. A **chemical reaction** is a change in which one or more substances are converted into new substances. The starting substances that react are called **reactants**. The new substances produced are called **products**. This relationship between reactants and products can be written as follows: reactants \rightarrow products.

Evidence for Chemical Reactions

Evidence of Reactions:

- Changes in Temperature
- Light Production
- Precipitate Formation
- Gas Formation
- Color Change



2	Explain basic energy concepts (exothermic and endothermic).	3.	How do you know if a reaction is exothermic or endothermic? Discuss.
		4.	 Get It? Infer Why is a log fire considered to be an exothermic reaction?
		5.	Explain Your Thinking 23. Apply To develop a product that warms people's hands, would you use an exothermic or endothermic reaction? Why?

Chemical bonds are the source of this energy. When most chemical reactions take place, some chemical bonds in the reactants are broken, which requires energy called activation energy. In order for products to be produced, new bonds must form. Bond formation releases energy. Reactions such as dynamite combustion, shown in **Figure 13**, require much less energy to break chemical bonds than the energy released when new bonds are formed. The result is a release of energy and an explosion.

5	Recall that forming/breaking chemical bonds involves energy transfer.	10.	<p>The breaking of chemical bonds</p> <ul style="list-style-type: none"> <input type="radio"/> neither absorbs nor releases energy. <input type="radio"/> releases energy. <input checked="" type="radio"/> absorbs energy. <input type="radio"/> either absorbs or releases energy depending on the type of reaction. <p>What happens when bonds are formed?</p>
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Energy will be Released



More Energy Out

Many of the reactions with which you are most familiar involve the release of energy. Chemical reactions that release energy are called **exergonic reactions**. In these reactions, the activation energy required to break the original bonds is less than the energy that is released when new bonds form. As a result, some form of energy, such as light or thermal energy, is given off by the reaction. The abdomen of a firefly glows as a result of an exergonic reaction that produces visible light, as shown in **Figure 14**.

Thermal energy released

In many reactions, the energy given off is thermal energy. This is the case with some heat packs that are used to treat muscle aches and other problems. When the energy given off is primarily in the form of thermal energy, the reaction is called an **exothermic reaction**. Wood burning and the explosion of dynamite are exothermic reactions. Iron rusting is also exothermic, but, under typical conditions, the reaction proceeds so slowly that it's difficult to detect any temperature change.



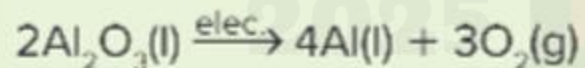
Figure 14 The chemical reactions happening inside the abdomen of a firefly produce light.

Infer How do you know these are exergonic reactions?

More Energy In

Sometimes a chemical reaction requires more energy to break bonds than is released when new ones are formed. These reactions are called **endergonic reactions**. The energy absorbed can be in the form of light, thermal energy, or electricity.

Electricity is often used to supply energy to endergonic reactions. For example, an electric current passed through water produces hydrogen and oxygen, shown in **Figure 16**. Also, aluminum metal is obtained from its ore using the following endergonic reaction:



Thermal energy absorbed

When the energy needed to keep a reaction going is in the form of thermal energy, the reaction is called an **endothermic reaction**. The

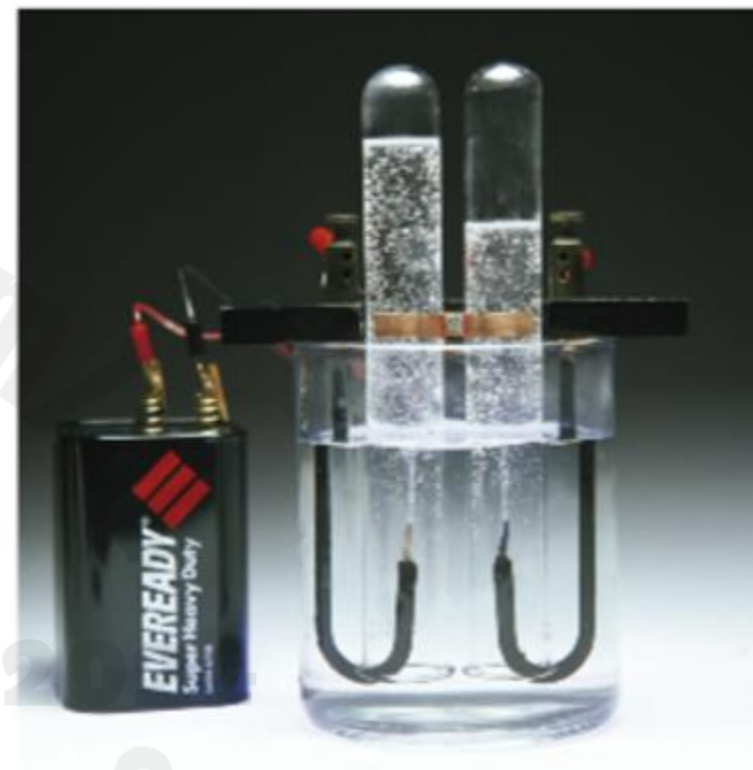


Figure 16 Water is stable, but the addition of an electrical current will cause it to decompose into hydrogen and oxygen.


Thermal energy absorbed

When the energy needed to keep a reaction going is in the form of thermal energy, the reaction is called an **endothermic reaction**. The terms *exothermic* and *endothermic* are not just related to chemical reactions. They can also describe physical changes. If you ever had to soak a swollen ankle in an Epsom salt solution, you probably noticed that when you mixed the Epsom salt in water, the solution became cold. The dissolving of Epsom salt absorbs thermal energy. Thus, it is a physical change that is endothermic.

Cooking involves the addition of thermal energy to bring about chemical changes in food. When baking cookies, you might add baking soda (NaHCO_3) to the dough mixture. Through an endothermic reaction, the baking soda breaks down into sodium carbonate (Na_2CO_3), carbon dioxide gas (CO_2), and water vapor (H_2O). As these gases are released, tiny pockets form in the dough, which causes the cookies to puff up, as shown in **Figure 17**.

Figure 16 Water is stable, but the addition of an electrical current will cause it to decompose into hydrogen and oxygen.



3	Write and balance chemical equations, demonstrating conservation of atoms and mass.	6.	 Get It? Summarize Describe the purpose of coefficients in a chemical equation. Balance the chemical equation: $\text{Fe(s)} + \text{Cl}_2\text{(g)} \rightarrow \text{FeCl}_3\text{(s)}$. _____ Fe(s) + _____ $\text{Cl}_2\text{(g)}$ \rightarrow _____ $\text{FeCl}_3\text{(s)}$
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By the 1770s, the pseudoscience of alchemy was starting to be replaced by chemistry. While alchemy imitated science, alchemists did not provide science-based explanations about the natural world. However, scientists, such as the French chemist Antoine Lavoisier, studied chemical reactions using scientific methods. As a result of such study, Lavoisier established that the total mass of the products always equals the total mass of the reactants. This principle is demonstrated in **Figure 1**.

- 1) $\text{___ H}_3\text{PO}_4 + \text{___ KOH} \rightarrow \text{___ K}_3\text{PO}_4 + \text{___ H}_2\text{O}$
- 2) $\text{___ K} + \text{___ B}_2\text{O}_3 \rightarrow \text{___ K}_2\text{O} + \text{___ B}$
- 3) $\text{___ HCl} + \text{___ NaOH} \rightarrow \text{___ NaCl} + \text{___ H}_2\text{O}$
- 4) $\text{___ Na} + \text{___ NaNO}_3 \rightarrow \text{___ Na}_2\text{O} + \text{___ N}_2$
- 5) $\text{___ C} + \text{___ S}_8 \rightarrow \text{___ CS}_2$
- 6) $\text{___ Na} + \text{___ O}_2 \rightarrow \text{___ Na}_2\text{O}$
- 7) $\text{___ N}_2 + \text{___ O}_2 \rightarrow \text{___ N}_2\text{O}_5$
- 8) $\text{___ H}_3\text{PO}_4 + \text{___ Mg(OH)}_2 \rightarrow \text{___ Mg}_3(\text{PO}_4)_2 + \text{___ H}_2\text{O}$
- 9) $\text{___ NaOH} + \text{___ H}_2\text{CO}_3 \rightarrow \text{___ Na}_2\text{CO}_3 + \text{___ H}_2\text{O}$
- 10) $\text{___ KOH} + \text{___ HBr} \rightarrow \text{___ KBr} + \text{___ H}_2\text{O}$
- 11) $\text{___ Na} + \text{___ O}_2 \rightarrow \text{___ Na}_2\text{O}$
- 12) $\text{___ Al(OH)}_3 + \text{___ H}_2\text{CO}_3 \rightarrow \text{___ Al}_2(\text{CO}_3)_3 + \text{___ H}_2\text{O}$
- 13) $\text{___ Al} + \text{___ S}_8 \rightarrow \text{___ Al}_2\text{S}_3$
- 14) $\text{___ Cs} + \text{___ N}_2 \rightarrow \text{___ Cs}_3\text{N}$

7.

Which is an example of a balanced chemical equation?

- ☐ $\text{AgNO}_3 + \text{NaCl} \rightarrow 4\text{AgCl} + 2\text{NaNO}_3$
- ☒ $\text{AgNO}_3 + \text{NaCl} \rightarrow \text{AgCl} + \text{NaNO}_3$
- ☐ $2\text{AgNO}_3 + 2\text{NaCl} \rightarrow 3\text{AgCl} + 2\text{NaNO}_3$
- ☐ $\text{AgNO}_3 + 2\text{NaCl} \rightarrow \text{AgCl} + 3\text{NaNO}_3$

8.

Additional Practice:

PRACTICE Problems



ADDITIONAL PRACTICE

1. Balance this equation: $\text{MgCl}_2(\text{aq}) + \text{AgNO}_3(\text{aq}) \rightarrow \text{Mg}(\text{NO}_3)_2(\text{aq}) + \text{AgCl}(\text{s})$.
2. Balance this equation: $\text{NaOH}(\text{aq}) + \text{CaBr}_2(\text{s}) \rightarrow \text{Ca}(\text{OH})_2(\text{s}) + \text{NaBr}(\text{aq})$.



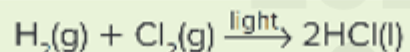
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Combustion reactions

If you have ever seen something burning, you have seen a combustion reaction. The reaction shown in **Figure 7** creates flames of heat and light as carbon in the wood reacts with oxygen in the air to form carbon dioxide (CO_2). Lavoisier deduced that the process of combustion involves a substance combining with oxygen. Our definition states that a **combustion reaction** occurs when a substance reacts with oxygen to produce energy in the form of heat and light. Many combustion reactions also fit into other categories. For example, the reaction between carbon and oxygen is also a synthesis reaction.

Synthesis reactions

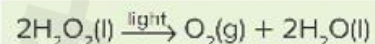
One of the easiest reaction types to recognize is a synthesis reaction. In a **synthesis reaction**, two or more substances combine to form another substance. The generalized formula for this reaction type is $A + B \rightarrow AB$. The reaction in which hydrogen gas (H_2) combines with chlorine gas (Cl_2) to form hydrogen chloride (HCl) is an example of a synthesis reaction.



Decomposition reactions

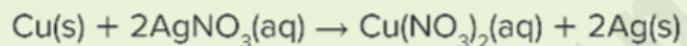
A decomposition reaction is just the reverse of a synthesis. Instead of two substances coming together to form a third, a **decomposition reaction** occurs when one substance breaks down, or decomposes, into two or more substances. The general formula for this type of reaction can be expressed as $AB \rightarrow A + B$.

Most decomposition reactions require the input of heat, light, or electricity. For example, hydrogen peroxide (H_2O_2), shown in **Figure 8**, will slowly decompose in the presence of light, producing oxygen gas (O_2) and water (H_2O).



Single displacement

The chemical reaction in which one element replaces another element in a compound is called a **single-displacement reaction**. Single-displacement reactions—sometimes called *single-replacement reactions*—are described by the general equation $A + BC \rightarrow AC + B$. Here you can see that atom A displaces atom B to produce a new molecule, AC. A single displacement reaction is illustrated in **Figure 9**, where a copper wire is put into a solution of silver nitrate. Because copper is a more active metal than silver, it replaces the silver, forming a blue copper(II) nitrate solution. The silver, which is not soluble, forms crystals on the wire.



Double displacement

The positive ion of one compound replaces the positive ion of the other to form two new compounds in a **double-displacement reaction**—sometimes called a *double-replacement reaction*. You know that a double-displacement reaction is taking place if a precipitate, water, or a gas forms when two ionic compounds in solution are combined. A **precipitate** is an insoluble compound that comes out of solution during this type of reaction. The generalized formula for this reaction is $AB + CD \rightarrow AD + CB$.



4	Classify reactions into five basic types (e.g., synthesis, decomposition)	9.	A _____ reaction involves bringing elements or compounds together to form new compounds, whereas, a _____ reaction involves breaking down compounds into smaller compounds or elements.
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6

Define reaction rate and describe chemical equilibria.

11.


Define rate of a chemical reaction.

The **reaction rate** is the rate at which reactants change into products.

When a reversible reaction's forward and reverse reactions take place at exactly the same rate, a state of balance, or equilibrium, exists. **Equilibrium** (plural, *equilibria*) is a state in which forward and reverse reactions or processes proceed at equal rates. An equilibrium state is indicated with double reaction arrows, as shown below. Chemists call the left-to-right reaction the forward reaction and the right-to-left reaction the reverse reaction.

reactants \rightleftharpoons products



Differentiate between catalysts and inhibitors.	12.	How does a catalyst affect the rate of a reaction?
	13.	 Get It? Compare and contrast catalysts and inhibitors in terms of how they affect reaction rates.

Catalysts and inhibitors

Some reactions proceed too slowly to be useful. To speed up such a reaction, a catalyst can be added. A **catalyst** is a substance that speeds up a chemical reaction without being permanently changed itself. When you add a catalyst to a reaction, the mass of the product that is formed remains the same, but it will form more rapidly. The catalyst remains unchanged and often is recovered and reused. Catalysts are used to speed many reactions in industry, such as the process of polymerization to make plastics and fibers. In order to break down food, your body utilizes special catalysts called enzymes.

At times, it is worthwhile to prevent certain reactions from occurring. For example, foods often spoil because they react with oxygen from the air. Substances called **inhibitors** are used to slow down the rates of chemical reactions or prevent a reaction from happening at all. Food preservatives are inhibitors that prevent the reactions that lead to the spoilage of certain foods.

One thing to remember when thinking about catalysts and inhibitors is that they do not change the amount of product produced. They only change the rate of production.



14.

Match the term to the description.

Description:

1- Products are produced at the same rate as reactants in a chemical reaction. Chemical equilibrium

2- A physical change (such as a change in state) occurs in two directions at the same rate. Physical equilibrium

Matching term:

Physical equilibrium, conservation of mass, chemical equilibrium, Le Chatelier's principle, collision model, balanced chemical equation



9

Emphasize the conservation of energy—total energy in a reaction remains constant.

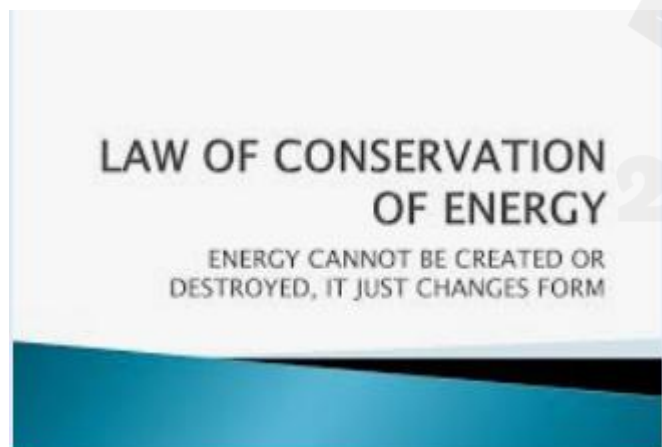
15.

Consider the equation below:

$$\text{chemical energy of reactants} = \text{chemical energy of products} + \text{energy released}$$

The sum of the energy released, and the chemical energy of the products is always exactly equal to the chemical energy of the reactants.

This represents the law of _____.



Factors Affecting Reaction Rates

You already know that sugar dissolves faster in hot water than it does in cold water. Sugar dissolving in water is not a chemical reaction. However, the rates of most chemical reactions, too, vary with temperature. Chemists use a commonsense idea to explain why reaction rates depend upon temperature and other factors, such as concentration and surface area. This idea is called the collision model. The **collision model** states that atoms, ions, and molecules must collide in order to react. The collision model helps explain why changing the conditions of a chemical reaction can have an effect on the reaction rate.

Temperature

You normally store perishable foods such as milk, eggs, and vegetables in a refrigerator. That's because lowering the temperature decreases the rates of the chemical reactions that cause spoilage. Conversely, increasing the temperature of chemical reactions generally increases their reaction rates.

Why does temperature affect reaction rate? Recall that the temperature of a substance is a measure of the average kinetic energy of all of its particles. At higher temperatures, therefore, reacting particles move faster and collide more frequently. A higher collision frequency alone, however, does not completely explain the increase in reaction rate. Because the particles are moving faster at higher temperatures, they collide with greater energy. As a result, a greater percentage of collisions result in a reaction between colliding particles.



Concentration

Another way you can change the rate of a chemical reaction is by changing the concentration of one or more of the reactants. Concentration describes the number of particles of a substance per unit volume. Chemists usually express concentration as moles of a substance per liter (mol/L).

Volume and pressure

For chemical reactions involving gases, volume and pressure are important considerations because they relate to the concentrations of the reacting gases. For example, decreasing the volume of a flask containing gases while maintaining a constant temperature increases the concentrations of the gases. Just as with liquid solutions, increasing the concentrations of gases increases the rate at which the particles collide with each other and with the walls of the container. The pressure inside the flask increases. More importantly, the reaction rate increases as well because the reacting gas particles collide with each other more frequently. The effect of increased pressure and decreased volume on gas particles is demonstrated in Figure 20.

Surface area

Which dissolves more quickly—granulated sugar or a sugar cube? As you probably guessed, the answer is granulated sugar because the individual grains of sugar have much greater total surface area compared to the sugar cube. Dissolving sugar is a physical change, but increased surface area also increases the rate of chemical reactions.



10	State how factors (temperature, catalysts, etc.) affect reaction rates using the collision model.	16.	<p>What is the effect of increasing temperature on the rate of reaction?</p> <p>What is the effect of decreasing temperature on the rate of reaction?</p> <p>What is the effect of increasing pressure on the rate of reaction?</p> <p>What is the effect of decreasing pressure on the rate of reaction?</p>
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11	Classify substances as solutes, solvents, or solutions.	17.	The substance being dissolved in a solution is called the _____.
		18.	When sugar dissolves in water, water is the _____.

Solutes and Solvents

To describe a solution, you can say that one substance is dissolved in another. The substance being dissolved in a solution is the **solute**. The substance in which a solute is dissolved is the **solvent**. When a solid or gas dissolves in a liquid, the solid or gas is the solute and the liquid is the solvent. Thus, in salt water, salt is the solute and water is the solvent. In carbonated soft drinks, carbon dioxide gas is one of the solutes and water is the solvent. When a liquid dissolves in another liquid, the substance that is present in the larger amount is typically called the solvent.

Classify substances as solutes, solvents, or solutions.	19.	<p>Which of the following is a solution?</p> <ul style="list-style-type: none"><input type="radio"/> salt water<input type="radio"/> milk<input type="radio"/> chlorine<input type="radio"/> muddy water
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Salt water

20.

Summarize possible ways in which phases of matter could combine to form a solution.

Dissolving liquids and gases

A similar but more complex process takes place when liquids and gases dissolve. Liquid and gas particles move much more freely than particles of solids move. When gases dissolve in gases or when liquids and gases dissolve in liquids, particle movement eventually spreads solutes evenly throughout the solvent, resulting in a homogeneous mixture.

Dissolving solids in solids

Solid particles do move a little, but this motion is not enough to spread particles evenly throughout a mixture. Solid metals are first melted and then mixed together while still molten. In the liquid state, the atoms can spread out evenly and will remain mixed after they have cooled.



ble sugar is in water. **Solubility** (sol yuh BIH luh tee) is the maximum amount of a solute that can be dissolved in a given amount of solvent at a given temperature. Solubility of substances dissolved in water is often expressed as grams of solute per 100 g of water (g/100 g water).

because no more copper(II) sulfate can dissolve. A **saturated solution** is a solution that contains all of the solute that it can hold at a given temperature. However, if you heat the mixture to a higher temperature, more copper(II) sulfate dissolves.

An **unsaturated solution** is any solution that can dissolve more solute at a particular temperature. Often, when a saturated

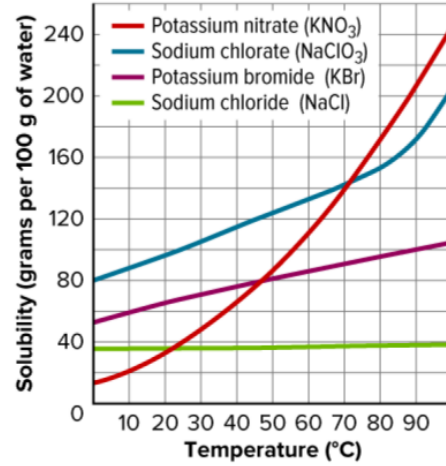
supersaturated. A **supersaturated solution** is one that contains more solute than a saturated solution at the same temperature. Supersaturated solutions are unstable. **Figure 10** shows that when a seed crystal of sodium acetate is dropped into the supersaturated solution, excess sodium acetate comes out of solution.



21.

According to the graph, if 25 g of sodium chlorate (NaClO_3) are dissolved in 100 g of water at 70°C , how would you describe the solution?

Temperature Effects on Solubility



- ☐ saturated
- ☐ supersaturated
- ☐ unsaturated
- ☐ concentrated

22.

Define the terms unsaturated, saturated, and supersaturated solutions.

Unsaturated



14	<p>Explain how factors (temperature, catalysts, etc.) affect reaction rates using the collision model.</p> <p>[application]</p>	23.	<p>Operators of grain elevators must take measures to ensure that grain dust and oxygen in the air do not combine in a combustion reaction. Explain why there is an increased risk of explosion in an elevator filled with grain dust.</p>
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Get It?

Compare and contrast the effects of increased concentration of liquid reactants and decreased volume of gaseous reactants.

Surface area

Which dissolves more quickly—granulated sugar or a sugar cube? As you probably guessed, the answer is granulated sugar because the individual grains of sugar have much greater total surface area compared to the sugar cube. Dissolving sugar is a physical change, but increased surface area also increases the rate of chemical reactions.

Operators of grain elevators must take measures to ensure that grain dust and oxygen in the air do not combine in a combustion reaction. Even on a scorching-hot day, there is little danger that whole grains of wheat or kernels of corn will react rapidly with oxygen in the air. However, the fine particles that make up grain dust can react explosively on a hot day, as shown in **Figure 21**. The larger total surface area of the grain dust greatly increases the rate at which reacting particles collide. With more collisions per unit time, the rate of the combustion reaction increases dramatically.



Figure 21 Grain dust can be explosive because of its increased surface area.



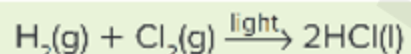
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Combustion reactions

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Synthesis reactions

One of the easiest reaction types to recognize is a synthesis reaction. In a **synthesis reaction**, two or more substances combine to form another substance. The generalized formula for this reaction type is $\text{A} + \text{B} \rightarrow \text{AB}$. The reaction in which hydrogen gas (H_2) combines with chlorine gas (Cl_2) to form hydrogen chloride (HCl) is an example of a synthesis reaction.



Decomposition reactions

A decomposition reaction is just the reverse of a synthesis. Instead of two substances coming together to form a third, a **decomposition reaction** occurs when one substance breaks down, or decomposes, into two or more substances. The general formula for this type of reaction can be expressed as $\text{AB} \rightarrow \text{A} + \text{B}$.

Single displacement

The chemical reaction in which one element replaces another element in a compound is called a **single-displacement reaction**. Single-displacement reactions—sometimes called *single-replacement reactions*—are described by the general equation $\text{A} + \text{BC} \rightarrow \text{AC} + \text{B}$. Here you can

Double displacement

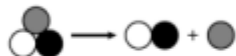
The positive ion of one compound replaces the positive ion of the other to form two new compounds in a **double-displacement reaction**—sometimes called a *double-replacement reaction*. You know that a double-displacement reaction is taking place if a precipitate, water, or a gas forms when two ionic compounds in solution are combined. A **precipitate** is an insoluble compound that comes out of solution during this type of reaction. The generalized formula for this reaction is $\text{AB} + \text{CD} \rightarrow \text{AD} + \text{CB}$.

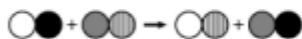


Identify each model of a chemical reaction.









single displacement

decomposition

combustion

synthesis

reduction

oxidation

Synthesis

Single displacement

Decomposition

Double displacement



1. In a reaction where hydrogen reacts with oxygen to produce water, which substances are the reactants?

- c. Both hydrogen and oxygen.



Recognize and interpret symbols used in chemical equations.	2.	<p>In a chemical equation, the symbol that takes the place of the words 'reacts to form' is _____ - d. Arrow (→).</p> <p>a. equal sign. b. plus sign. c. coefficient. d. arrow.</p>
	3.	<p>The symbol (s) written after a formula in a chemical equation stands for _____</p> <p>a. soluble. b. solid. c. solution. d. synthesis. - b. Solid.</p> <p>Which of the following symbols means a substance is in water solution?</p> <p>a. (aq) b. (w) c. (s) d. (l) a. (aq)</p>

Write and balance chemical equations, demonstrating conservation of atoms and mass.

4.



Get It?

Summarize How can you tell whether a chemical equation is balanced or not?

- A chemical equation is balanced when the number of atoms of each element is the same on both the reactant and product sides.



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5.

You have a sample of water, H_2O .

a. What is the molar mass of H_2O ?

_____ g/mol

- Molar mass of H_2O : $2(1.01) + 16.00 = 18.02 \text{ g/mol}$.



b. How many moles are in 54g of HCl?

_____ mol.

Show all your working.

- Moles in 54 g of HCl (for calculating we need to calculate molar mass of HCl)

Molar mass of HCl= 1.01 + 35.45 = 36.46 g/mol

$$\text{Moles} = \frac{54}{36.46} \quad \text{approx 1.48 mol}$$



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6.

You have a sample of hydrochloric acid, HCl.

c. What is the molar mass of HCl?

_____ g/mol

Molar mass of HCl = $1.01 + 35.45 = 36.46$ g/mol

d. How many moles are in 70g of HCl?

36.46 g/mol

_____ mol.

Moles = $\frac{70\text{g}}{36.46\text{g/mol}}$ approx 1.91 mol

36.46g/mol

Show all your working.



Apply the principle of conservation of mass

7.

Fill in the blanks using the available answer choices.

Select the correct answers to describe Lavoisier's experimental discovery.

a. The mass of the products _____ the mass of the reactants.
(Blank 1)

b. This is known as the law of _____
(Blank 2)

c. The chemical equation _____ correctly models this law.
(Blank 3)

d. Given this law, _____ of hydrogen (H₂) is produced in the following reaction.
(Blank 4)

Zn	+	2HCl	→	ZnCl ₂	+	H ₂
65 g		72 g		135 g		?

Blank 1 options

- always equals
- sometimes equals
- is greater than
- is less than

Blank 2 options

- conservation of mass
- conservation of energy
- equilibrium
- universal mass
- mass fluctuation

Blank 3 options

- $\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl}$
- $\text{H}_2 + \text{Cl}_2 \rightarrow \text{HCl}$
- $\text{H} + \text{Cl} \rightarrow 2\text{HCl}$
- $2\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl}_2$

Blank 4 options

- 2 g
- 2.016 g
- 7 g
- 272 g
- 63 g
- 70 g



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8. Fill in the blanks for Lavoisier's experimental discovery:

- a. The mass of the products ****always equals**** the mass of the reactants.
- b. This is known as the law of ****conservation of mass****.
- c. The chemical equation **** $H_2 + Cl_2 \rightarrow 2HCl$ **** correctly models this law.
- d. ****2 g**** of hydrogen (H_2) is produced in the reaction.



8.

Which type of reaction is shown in the chemical equation $2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$?

- ☐ combustion
- ☐ double displacement
- ☐ decomposition
- ☐ synthesis
- ☐ single displacement

Explain your answer.

- Decomposition (A single compound breaks down into simpler substances.)



9.

Which type of reaction is shown in the chemical equation $\text{NH}_3 + \text{HCl} \rightarrow \text{NH}_4\text{Cl}$?

- ☐ decomposition
- ☐ combustion
- ☐ synthesis
- ☐ single displacement
- ☐ double displacement

Explain your answer.

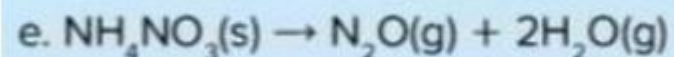
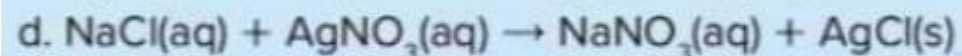
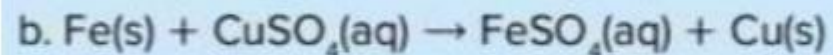
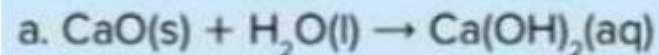
- Synthesis (Two substances combine to form a single product.)



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10.

Characterize each reaction by determining its reaction type.



Explain your answer.

10. Characterize each reaction by determining its reaction type:

- a. $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2$: **Synthesis**.


- b. $\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$: **Single displacement**.

- c. $\text{C}_{10}\text{H}_8 + 12\text{O}_2 \rightarrow 10\text{CO}_2 + 4\text{H}_2\text{O}$: **Combustion**.

- d. $\text{NaCl} + \text{AgNO}_3 \rightarrow \text{NaNO}_3 + \text{AgCl}$: **Double displacement**.

- e. $\text{NH}_4\text{NO}_3 \rightarrow \text{N}_2\text{O} + 2\text{H}_2\text{O}$: **Decomposition**.



Explore how factors (temperature, catalysts, etc.) affect reaction rates using the collision model.	11.	 Get It? Use the collision model to explain the effect of increased temperature on reaction rates.
	12.	List four ways to change the rate of a chemical reaction. <div style="border: 1px solid black; height: 120px; width: 100%;"></div>

11. Explain the effect of increased temperature on reaction rates using the collision model.

- Increased temperature provides more kinetic energy to particles, increasing the frequency and energy of collisions, which raises the likelihood of successful collisions leading to a reaction.

12. List four ways to change the rate of a chemical reaction.

- Increase temperature, increase concentration of reactants, add a catalyst, increase surface area of solid reactants.



13.

Which of the following will speed up the dissolving of a solid solute in water? Select all that apply.

- ☐ Cool the solution.
- ☐ Heat the solution.
- ☐ Grind up the solute to smaller pieces.
- ☐ Stir the solution.
- ☐ Increase the pressure on the solution.

- Heat the solution, grind up the solute, stir the solution.



14.

Why does breaking up a solid solute into smaller pieces help it dissolve more quickly?

- Smaller pieces have a larger surface area exposed to the solvent, increasing the rate of dissolution.

15.

Explain how sugar dissolves in water.

- Sugar molecules are surrounded by water molecules, which break the intermolecular bonds in sugar and disperse the molecules evenly throughout the solvent.



**Get It?****Explain** What is solubility?

- Solubility is the maximum amount of solute that can dissolve in a given amount of solvent at a specific temperature and pressure.



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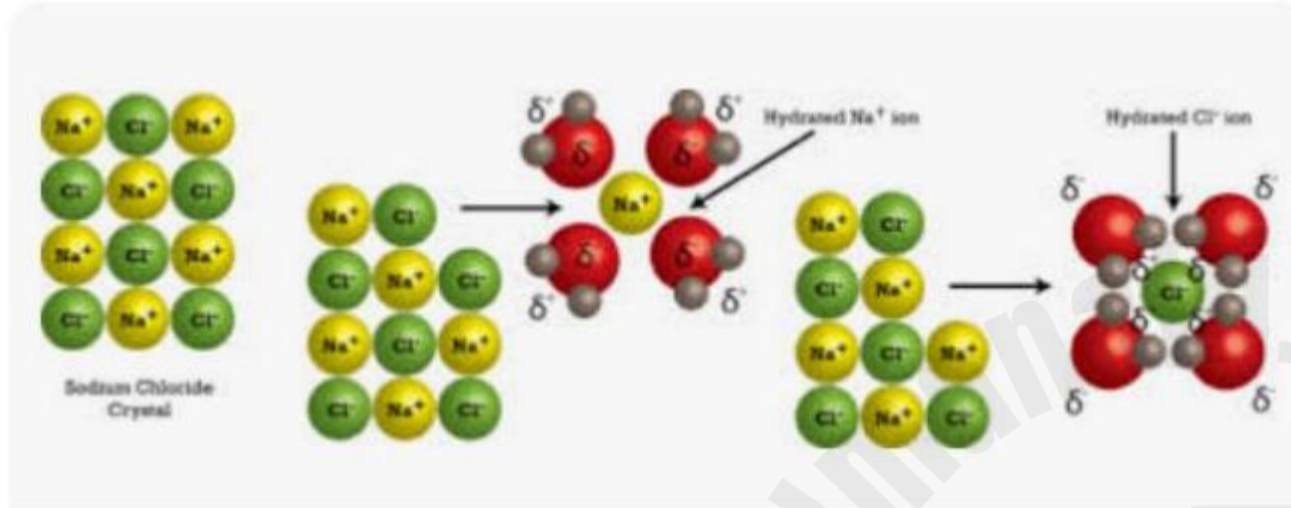
Demonstrate Understanding

10. **Contrast** What is the difference between solubility and concentration?

- Solubility is a physical property describing the maximum amount of solute that can dissolve, while concentration refers to the actual amount of solute dissolved in a solution.



Using the image below, explain the process of salt dissolving in water.



Water molecules pull the sodium and chloride ions apart, breaking the ionic bond that held them together. After the salt compounds are pulled apart, the sodium and chloride atoms are surrounded by water molecules, as this diagram shows. Once this happens, the salt is dissolved, resulting in a homogeneous solution.

19.

If a solute crystallizes out of a solution when a seed crystal is added, what kind of solution is it?

- ☐ unsaturated
- ☐ saturated
- ☐ supersaturated
- ☐ dilute

- Supersaturated.



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Explain Your Thinking

14. **Explain** why keeping a carbonated beverage capped and refrigerated helps keep it from going flat.

- Capping reduces CO_2 escape, and refrigeration lowers the solubility of gases, slowing the release of CO_2 .



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21.

Solubility of some substances in water, at 20°C and 1 atm (in g per 100g of water)	
"Substance"	"Solubility"
Oxygen	0,0043
Nitrogen	0,0019
Carbon dioxide	0,17
Benzene	0,08
Sugar	204
Chloroform	1,3
Ammonia	52,6

Which substance is the least soluble? Explain your answer.

Which substance is the most soluble? Explain your answer.

Which substance is the least soluble?

- Nitrogen (0.0019 g per 100 g of water).

Which substance is the most soluble?

- Sugar (204 g per 100 g of water).

