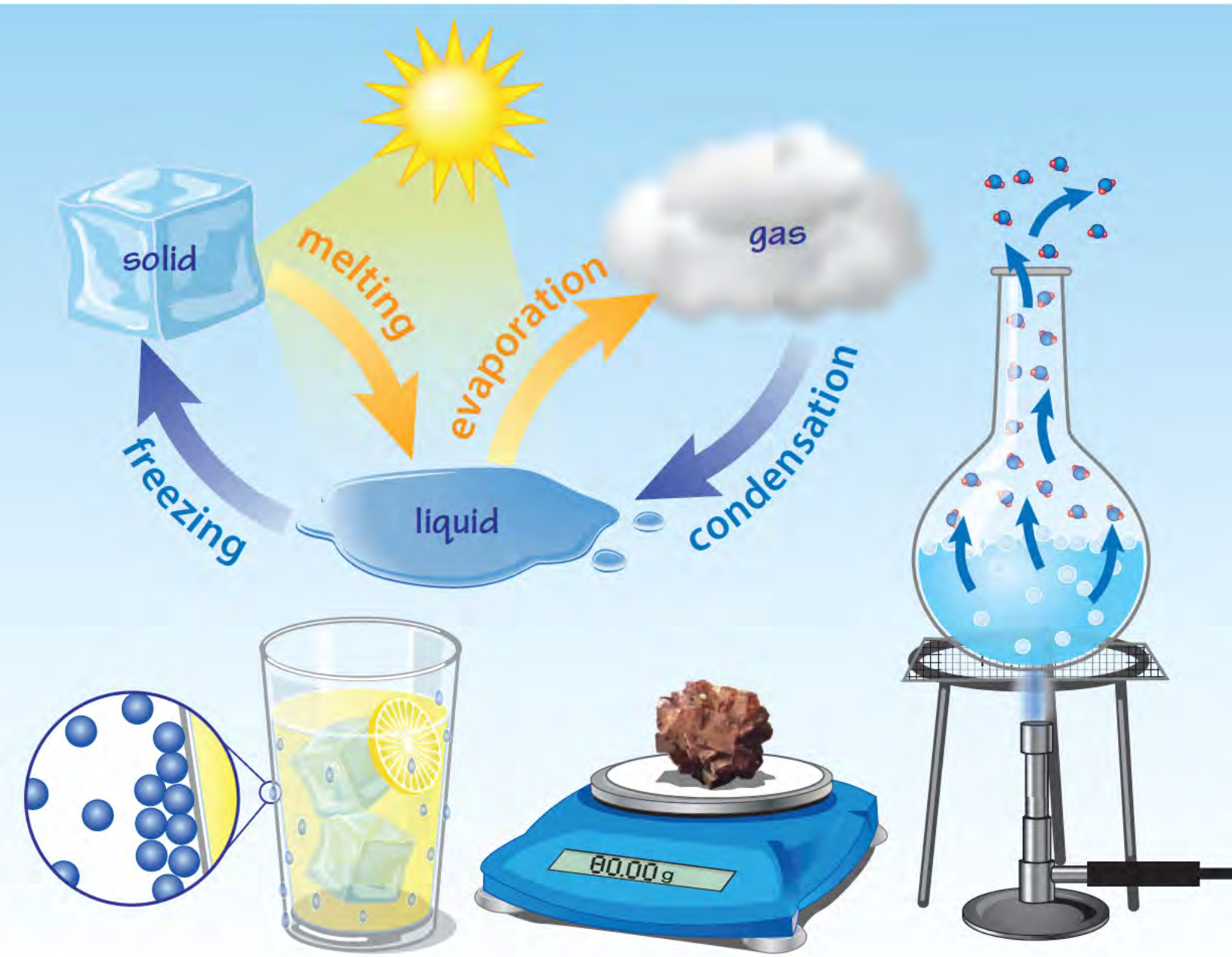
Properties & States of Matter
Learning Guide



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Fax: 800-507-0967
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INTRODUCTION TO MATTER

What Is Matter?

Matter is anything that **takes up space** and has **mass**. Everything around us that we can see is made up of matter. Our food, clothing, homes, possessions and even our bodies are all composed of matter.

Matter and Substances

A **substance** is a type of matter that is pure and has a specific **chemical makeup**. For example, **salt**, **sugar**, and **water** are all substances with precise **chemical compositions**.

salt — $NaCl$

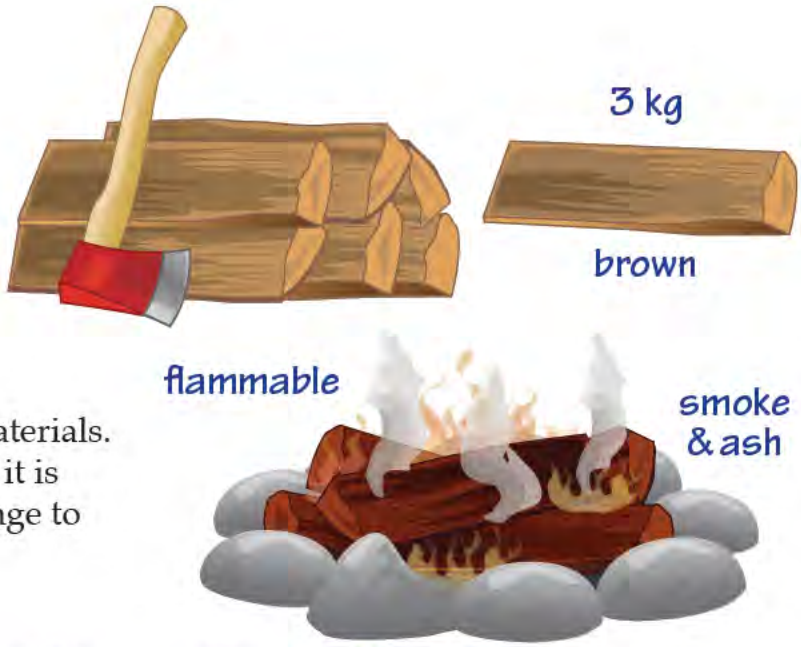
sugar — $C_{12}H_{22}O_{11}$ (sucrose)

water — H_2O

Although there are numerous examples of pure substances, most of the matter around us is made up of many substances. Just think of all the substances and ingredients found in the foods we eat every day.

Properties of Matter

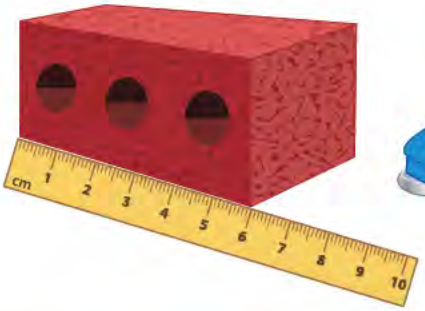
Matter can be described as having **physical** and **chemical properties**. **Physical properties** would include things like **mass** and **color**. For example, a piece of wood has physical properties that can be measured and observed. **Chemical properties** are related to how matter can **react** and **change** into other materials. Chemical properties of this wood are that it is **flammable**, and if it is burned, it will change to ash and smoke.



Physical Properties

A **physical property** of matter is a property that can be **observed or measured** without changing the composition of the matter.

Some examples of physical properties include **color, texture, flexibility, density, mass,** and **magnetism**. The **states of matter**, **solid, liquid** or **gas**, are also physical properties.



Chemical Properties

A **chemical property** of matter is a property that describes the **ability of the matter to react** to other substances and **change into different substances**. **Reactivity** and **flammability** are both **chemical properties**. A **chemical property** of iron is that it reacts with oxygen in the air to form **iron oxide**, or **rust**. Another example is the flammability of fossil fuels, which release **carbon dioxide** gases when they are burned.

Reactivity

iron + oxygen → rust

Flammability