

# *The Interactive Periodic Table of the Elements Teacher's Guide*

**Grade Level:** 9–12

**Curriculum Focus:** Chemistry

## **Description**

### **Disc 1. Alkali Metals and Alkaline-Earth Metals**

These elements are highly reactive and rarely found uncombined in nature. The alkaline-earth metals group includes elements that are very reactive and rarely found uncombined in nature.

### **Disc 2. Transition Metals**

These elements are malleable and ductile, and they make up the largest elemental group.

### **Disc 3. Other Metals, Metalloids, Nonmetals, and Gases**

The other metals group includes metals that are more brittle and very useful in industry.

The metalloids group includes elements that have physical properties in common with metals and nonmetals.

The nonmetals group includes the most common elements in living organisms.

The halogens group is made of elements that are highly reactive and rarely found uncombined in nature.

The noble gases group is the most chemically stable group of elements.

### **Disc 4. Lanthanides and Actinides**

The lanthanide series is a subgroup of the transition metals; the elements are reactive and rarely found uncombined in nature.

The actinide series is also a subgroup of the transition metals; all these elements are radioactive, and only a few occur naturally on Earth.

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### **Disc 1. Alkali Metals and Alkaline-Earth Metals**

Explore the alkali metals to see how they react violently with water and tarnish rapidly in dry air. Then, take a look at the alkaline-earth metals, which are generally softer than most other metals.

#### **Overview of Alkali Metals**

Because they are highly reactive, the alkali metals are never found uncombined in nature. Examine the key properties, characteristics, and uses of the six alkali metals.

- lithium
- sodium
- potassium
- rubidium
- cesium
- francium

## Overview of Alkaline-Earth Metals

Almost as unstable as alkali metals, alkaline-earth metals are soft, silvery metals that react easily with water. Learn about the common properties and unique characteristics of these metallic elements.

- beryllium
- magnesium
- calcium
- strontium
- barium
- radium

## BONUS MATERIALS

### Three Phases of Matter: Demonstration of Temperature Changes

Watch a demonstration of the effects of temperature on atoms in their three states of matter.

### Organic and Inorganic Material in Bones

Take a digital tour through bone matter to see how organic and inorganic materials combine to make strong, flexible bones.

## Academic Standards

### National Academy of Sciences

The National Academy of Sciences provides guidelines for teaching science in grades K–12 to promote scientific literacy. To view the standards, visit this Web site:

<http://books.nap.edu/html/nses/html/overview.html#content>.

### This disc addresses the following national standards:

- Physical Science: Structure and properties of matter; chemical reactions
  - Science and Technology: Understanding about science and technology
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## Disc 2. Transition Metals

The transition metals are malleable and ductile elements, and they make up the largest elemental group on the table.

### Overview of Transition Metals

The transition metals are generally known for their hardness, high densities, and melting and boiling points. Examine the shared traits and unique properties of this large group of elements.

### Transition Metals I

Discuss the unique properties and characteristics of the first part of the transition metal group, metals scandium through cadmium.

- scandium
- titanium
- manganese
- iron
- cobalt
- vanadium
- chromium
- nickel
- copper
- zinc

- yttrium
- zirconium
- niobium
- molybdenum
- technetium
- ruthenium
- rhodium
- palladium
- silver
- cadmium

### Transition Metals II

Discuss the unique properties and characteristics of the second part of the transition metal group, metals hafnium to ununbium.

- hafnium
- tantalum
- tungsten
- rhenium
- osmium
- iridium
- platinum
- gold
- mercury
- rutherfordium
- dubnium
- seaborgium
- bohrium
- hassium
- meitnerium
- darmstadtium
- roentgenium
- ununbium

### BONUS MATERIALS

#### Iron Rusting and Corrosion

How does iron rust? Examine the rusting and corrosion process.

#### Lanthanide Contraction

Learn why the change in atomic radius from element to element on the periodic table is so highly pronounced in the lanthanide series.

#### Uranium Fission

Watch a demonstration of fission as it occurs in the isotope uranium-235.

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### Disc 3. Other Metals, Metalloids, Nonmetals, and Gases

Compare the other metals with the metalloids. See how nonmetals are essential to the natural world, explore the noble gases, learn how halogens help keep us safe.

#### Overview of Other Metals

The other metals group contains some of the most widely used elements in the world. Discuss the composition and uses of these elements and compare them with the transition.

- aluminum
- gallium
- indium
- tin
- thallium
- lead
- bismuth

#### Overview of Metalloids

Sometimes acting as metals and sometimes as nonmetals, the metalloids may be the strangest and perhaps most useful group of elements on the periodic table.

- boron
- silicon
- germanium
- arsenic
- antimony
- tellurium
- polonium

#### Overview of Nonmetals

There are far fewer nonmetals than metals on the periodic table; however, the nonmetals are essential components of many of Earth's natural resources.

- hydrogen
- carbon
- nitrogen
- oxygen
- phosphorous
- sulfur
- selenium

#### Overview of Halogens

Comprised of fluorine, chlorine, bromine, iodine and astatine, the halogens are highly reactive nonmetals with relatively low melting and boiling points.

- fluorine
- chlorine
- bromine
- iodine
- astatine



## Overview of Noble Gases

The noble gases are the most stable group of elements on the periodic table; learn their key properties and uses.

- helium
- neon
- argon
- krypton
- xenon
- radon

## BONUS MATERIALS

### Flexible Carbon

Examine four different allotropes made of carbon.

### Teflon Magic

See how Teflon is created.

### Noble Glow

Watch what happens when electrons from noble gases release energy.

### Doping Silicon

See how silicon reacts when it is treated with impurities.

### Atoms, the Building Blocks of Matter

Discover just how small an atom is.

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- Physical Science: Physical Science: Structure and properties of matter; chemical reactions; Structure of atoms; Interactions of energy and matter
- Science and Technology: Understanding about science and technology
- Science as Inquiry: Understanding about scientific inquiry
- History and Nature of Science: Historical perspectives; Science as a human endeavor; Nature of scientific knowledge
- Earth and Space Science: Energy in the Earth system; Geochemical cycles; Properties of earth materials



#### Disc 4. Lanthanides and Actinides

Take a closer look at the lanthanide series and the radioactive actinide series to discover the dangers and benefits of nuclear energy.

##### Overview of the Lanthanide Series

The lanthanides are also called the rare-earth elements because scientists once believed these common metals were hard to come by.

- lanthanum
- cerium
- praseodymium
- neodymium
- promethium
- samarium
- europium
- gadolinium
- terbium
- dysprosium
- holmium
- erbium
- thulium
- ytterbium
- lutetium

##### B. Overview of the Actinide Series

The radioactivity of the actinide elements can be beneficial, such as for cancer treatment and as heat and power sources.

- actinium
- thorium
- protactinium
- uranium
- neptunium
- plutonium
- americium
- curium
- berkelium
- californium
- einsteinium
- fermium
- mendelevium
- nobelium
- lawrencium

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- Science and Technology: Understanding about science and technology



- Science in Personal and Social Perspectives: Science and technology in society; Science and technology in local, national, and global challenges
- History and Nature of Science: Science as a human endeavor; Historical perspectives

