🧪 Lesson Plan: Elements and the periodic table

Grade Level: 7
Subject: Physical Science
Duration: 45–60 min
NGSS MS-PS1-1: Develop models to describe the atomic composition of simple molecules and extended structures.

🎯 Learning Objectives

By the end of this lesson, students will be able to:

- **Define** an element as a pure substance made of only one type of atom that cannot be broken down by chemical means.
- **Describe** how the periodic table organizes the elements into periods and groups in order of

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- **Periodic Table:** A chart that organizes all of the known elements into rows and columns. The elements are placed in order of increasing atomic number so that their properties form repeating patterns.
- **Atomic Number:** The number of protons in an atom's nucleus. Every element has its own atomic number, and it sets the order of the elements on the periodic table.
- **Atomic Mass:** The total number of protons and neutrons in the nucleus of an atom. Subtracting the atomic number from the atomic mass gives the number of neutrons.

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- **Group:** A vertical column on the periodic table, also called a family. Elements in the same group have similar chemical properties because they have the same number of electrons in their outer shell.
- **Period:** A horizontal row on the periodic table. Reading a period from left to right, each element has one more proton, so the atomic number increases across the row.
- **Metalloid:** An element that has some properties of both metals and nonmetals. Silicon is a metalloid, and metalloids sit along the zig-zag line that separates metals from nonmetals on the periodic table.

💼 Materials Needed: (all links are included in this PDF)

- Printed copies of the Study Guide (https://newpathworksheets.com/api/guide/study-guide-science-grade-7-elements-and-the-periodic-table-1.pdf)
- Elements & the Periodic Table Activity Lesson handout

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📝 Lesson Procedure

Step 1: Introduction (5 minutes)

- Open by asking students: 'Everything around you—your desk, the air, your body—is made of matter. What do you think matter is made of at its smallest level?'
- Hold up aluminum foil, a graphite pencil core, and a silicon chip and explain that each is made of just one kind of atom, so each is a pure element.
- Tell students that today they will learn how all the known elements are organized on the periodic table and what its rows and columns reveal about an element's properties.

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Step 2: Direct Instruction (15 minutes)

- Use the Study Guide to explain that elements are the purest form of matter, each made of one type of atom, and that the roughly 118 known elements are arranged in order of increasing atomic number. (https://newpathworksheets.com/api/guide/study-guide-science-grade-7-elements-and-the-periodic-table-1.pdf)
- Point out on the Study Guide's periodic table that horizontal rows are periods, vertical columns are groups, and that elements in the same group share chemical properties because they have the same number of outer-shell electrons. (https://newpathworksheets.com/api/guide/study-guide-science-grade-7-elements-and-the-periodic-table-1.pdf)
- Demonstrate the metal, metalloid, and nonmetal categories by passing around a shiny, bendable piece of aluminum foil (metal), a silicon chip (metalloid), and a brittle graphite pencil core (nonmetal), and have students note which are shiny, bend, or crumble.

Step 3: Guided Practice (15 minutes)

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questions about metalloids, valence electrons, and how the atomic number changes across a period. (https://newpathworksheets.com/api/worksheet/worksheet-science-grade-7-elements-and-the-periodic-table-1-0.pdf)

- Ask students to choose three elements and record each element's symbol, atomic number, atomic mass, and calculated number of neutrons using their printed periodic table.
- Have students label one full period on their printed periodic table and mark each element in it as a metal, metalloid, or nonmetal.

Step 5: Assessment (10 minutes)

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- Administer Practice Worksheet 1 as a short closing quiz covering periods, groups, valence electrons, and noble gases, then review the answers as a class. (https://newpathworksheets.com/api/worksheet/worksheet-science-grade-7-elements-and-the-periodic-table-1-1.pdf)
- Have students classify named everyday elements—the aluminum in foil, the helium in a balloon, and the silicon in a computer chip—as a metal, a noble gas, or a metalloid, and justify each answer using the periodic table.
- Ask students to explain in one or two sentences why the periodic table lists the elements in order of increasing atomic number.

Differentiation Strategies

For advanced learners:

- Challenge students to use the periodic table to predict how reactive an element is from its

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- Sort a set of labeled element samples—aluminum foil, copper wire, a graphite core, and a silicon chip—into metals, metalloids, and nonmetals and defend the sorting to a partner.
- Create an element trading card for one element that shows its symbol, atomic number, atomic mass, group, period, and one real-world use.

Complete List of Available Resources:

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- NewPathWorksheets: Elements and the periodic table (https://newpathworksheets.com/science/grade-7/elements-and-the-periodic-table-1)
- Study Guide PDF (https://newpathworksheets.com/api/guide/study-guide-science-grade-7-elements-and-the-periodic-table-1.pdf)
- Activity Lesson PDF (https://newpathworksheets.com/api/activity-lesson/activity-lesson-science-grade-7-elements-and-the-periodic-table-1-elements-the-periodic-table-4.pdf)
- Worksheet PDF 0 (https://newpathworksheets.com/api/worksheet/worksheet-science-grade-7-elements-and-the-periodic-table-1-0.pdf)
- Worksheet PDF 1 (https://newpathworksheets.com/api/worksheet/worksheet-science-grade-7-elements-and-the-periodic-table-1-1.pdf)
- Worksheet PDF 2 (https://newpathworksheets.com/api/worksheet/worksheet-science-grade-7-elements-and-the-periodic-table-1-2.pdf)
- Worksheet PDF 3 (https://newpathworksheets.com/api/worksheet/worksheet-science-grade-7-elements-and-the-periodic-table-1-3.pdf)
- Vocabulary PDF 1 (https://newpathworksheets.com/api/vocabulary/vocabulary-science-

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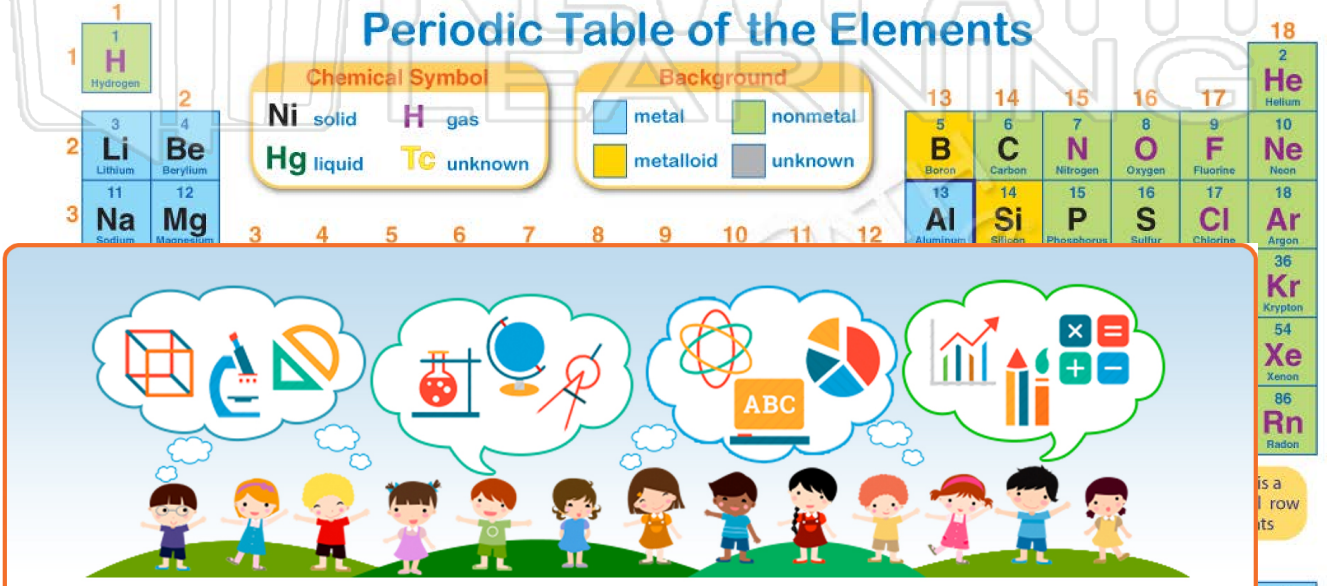
PERIODIC TABLE

Pure Matter

Elements are the purest form of matter and can not be broken down into any other substance by either a physical or chemical change. There are about 114 elements and they are organized on a modern **Periodic Table of the Elements**.



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On the table shown above, the first element is H for hydrogen and one atom of H has an atomic number of 1. The element with the highest atomic number is the last one on the bottom right of chart, Uuq.

Lesson Checkpoint:
What is used to organize the elements on the Periodic Table?

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Chart Represents an Atom of Each Element

Up toward the top left hand side of the table, the element C or carbon has been taken out and shown separately. To the right of the symbol, labels are given to the various pieces of information that are available for each element. Remember that in each case the information is for one atom of that element.

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the small box, it will give you the total number of electrons in that atom. Whenever an atom is not bonded to another, the number of protons in the nucleus always equals the number of electrons outside the nucleus.

Lesson Checkpoint:
What can the atomic mass of an atom tell us about particles of the atom?

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Positions in the Periodic Table

The horizontal rows of the table are called **periods**. The elements in a period are not chemically similar. Normally the elements toward the left are **metals**, the ones along the dark line on the right side are **metalloids,** and the ones on the right are **non metals**. Metalloids, such as Silicon (Si), have both metallic and non metallic properties.

5	6	7	8	9	10
B	C	N	O	F	Ne
10.81	12.011	14.007	15.999	18.998	20.179

Periods towards the bottom of the table contain **radioactive** elements. These atoms disintegrate and, when they do, large amounts of atomic or nuclear energy are released.

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Group 18 contains **noble gases**. These atoms all have eight electrons in their outer electron orbit and are almost totally unable to bond to other atoms. These elements are sometimes referred to as **inert** elements.

85.468
55 Cs 132.91
87 Fr 223

Lesson Checkpoint:
What are the names of the vertical columns and horizontal rows of the Periodic Table?

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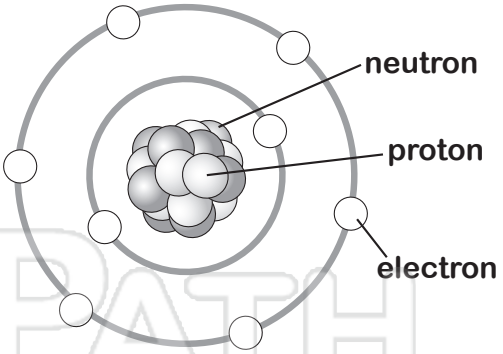
Elements & the Periodic Table

Name _____ Class _____ Date _____

Elements are the basic building blocks of **matter**. Each element is made up of one type of **atom** which determines its properties. Each element is represented by a unique **chemical symbol**.

The Periodic Table groups elements in an **organized fashion.** Elements in each **column** have similar **chemical properties.** Elements in each **row** are arranged according to the **number of protons** (**atomic number**).



Oxygen atom model

The **Periodic Table** groups elements in an organized fashion.

8 — Atomic number (number of protons)

Each element has a unique ... of protons in the nucleus.

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	1																	
1	1 H Hydrogen																	
2	3 Li Lithium																	
3	11 Na Sodium																	
4	19 K Potassium																	
5	37 Rb Rubidium																	
6	55 Cs Cesium																	
7	87 Fr Francium	88 Ra Radium	89 Ac Actinium	104 Rf Rutherfordium	105 Db Dubnium	106 Sg Seaborgium	107 Bh Bohrium	108 Hs Hassium	109 Mt Meitnerium	110 Ds Darmstadtium	111 Rg Roentgenium	112 Cn Copernicium	113 Nh Nihonium	114 Fl Flerovium	115 Mc Moscovium	116 Lv Livermorium	117 Ts Tennessine	118 Og Ognesson

Period

increasing atomic number

increasing atomic number

Lanthanoids

58 Ce Cerium	59 Pr Praseodymium	60 Nd Neodymium	61 Pm Promethium	62 Sm Samarium	63 Eu Europium	64 Gd Gadolinium	65 Tb Terbium	66 Dy Dysprosium	67 Ho Holmium	68 Er Erbium	69 Tm Thulium	70 Yb Ytterbium	71 Lu Lutetium

Actinids

90 Th Thorium	91 Pa Protactinium	92 U Uranium	93 Np Neptunium	94 Pu Plutonium	95 Am Americium	96 Cm Curium	97 Bk Berkelium	98 Cf Californium	99 Es Einsteinium	100 Fm Fermium	101 Md Mendelevium	102 No Nobelium	103 Lr Lawrencium

Elements in each **column** or **group** have similar **chemical properties**.

Elements in each **row** or **period** are arranged according to the number of **protons**. The number of protons (**atomic number**) **increases** from left to right.

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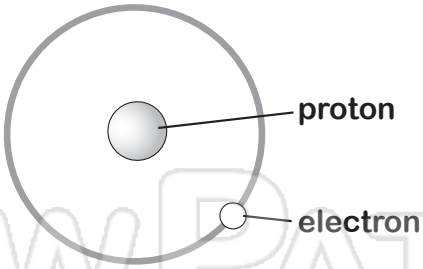
Elements & the Periodic Table

Name _____ Class _____ Date _____

A **column of elements** in the **Periodic Table** is known as a **group** or **family**.

Hydrogen is set apart from the rest of the elements because of its **unique properties.** It is the most abundant element in our universe.

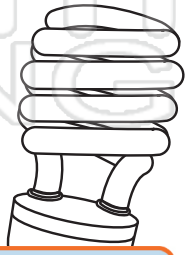


Group 1: Alkali Metals

These metals are **very reactive** which are only found in **compounds**.

Group 2: Alkaline Earth Metals

These metals are **fairly reactive, conduct electricity** and are only found in **compounds**. Magnesium and calcium are the two most common eleme



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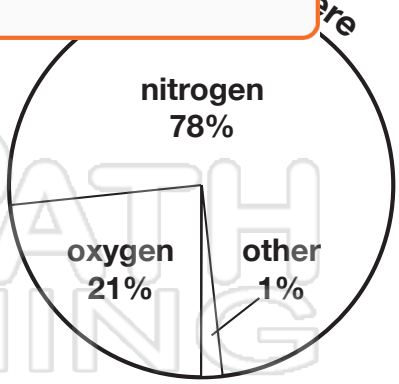
Oxygen makes up about **20%** of the air in our **atmosphere.** It is **necessary** for most living things on Earth.



Group 17: Halogens

Halogens are **very reactive nonmetals** which are only found in **compounds**.

Group 18: Noble Gases

Noble gases are **unreactive nonmetals** which are colorless and odorless at room temperature. Some of these gases are used to make ***"neon" lights***.

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Elements & the Periodic Table

Name _____ Class _____ Date _____

Use a reference to color metals blue, metalloids orange and nonmetals green.

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Elements & the Periodic Table

Name _____ Class _____ Date _____

Complete the graphic organizer. For boxes that are not labeled, provide both appropriate labels and details.

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Elements & the Periodic Table

Use a reference to color **metals** blue, **metalloids** orange and **nonmetals** green.

Answer Key

Perio ts

Background Col
metal nor
metalloid

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1 H Hydrogen																	2 He Helium
2	3 Li Lithium	4 Be Beryllium												6 C Carbon	7 N Nitrogen	8 O Oxygen	9 F Fluorine	10 Ne Neon
3	11 Na Sodium	12 Mg Magnesium												14 Si Silicon	15 P Phosphorus	16 S Sulfur	17 Cl Chlorine	18 Ar Argon
4	19 K Potassium	20 Ca Calcium	21 Sc Scandium	22 Ti Titanium	23 V Vanadium	24 Cr Chromium								32 Ge Germanium	33 As Arsenic	34 Se Selenium	35 Br Bromine	36 Kr Krypton
5	37 Rb Rubidium	38 Sr Strontium	39 Y Yttrium	40 Zr Zirconium	41 Nb Niobium	42 Mo Molybdenu								50 Sn Tin	51 Sb Antimony	52 Te Tellurium	53 I Iodine	54 Xe Xenon
6	55 Cs Cesium	56 Ba Barium	57 La Lanthanum	72 Hf Hafnium	73 Ta Tantalum	74 W Tungstur								82 Pb Lead	83 Bi Bismuth	84 Po Polonium	85 At Astatine	86 Rn Radon
7	87 Fr Francium	88 Ra Radium	89 Ac Actinium	104 Rf Rutherfordium	105 Db Dubnium	106 Sg Seaborgiu								114 Fl Flerovium	115 Mc Moscovium	116 Lv Livermorium	117 Ts Tennessine	118 Og Ognesson

Group

increasing atomic number

Lanthanoids

	58 Ce Cerium	59 Pr Praseodymi																

Actinids

	90 Th Thorium	91 Pa Protactiniu																

increasing atomic number

	67 Ho Holmium	68 Er Erbium	69 Tm Thulium	70 Yb Ytterbium	71 Lu Lutetium													

	99 Es Einsteinium	100 Fm Fermium	101 Md Mendelevium	102 No Nobelium	103 Lr Lawrencium													

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Elements & the Periodic Table

Answer Key Example

Complete the graphic organizer. For boxes that are not labeled, provide both appropriate labels and details.

Periodic Table

chart used to organize elements according to properties

make up

Elements

PREVIEW

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open-ended

such as

such as

open-ended

open-ended

open-ended

open-ended

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Elements and the periodic table

Sci G

Name_____ Class_____ Date_____

1 Silicon (Si) and Boron (B) are called **metalloids** because they _____.

A always act as metals
B always act as nonmetals
C act as both metals and nonmetals
D do not act like metals or nonmetals

2 An atom with an **atomic mass** of 12 and an **atomic number** of 5 has how many neutrons?

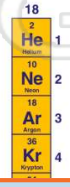
A 7
B 5
C 12
D 17

3 Carbon (C) has **four** electrons in its valence shell. **How many more** electrons does carbon need to have a **full valence shell**?

A 2 more
B 4 more

4 Why are argon (Ar) and krypton (Kr) considered **noble gases**?

A they do not react with other elements
B they only react with metals



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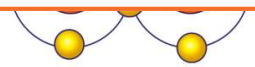
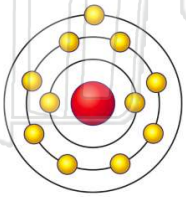
7

D right side



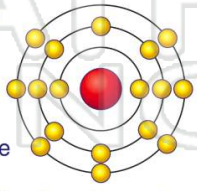
9 Sodium (Na) is on the **left** side of the periodic table because it **always acts as** a _____.

A metal
B nonmetal
C metalloid
D noble gas



10 Chlorine (Cl) is called a **nonmetal** because it _____.

A has a luster
B conducts electricity
C has seven valence electrons
D does not react with other elements



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Elements and the periodic table

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A 7
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C 12
D 17

A

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A 2 more
B 4 more

B

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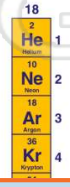

A

5

A

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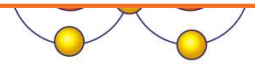
A

D right side



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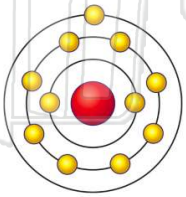
D noble gas



A

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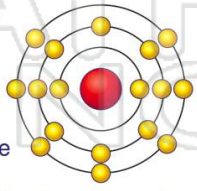

C

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Elements and the periodic table

Sci G

Name_____ Class_____ Date_____

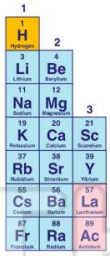
1 **Radioactive** atoms break up and give off energy.

True or false?

A true
B false

2 As you go from top to bottom down any **group** in the periodic table, the number of valence electrons stays the same.

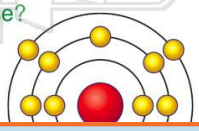
True or false?



A true
B false

3 Silicon (Si) is considered a **metalloid** because it has 20 **protons**.

True or false?



A true
B false

4 Chromium has an atomic number of **24**. If an atom of chromium has **28 neutrons**, its **atomic mass** would be **28**.

True or false?

A true

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5

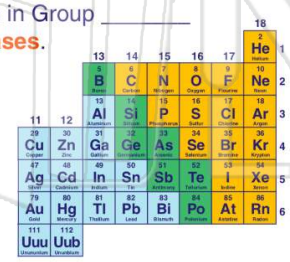
D 4

C Kr
D none of the above

7

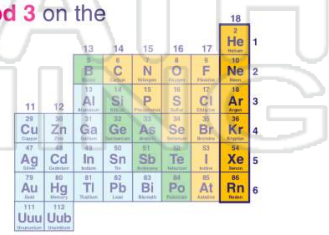
9 All the atoms in Group _____ are **noble gases**.

A 15
B 16
C 17
D 18



10 The noble gas with _____ protons is found in **Period 3** on the periodic table.

A 15
B 16
C 17
D 18



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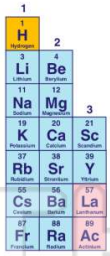
2 As you go from top to bottom down any **group** in the periodic table, the number of valence electrons stays the same.

True or false?

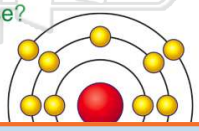


A true
B false

A

3 Silicon (Si) is considered a **metalloid** because it has 20 **protons**.

True or false?



A true
B false

B

4 Chromium has an atomic number of **24**. If an atom of chromium has **28 neutrons**, its **atomic mass** would be **28**.

True or false?

A true

B

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5

C

7

D 4

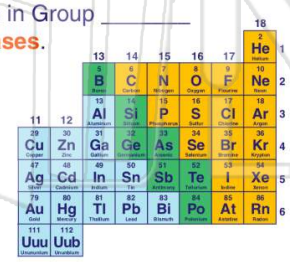
C

C Kr
D none of the above

C

9 All the atoms in Group _____ are **noble gases**.

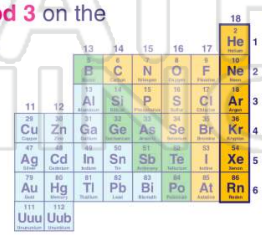
A 15
B 16
C 17
D 18



D

10 The noble gas with _____ protons is found in **Period 3** on the periodic table.

A 15
B 16
C 17
D 18



D

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Elements and the periodic table

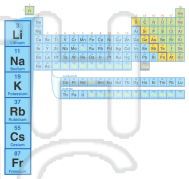
Sci G

Name_____ Class_____ Date_____

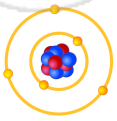
Match each of the following terms to its definition:

Group	Nonmetal	Alkali metals	Metalloid
Element	Halogen	Metal	Noble gas

1. - the metals listed in group 1 of the Periodic Table



2. - the most basic (simple) kind of matter that cannot be broken down; a substance that cannot be decomposed to another substance by a chemical change



3.

4. Period

5. condu

6. nonme

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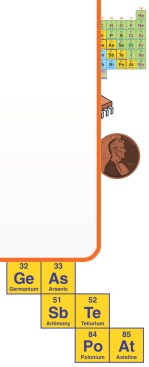
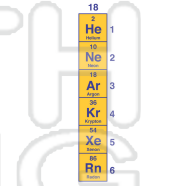
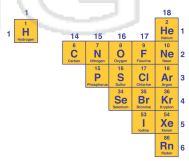


7. - one of the elements found in group 18 of the Periodic Table; helium and argon are examples



8. - an element that lacks the properties of a metal



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Elements and the periodic table

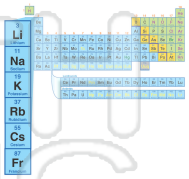
Sci G

Name_____ Class_____ Date_____

Match each of the following terms to its definition:

Group	Nonmetal	Alkali metals	Metalloid
Element	Halogen	Metal	Noble gas

1. alkali metals - the metals listed in group 1 of the Periodic Table



2. element - the most basic (simple) kind of matter that cannot be broken down; a substance that cannot be decomposed to another substance by a chemical change

3. gro

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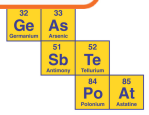
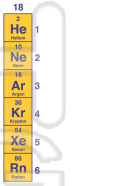
4. hal
Table;

5. me
condu

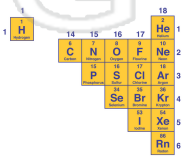
6. me
nonme



7. noble gas - one of the elements found in group 18 of the Periodic Table; helium and argon are examples



8. nonmetal - an element that lacks the properties of a metal



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