

# Atoms and Isotopes Reading

**Directions:** 1. Read the information on the left. 2. Use the red circles on the left to identify key words. 3. Answer the questions by putting answers and key details onto the right. 4. Write a one sentence synthesis statement that explains the big idea of the text.

Look at the periodic table. Focus on the atomic numbers and the atomic masses of the different elements. What do you notice? One detail you might have noticed is that the atomic number is always a whole number while the atomic mass has decimals. Why?

The atomic number is made up of the number of protons. The atomic mass is made up of the number of protons and neutrons. Although the number of protons in an element stays the same, the number of neutrons varies. The atomic mass is an average of the different number of neutrons an atom of an element has.

The atoms in an element that have the same number of protons but different numbers of neutrons are called isotopes. Isotopes of an element are given isotope names that include the element's name and the mass number of that element. For example, Lithium has two main isotopes, Lithium-6 and Lithium-7. Lithium-6 is contains 3 protons and 3 neutrons while Lithium-7 contains 3 protons and 4 neutrons. The number of protons is the same, they both have 3. The number of neutrons for each is different, Lithium-6 has 3 and Lithium-7 has 4 (diagram 1).

**Diagram 1**

Lithium-6 Protons = 3 Neutrons = 3 Electrons = 3	Lithium-7 Protons = 3 Neutrons = 4 Electrons = 3

TOPIC	isotopes	GUIDING QUESTION	What are isotopes and what are they used for?
QUESTION		KEY DETAILS	
What is an isotope?		Add text	
QUESTION		KEY DETAILS	
How can you identify isotopes?		Add text	
SYNTHESIS SENTENCE: BIG IDEA OF THE TEXT IN ONE SENTENCE:			
Add text			



comprehension passages  
**2** Guided Note templates  
 worksheets

**Isotopes**

neutrons, and electrons in the isotopes below. Then write name-mass number).

Atom B	Atom C
protons = _____ electrons = _____ neutrons = _____ isotope name: _____	protons = _____ electrons = _____ neutrons = _____ isotope name: _____

**Apply:**

3. Look at the atoms below. Which ones are isotopes of each other and why?  
 a. Atom W: 9 protons and 9 neutrons  
 b. Atom X: 8 protons and 9 neutrons

## Atoms

### Big Idea Question: What is an atom and what is it made up of?

Look around you. The air, your desk, your chair, this paper, everything you see is made up of these extremely small particles called atoms. Atoms are so small that it takes a special microscope called the scanning tunneling microscope in order to see them. Atoms are the smallest basic unit of a substance.

As small as atoms are, they are made up of even smaller particles called protons, neutrons, and electrons. It is the combination of these particles that determine the properties of the atom. To better understand these particles we need to take a look at the structure of the atom (diagram 1).

The atom is composed of two parts, the nucleus and the electron cloud. The nucleus is found in the center of the atom. It is made up of protons and neutrons. Protons are known for having a positive charge and a mass of 1 amu (atomic mass unit). Neutrons also have a mass of 1 amu but do not have a charge. The electron cloud is the area that surrounds the nucleus and is where the electrons are located. Electrons are negatively charged particles. They have a mass but it is so small that we say they have a mass of 0 amu. The electrons have different energy levels. Those with similar energy levels hang out together in certain areas called shells. These shells can hold a certain amount of electrons. For example, the first shell can hold only eight electrons.

Diagram 1

- Neutron:
  - mass = 1 amu
  - charge = No charge
  - location = nucleus
- Proton:
  - mass = 1 amu
  - charge = positive
  - location = nucleus

Elements are the basic substances that have the same number of protons. It identifies with the number of electrons match the number, you determine the atomic mass. atomic number

Diagram 2

Atomic Number:  
number of protons

Atomic Mass:  
number of protons  
and neutrons

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## Isotopes

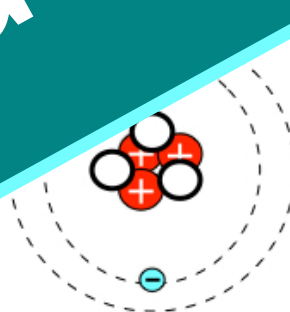
### Big Idea Question: What is an isotope?

Look at the periodic table of the different elements. The atomic number is always the same for an element.

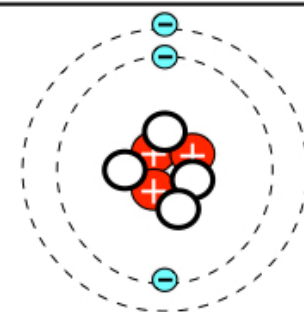
The atomic mass of the number of the same element is different.

Atomic masses are different. This is because the number of neutrons is different. The number of protons is the same, but the number of neutrons is different. This is why the atomic mass is different.

Isotopes are atoms of the same element that have the same number of protons but a different number of neutrons. For example, Lithium has two isotopes. Lithium-6 has 3 protons and 3 neutrons. Lithium-7 has 3 protons and 4 neutrons. The number of protons is the same, but the number of neutrons is different.



**Lithium-6**  
Protons = 3  
Electrons = 3  
Neutrons = 3



**Lithium-7**  
Protons = 3  
Electrons = 3  
Neutrons = 4

Why are isotopes so important? Isotopes have only been known for less than 100 years and yet they are used in many of our everyday products. Although most people have heard of Carbon-14 which is used in radiocarbon dating to determine how long ago and organism lived there are many isotopes you might not be aware of. Americum-241 is used in our smoke detectors. The alpha particles it emits collides with oxygen and nitrogen in the air and produces charged ions. These ions create a steady current. When smoke enters the space and disrupts the current the smoke detector goes off. Technetium-99 is the most common radioisotope in medicine used for the detection of diseases and cancer. Iodine-131 is used to determine the amount of activity in a persons thyroid to help diagnose both hyperthyroidism and hypothyroidism. Many foods you find in your local supermarkets have been treated with cobalt-60 which helps kill organisms and keeps the food fresher longer by preventing spoilage. These are only some isotopes used in our everyday lives. What are some others you can find through research?

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**Directions:** Follow the directions on each slide to complete this guided reading activity notebook

# ATOMS AND ISOTOPES

1

**Directions:** 1. Read the information on the left. 2. Use the red circles on the left to identify key words. 3. Answer the questions by putting answers and key details onto the left. 4. Write a one sentence synthesis statement that explains the big idea of the text.

As small as atoms are, they are made up of even smaller particles called protons, neutrons, and electrons. It is the combination of these particles that determine the properties of the atom. To better understand these particles we need to take a look at the structure of the atom (diagram 1).

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**Diagram 1**

- Neutrons: mass = 1 amu, charge = no charge, location = nucleus
- Protons: mass = 1 amu, charge = positive, location = nucleus
- Electrons: mass = 0 amu, charge = negative, location = electron shell

**TOPIC:** atoms      **GUIDING QUESTION:** What are atoms and what are they made up of?

**QUESTION:** What is an atom?      **KEY DETAILS:** Add text

**QUESTION:** What are the different parts of an atom?      **KEY DETAILS:** Add text

**SYNTHESIS SENTENCE: (BIG IDEA OF THE TEXT IN ONE SENTENCE):** Add text

2

**Directions:** 1. Read the information on the left. 2. Use the red circles on the left to identify key words. 3. Answer the questions by putting answers and key details onto the left. 4. Write a one sentence synthesis statement that explains the big idea of the text.

Elements are the basic substances that make up matter. The atoms of each element have the same number of protons. The number of protons in each atom is called the atomic number. It identifies what the element is. In a neutral atom, the number of protons and electrons match since they have opposite charges. This means that if you know the atomic number, you know the number of protons and electrons in an atom. The atomic mass is determined by the number of protons and neutrons found in an atom's nucleus. The electrons mass is too small to be counted. The number of protons and neutrons is called the atomic mass. To find the number of neutrons in an atom you simply need to subtract the atomic number from the atomic mass (diagram 2).

**Diagram 2**

Atomic Number = number of protons = 3  
 Lithium

Atomic Mass = number of protons and neutrons = 7  
 Number of neutrons = atomic mass - atomic number = 7 - 3 = 4

**TOPIC:** atoms      **GUIDING QUESTION:** What are atoms and what are they made up of?

**QUESTION:** How can you determine how much of each particle is in an atom?      **KEY DETAILS:** Add text

**SYNTHESIS SENTENCE: (BIG IDEA OF THE TEXT IN ONE SENTENCE):** Add text

3

**Directions:** 1. Answer the questions on the left. 2. Use the labels on the left to identify the parts of the atom. 3. Fill in the table below. 4. Use the information to identify the number of protons, electrons, and neutrons for each atom.

**What is an atom?** Add text

**Fill in the table**

	Charge	Location	Mass
Protons	Add text	Add text	Add text
Neutrons	Add text	Add text	Add text
Electrons	Add text	Add text	Add text

**Use the labels on the left to identify the different parts of the atom.**

**Identify the number of protons, electrons, and neutrons.**

Atom	# of protons	# of electrons	# of neutrons
4 Be Beryllium 9	#	#	#
9 F Fluorine 19	#	#	#
11 Na Sodium 23	#	#	#
10 Ne Neon 20	#	#	#

4

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**Diagram 1**

- Lithium-6: Protons = 3, Neutrons = 3
- Lithium-7: Protons = 3, Neutrons = 4

**TOPIC:** isotopes      **GUIDING QUESTION:** What are isotopes and what are they used for?

**QUESTION:** What is an isotope?      **KEY DETAILS:** Add text

**QUESTION:** How can you identify isotopes?      **KEY DETAILS:** Add text

**SYNTHESIS SENTENCE: (BIG IDEA OF THE TEXT IN ONE SENTENCE):** Add text

5

**Directions:** 1. Read the information on the left. 2. Use the red circles on the left to identify key words. 3. Answer the questions by putting answers and key details onto the left. 4. Write a one sentence synthesis statement that explains the big idea of the text.

Why are isotopes so important? Isotopes have only been known for less than 100 years and yet they are used in many of our everyday products. Although most people have heard of Carbon-14 which is used in radiocarbon dating to determine how long ago an organism lived there are many isotopes you might not be aware of. Americium-241 is used in our smoke detectors. The alpha particles it emits collide with oxygen and nitrogen in the air and produces charged ions. These ions create a steady current. When smoke enters the space and disrupts the current the smoke detector goes off. Technetium-99 is the most common radiotracer in medicine used for the detection of diseases and cancer. Iodine-131 is used to determine the amount of activity in a person's thyroid to help diagnose both hyperthyroidism and hypothyroidism. Many foods you find in your local supermarkets have been treated with cobalt-60 which helps kill organisms and keeps the food fresher longer by preventing spoilage. These are only some isotopes used in our everyday lives. What are some others you can find through research?

**TOPIC:** isotopes      **GUIDING QUESTION:** What are isotopes and what are they used for?

**QUESTION:** What are some uses of isotopes?      **KEY DETAILS:** Add text

**SYNTHESIS SENTENCE: (BIG IDEA OF THE TEXT IN ONE SENTENCE):** Add text

6

**Directions:** 1. Answer the questions on the left. 2. Identify the number of protons, electrons, neutrons, and the isotope name below. 3. Use the atoms on the bottom left to answer the questions on the bottom right.

**What is an isotope?** Add text

**Identify the number of protons, electrons, neutrons, and the isotope name.**

Atom	# of protons	# of electrons	# of neutrons	Isotope name
(Diagram)	#	#	#	Add text
(Diagram)	#	#	#	Add text
(Diagram)	#	#	#	Add text

a. Atom W: 9 protons and 9 neutrons  
 b. Atom X: 8 protons and 9 neutrons  
 c. Atom Y: 9 protons and 9 neutrons  
 d. Atom Z: 9 protons and 10 neutrons

Which atoms on the left (a, b, c, d) are isotopes of each other and why? Add text

What are some uses of Chlorine? Add text

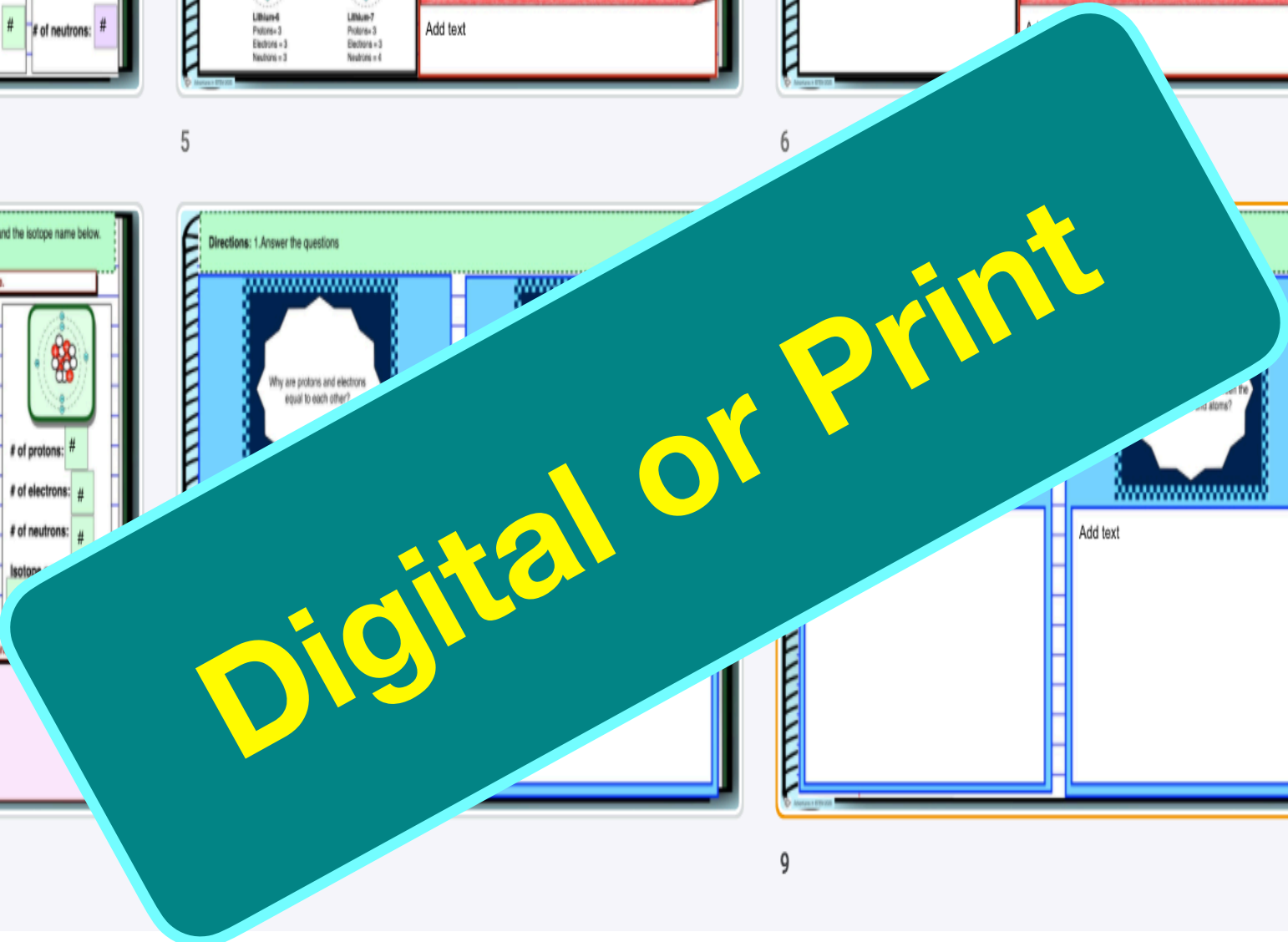
7

**Directions:** 1. Answer the questions

Why are protons and electrons equal to each other? Add text

What are some uses of Chlorine? Add text

9



Name: \_\_\_\_\_ Class: \_\_\_\_\_

Topic: isotopes Date: \_\_\_\_\_

**Big Idea Question:** What are isotopes and what are they used for?

**Questions**

**Notes**

What is an isotope?

How can you identify isotopes?

What are some uses of isotopes?



**Summary:**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

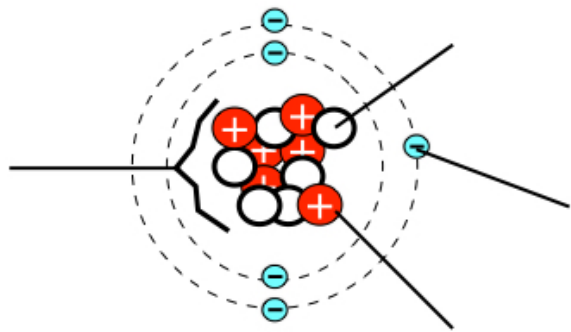
\_\_\_\_\_

## Atoms

**Identify and Define:**

1. What is an atom? \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

2. Label the parts of an atom



3. Fill in the table

	Charge
<b>Protons</b>	
<b>Neutrons</b>	
<b>Electrons</b>	

4. How many protons, neutrons, and electrons are in the following?

a. 4 Protons= \_\_\_\_\_  
 Electrons= \_\_\_\_\_  
 Neutrons= \_\_\_\_\_

## Isotopes

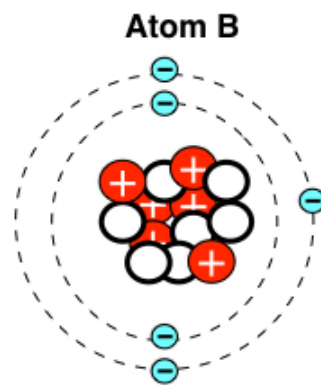
**Identify and Define:**

1. What is an isotope? \_\_\_\_\_  
 \_\_\_\_\_

2. Identify the number of protons, neutrons, and electrons in the isotopes below. Then determine the isotopes name (element name- mass number)



Protons= \_\_\_\_\_  
 Electrons= \_\_\_\_\_  
 Neutrons= \_\_\_\_\_  
 Isotope Name: \_\_\_\_\_



Protons= \_\_\_\_\_  
 Electrons= \_\_\_\_\_  
 Neutrons= \_\_\_\_\_  
 Isotope Name: \_\_\_\_\_



**Comprehension Worksheets with answer key**

4. What is the name of the isotope and Chlorine-37?  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Why are pro  
equal

Why i whole  
SS

# Extension Task Cards

Where is  
atom located a

What is the relationship between the  
periodic table and atoms?



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