**Chemistry**

**YOUR CHOICES + YOUR ACTIONS = YOUR FUTURE!!!**

**Packet# 3**

**Unit#3: Atomic Structure**

 (BRING THIS WITH YOU TO EVERY CLASS)

*“Success is not the result of spontaneous combustion. You must set yourself on fire.”*

***Edmodo Group Code:*** *ozm60q* (http://www.edmodo.com)

***Class Website:*** http://mrgchem.weebly.com

***Mr. Gutierrez’s email:*** gutierrezbr@elizabeth.k12.nj.us

Text Messaging Reminders: Text @aofchem to 23559



*Note: You are expected to work on this packet during the allotted class practice time.*

|  |  |  |
| --- | --- | --- |
| **Packet** | **Followed All Classroom Policies** | **Class work Participation** |
| /35 | Completed Class Notes | / | Monday | / |
| /35 | Completed Classwork | / | Tuesday | / |
| /5 | Writing Name on Every Page | / | Wednesday | / |
| /25 | Handed Packet in on Time  | / | Thursday | / |
| /100 | Total Points | / | Friday | / |
|  |  | / | Total Points | / |

Name of Chemist:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Period: \_\_\_\_\_\_\_\_\_\_\_

*\*All Classnotes + Questions MUST be finished for HOMEWORK if not done in class.*

***DUE \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***

**Unit#3: Atomic Structure**

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**Additional Resources:**

**\*Tutoring with Mr. Gutierrez:** Meet Mr. Gutierrez in student cafeteria after school or during 10th period.

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| --- |
| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objectives: 1) SWBAT summarize the important experiments that led to the current understanding of atomic structure.** |
|  |

Class Notes:

**Dalton’s Atomic Theory\*\***

Review: An atom is the smallest unit of an element.

The word *atom* comes from the Greek word “atomos,” which means “indivisible.”

1. All \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is composed of extremely small particles called \_\_\_\_\_\_\_\_\_\_\_.
2. Atoms of a given element are identical in \_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and other properties.
3. Atoms cannot be \_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, or \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
4. Atoms of different elements combine in simple \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ratios to form chemical compounds.
5. In chemical reactions, atoms are \_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

\*\*More recent experiments and evidence have revealed that not all parts of Dalton’s Atomic Theory are correct. For example, atoms CAN be subdivided into smaller particles as we will soon see.

**John Dalton 1766-1844**

John Dalton was an English chemist. His ideas form the atomic theory of matter. Here are his ideas.

1. All elements are composed (made up) of atoms. It is impossible to divide or destroy an atom. 2. All atoms of the same elements are alike. (One atom of oxygen is like another atom of oxygen.)

3. Atoms of different elements are different. (An atom of oxygen is different from an atom of hydrogen.) 4. Atoms of different elements combine to form a compound. These atoms have to be in definite whole number ratios. For example, water is a compound made up of 2 atoms of hydrogen and 1 atom of oxygen (a ratio of 2:1). Three atoms of hydrogen and 2 atoms of oxygen cannot combine to make water.

1. What is the name of his theory? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. What are elements made of? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. An atom of hydrogen and an atom of carbon are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

4. What are compounds made of ? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5. The ratio of atoms in HCl is a. 1:3 b. 2:1 c. 1:1

**J.J. Thompson Late 1800s**

J.J. Thompson was an English scientist. He discovered the electron when he was experimenting with gas discharge tubes. He noticed a movement in a tube. He called the movement cathode rays. The rays moved from the negative end of the tube to the positive end. He realized that the rays were rays were made of negatively charged particles – electrons.

1. What did J.J. Thompson discover? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. What is the charge of an electron? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. What are cathode rays made of? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. Why do electrons move from the negative end of the tube to the positive end? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5. What was Thompson working with when he discovered the cathode rays? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Lord Ernest Rutherford 1871-1937**

Ernest Rutherford conducted a famous experiment called the gold foil experiment. He took a thin sheet of gold foil. He used special equipment to shoot alpha particles (positively charged particles) at the gold foil. Most particles passed straight through the foil like the foil was not there. Some particles went straight back or were deflected (went in another direction) as if they had hit something. The experiment shows:

* atoms are made of a small positive nucleus; positive nucleus repels (pushes away) positive alpha particles;
* atoms are mostly empty space.

1. What is the charge of an alpha particle?   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. Why is Rutherford’s experiment called the gold foil experiment?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. How did he know that atom was mostly empty space? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. What happened to the alpha particles as they hit the gold foil? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5. How did he know that the nucleus was positively charged? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Niels Bohr Early 1900s**

Niels Bohr was a Danish physicist. He proposed a model of the atom that is similar to the model of the solar system. The electrons go around the nucleus like planets orbit around the sun. All electrons have their energy levels – a certain distance from the nucleus. Each energy level can hold a certain number of electrons. Level 1 can hold 2 electrons, Level 2 – 8 electrons, Level 3 – 18 electrons, and Level 4 – 32 electrons. The energy of electrons goes up from Level 1 to other levels. When electrons release (lose) energy they go down a level. When electrons absorb (gain) energy, they go to a higher level.

1. Why could Bohr’s model be called a planetary model of the atom? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. How do electrons in the same atom differ? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. How many electrons can the fourth energy level hold? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. Would an electron have to absorb or release energy to jump from the second energy level to the third energy level? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5. For an electron to fall from the third energy level to the second energy level, it must \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy.

|  |
| --- |
| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objectives: 1) SWBAT describe the subatomic particles found inside an atom. 2) Draw a Bohr model of an atom.** |
|  |

**Parts of an Atom**



|  |  |  |  |
| --- | --- | --- | --- |
| **Particle** | **Charge** | **Location** | **Mass** |
| Electron |  |  |  |
| Proton |  |  |  |
| Neutron |  |  |  |

**IMPORTANT:** The number of PROTONS determines the IDENTITY of the ELEMENT.

**BOHR MODEL NOTES**

Draw a picture of Niels Bohr’s model of the atom below:

Pieces of information I need to make a Bohr model:

1. Number of Protons
2. Number of Electrons
3. Number of Neutrons

How do I find each piece of information?

1. # of Protons = Atomic #
2. # of Neutrons = Mass # - Atomic #
3. # of electrons = # of Protons = Atomic # (in a NEUTRAL atom)
4. Mass# = Atomic # + # of Neutrons

The atom is organized as follows:

* + The Nucleus is in the center
	+ A cloud of electrons surround the nucleus
	+ Electron cloud has energy levels where electrons occupy
	+ Each level can only hold a specific number of electrons

Rules for making a Bohr model:

1. Draw the nucleus with correct number of protons and neutrons
2. Draw each energy level as needed (ie don’t draw all four levels if you don’t need them, as in for hydrogen)
3. Each energy level must be filled before filling the next energy level

1. Each energy level can only hold a certain number of electrons
2. Level 1 = 2 electrons, level 2 = 8 electrons, Level 3 = 18 electrons, Level 4 = 32 electrons

**PRACTICE SPACE**

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

5P

6N

2. Draw the Bohr model for the element with the atomic number 3.

3. Draw the Bohr model for the element Beryllium, Be.

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Per: \_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**15 p**

**16 n**

**10 p**

**10 n**

1. How many Protons? \_\_\_\_\_

2. Atomic number of atom? \_\_\_\_

3. How many Electrons? \_\_\_\_

4. How many Neutrons? \_\_\_\_

5. Mass Number of atom?\_\_\_\_

6. What atom is this? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. How many Protons? \_\_\_\_\_

2. Atomic number of atom? \_\_\_\_

3. How many Electrons? \_\_\_\_

4. How many Neutrons? \_\_\_\_

5. Mass Number of atom?\_\_\_\_

6. What atom is this? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Part II: Draw your own Bohr model**

7. Draw the Bohr model for Oxygen 8. What element is below? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

12P

10N

What is wrong with this Bohr model? (there are 2)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Part II: Draw your own Bohr model**

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12P

10N

What is wrong with this Bohr model? (there are 2)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |
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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objective: SWBAT describe isotopes and identify an element using its atomic number.** |
|  |

**Skittles and the Elements – What are Isotopes?**

**REVIEW:**

Atomic # =\_\_\_\_\_\_\_\_\_\_ Mass Number = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What subatomic particle IDENTIFIES the element?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Example:**

An atom has 6 protons and 6 neutrons.

Atomic Number:\_\_\_\_\_\_\_\_\_\_\_\_\_ Atomic Mass:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What element is this?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_STOP!!!\_\_\_\_\_\_\_\_\_\_

**Instructions:**

Each bag you will receive will have skittles of two different colors in them and a key for which color stands for protons and which stands for neutrons.

Count up the skittles of each color in each bag to fill in the first two columns in the following table, then use your knowledge of the meaning of the atomic number, how the atomic mass is calculated and the periodic table to fill in the rest.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Bag | # of Protons | # of Neutrons | Atomic # | Atomic Mass | Element |
| A |  |  |  |  |  |
| B |  |  |  |  |  |
| C |  |  |  |  |  |
| D |  |  |  |  |  |

1. Which pairs of bags represent the same element?
	1. Element: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Bags: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	2. Element: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Bags: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Answer in **COMPLETE SENTENCES** below:

1. How did you decide which bags represented which elements?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What do the bags that represent the same element have in common?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What is difference between the bags that represent the same element?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What subatomic particle makes the masses different? How do you know?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Think about it…

Bags A and C are ISOTOPES of Carbon.

Bags B and D are ISOTOPES of Boron.

Based on your observations of the bags, what is an isotope? Do not copy the definition from the book. Write your own definition based on what you just did.

An isotope is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Isotopes Notes**

1. The atomic number tells us how many \_\_\_\_\_\_\_\_\_\_\_\_\_ are in a particular atom. \_\_\_\_\_\_\_\_\_\_\_\_\_\_ have a \_\_\_\_\_\_\_\_\_ charge.

2. For a **neutral** atom, the atomic number also tells us how many \_\_\_\_\_\_\_\_\_\_\_\_ are in a particular atom. \_\_\_\_\_\_\_\_\_\_ have a \_\_\_\_\_\_\_\_\_\_\_\_ charge

3. The atomic mass (or mass number) tells us how many \_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_ are in a particular atom. \_\_\_\_\_\_\_\_\_\_ have a \_\_\_\_\_\_\_\_\_\_\_ charge.

**Isotopes:**

* 1. The number of \_\_\_\_\_\_\_\_\_\_ gives an atom its identity. An atom can have a different number of \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_ but still retain its identity.
	2. Isotopes: Atoms of the same \_\_\_\_\_\_\_\_\_\_\_\_\_ with different numbers of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	3. \_\_\_\_\_\_\_\_\_\_\_ are found naturally in nature and their \_\_\_\_\_\_\_\_\_\_\_ differ only slightly from one another.

Example 1 Example 2

* 1. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) given on the periodic table is an average mass of all \_\_\_\_\_\_\_\_\_\_ found in nature.

Guided Practice Questions

Determine what the following isotopes are. Write the answer using BOTH notations (see Examples 1 & 2 above) on a separate sheet of paper.

**Questions to ask yourself when writing isotope notation:**

1. What is the element?
2. What is the atomic number?
3. What is the atomic mass?
4. Notation 1:

Element Name-Atomic Mass

1. Notation 2:

 Atomic Mass

 Symbol

 Atomic Number

1. An atom with 17 protons and 18 neutrons?

Hyphen: Nuclear Symbol:

1. An atom with atomic number 16 and atomic mass 32?

Hyphen: Nuclear Symbol:

1. An atom with atomic number 16 and 18 neutrons?

Hyphen: Nuclear Symbol:

1. An atom with 16 protons and 18 neutrons?

Hyphen: Nuclear Symbol:

1. An atom with 17 protons and 20 neutrons?

Hyphen: Nuclear Symbol:

1. An atom with atomic number 16 and atomic mass 33?

Hyphen: Nuclear Symbol:

ATOMIC BOMB MECHANISM:



AFTER

BEFORE

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|   | U-235 | U-236 | Kr-92 | Ba-141 |
| Element |   |   |   |   |
| # of protons |   |   |   |   |
| # of neutrons |   |   |   |   |
| # of electrons |   |   |   |   |

|  |  |  |
| --- | --- | --- |
|   | **BEFORE**n + U-235 | **AFTER**Kr-92 + Ba-141 + 3n |
| Total protons |   |   |
| Total neutrons |   |   |
| Total electrons |   |   |

|  |
| --- |
| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objectives: 1) SWBAT designate isotopes of an element using hyphen and nuclear symbol notation.** |
|  |

**Designating Isotopes**

***Class Work (Independent Practice):*** Finish as many questions as you can during class. Refer to your notes and ask at least three classmates before asking me for help. If you do not finish these questions in class, you must finish them for homework.

*Write the following in hyphen notation.*

1. Hydrogen: 1 proton, 0 neutron
2. Hydrogen: 1 proton, 1 neutron
3. Carbon: 6 protons, 7 neutrons
4. Carbon: 6 protons, 8 neutrons
5. Cesium: 55 protons, 78 neutrons

*Write the following in nuclear symbol notation.*

1. Oxygen: 8 protons, 8 neutrons
2. Oxygen: 8 protons, 9 neutrons
3. Oxygen: 8 protons, 10 neutrons
4. Copper: 29 protons, 36 neutrons
5. Uranium: 92 protons, 142 neutrons

Write the most common isotope in hyphen notation for the following elements. *The most common isotope can be found by rounding the atomic mass found on the periodic table of elements to the nearest whole number.*

1. Sodium: \_\_\_\_\_\_\_\_\_\_\_\_ 2. Aluminum: \_\_\_\_\_\_\_\_\_\_\_\_

3. Arsenic: \_\_\_\_\_\_\_\_\_\_\_\_ 4. Radon: \_\_\_\_\_\_\_\_\_\_\_\_

5. Carbon: \_\_\_\_\_\_\_\_\_\_\_\_ 6. Cesium: \_\_\_\_\_\_\_\_\_\_\_\_

Write the most common isotope in nuclear symbol notation for the following elements.

7. Uranium: \_\_\_\_\_\_\_\_\_\_\_\_ 8. Plutonium: \_\_\_\_\_\_\_\_\_\_\_\_

9. Flourine: \_\_\_\_\_\_\_\_\_\_\_\_ 10. Zinc: \_\_\_\_\_\_\_\_\_\_\_\_

11. Iodine: \_\_\_\_\_\_\_\_\_\_\_\_ 12. Hydrogen: \_\_\_\_\_\_\_\_\_\_\_\_

Calculate the number of protons and neutrons in the following isotopes

13. H-3: protons: \_\_\_\_ neutrons: \_\_\_\_\_\_

14. C-14: protons: \_\_\_\_ neutrons: \_\_\_\_\_\_

15. Oxygen-16: protons: \_\_\_\_ neutrons: \_\_\_\_\_\_

16. Osmium-190: protons: \_\_\_\_ neutrons: \_\_\_\_\_\_

17. Lead-270: protons: \_\_\_\_ neutrons: \_\_\_\_\_\_

18. C-12: protons: \_\_\_\_ neutrons: \_\_\_\_\_\_

19. protons: \_\_\_\_ neutrons: \_\_\_\_\_\_

20. protons: \_\_\_\_ neutrons: \_\_\_\_\_\_

21. protons: \_\_\_\_ neutrons: \_\_\_\_\_\_

22. protons: \_\_\_\_ neutrons: \_\_\_\_\_\_

23. protons: \_\_\_\_ neutrons: \_\_\_\_\_\_

24. protons: \_\_\_\_ neutrons: \_\_\_\_\_\_

25. protons: \_\_\_\_ neutrons: \_\_\_\_\_\_

Make sure Mr. Gutierrez stamps/signs this by the end of the period. You CANNOT get the stamp/signature for a day later on. It is your responsibility to remind Mr. Gutierrez. You will NOT receive a stamp if you did not follow all classroom policies or actively work on the practice problems during the allotted class time.A stamp means you received all 10 points. No stamps means you’ve received zero points. If you completed some work, I may give you partial credit based on my discretion. ***If you are absent, write the date on the day you were absent and write the word “Absent.” DO NOT LOSE THIS SHEET!!!*** (If you lose this sheet, you will lose all of your participation points. NO EXCEPTIONS.)

|  |  |  |  |
| --- | --- | --- | --- |
| **Day of Week** | **Followed All Classroom Policies** (Respectful, on time, prepared, engaged…) | **Class work Participation** | **Homework** |
| *Monday* | /10 | /10 | /10 |
| *Tuesday* | /10 | /10 | /10 |
| *Wednesday* | /10 | /10 | /10 |
| *Thursday* | /10 | /10 | /10 |
| *Friday* | /10 | /10 | /10 |

**Teacher Comments:**