

Subatomic Particles

WARM-UP QUIZ

1. What are the three subatomic particles?
2. Where are the particles located in the atom?
3. What are the charges of the particles?
4. What does amu stand for?
5. What is the mass (in amu) of each particle?
6. Which of the subatomic particles is the lightest?
7. What is the charge of the nucleus?
8. Where is virtually all of the mass of the atom located?
9. What effect do protons have on each other?
10. What effect do electrons have on each other?
11. What keeps the electrons in the atom?
12. What is the symbol for each particle?
13. What is the charge of an atom?
14. What does the charge of an atom tell us about the number of protons and electrons?
15. How is the nucleus of a hydrogen atom different from the nuclei of other elements?

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Writing Activity #1 **Due Date:** _____

- ✓ Create a table indicating the symbol, location, charge, and relative mass (in amu) of the three subatomic particles. Label the table *Document A*.
- ✓ In a well-developed writing, compare and contrast the three subatomic particles. Use the table that you created as a supporting document and refer to it in your writing.

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Atomic Structure

- Atoms make up _____, which are _____.
- Discovery of _____ elements have been reported.
- These elements are organized in the modern _____.
- The _____ in an element are _____ to each other and _____ from those of all other elements.

- ⑥ Rounding the average atomic mass to the _____ gives the _____ for the _____ isotope of the element.
- ⑦ The average atomic mass can be calculated when given _____ and _____ of an element's naturally occurring isotopes.

Average Atomic Mass =

etc.

Example: Find the weighted average mass of a football team if 92.0% of the players weigh 200. lbs. and 8.00% weigh 180. lbs.

$$\text{Average mass} = (\text{_____})(\text{_____}) + (\text{_____})(\text{_____})$$

Average mass =

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Practice. Calculate the average atomic mass for the two naturally occurring isotopes of copper: copper-63 and copper-65. The percent abundance for copper-63 is 69.2%, and its atomic mass is 62.9 amu. The percent abundance of copper-65 is 30.8%, and its atomic mass is 64.9 amu.

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Isotope Names

- All carbon atoms contain _____ protons because _____.
- ✧ One isotope of carbon contains eight neutrons, giving it a mass number of _____ (# protons + # neutrons). The isotope name for this isotope of carbon is written as _____ or _____.
- ✧ The carbon isotope containing seven neutrons is _____ or _____.

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 Concept Check

1. What is the isotope name for potassium with 21 neutrons?
2. What is the isotope name for oxygen with 9 neutrons?
3. What does nitrogen-13 (or N-13) mean?

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Isotopic Notation

- Isotopic notation or isotope symbol: uses the element _____, _____, and _____.



Practice

- For the carbon isotope above, find the
 - Atomic number: _____
 - Number of protons: _____
 - Number of electrons: _____
 - Number of neutrons: _____
- Write the isotopic notation for neon-22.
- Write the isotope symbol for calcium with 26 neutrons.
- Write the name of the isotope having 8 protons and 9 neutrons. _____
Write its isotopic notation.



Charged Particles: Ions

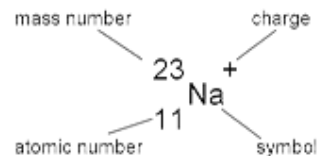
- The nucleus of an atom has a _____ charge. Why?
- Electrons are _____ charged. Why is the atom electrically neutral?
- Definition of *ion*:
- Definition of *anion*:

Example: F Atomic # _____ = # of e^- F^- _____ one electron

- Definition of *cation*:

Example: Mg Atomic # _____ = # of e^- Mg^{2+} _____ two electrons

- Isotopic notations for ions show the _____
in addition to the symbol, _____ number and
_____ number.



Practice

- | | | | |
|--------------|-----------------|-----------------|-----------------|
| 1. Mg^{2+} | # p^+ = _____ | # e^- = _____ | # n^0 = _____ |
| 2. Al^{3+} | # p^+ = _____ | # e^- = _____ | # n^0 = _____ |
| 3. N^{3-} | # p^+ = _____ | # e^- = _____ | # n^0 = _____ |
| 4. O^{2-} | # p^+ = _____ | # e^- = _____ | # n^0 = _____ |
| 5. F^- | # p^+ = _____ | # e^- = _____ | # n^0 = _____ |
| 6. P^{3-} | # p^+ = _____ | # e^- = _____ | # n^0 = _____ |
| 7. K^+ | # p^+ = _____ | # e^- = _____ | # n^0 = _____ |
| 8. Cl^- | # p^+ = _____ | # e^- = _____ | # n^0 = _____ |



Identifying Characteristics of Atoms

Using the square for silicon from the Periodic Table, identify the following:

1. Element Symbol
2. Atomic Number
3. Number of Protons
4. Number of Electrons
5. (Average) Atomic Mass
6. Mass Number (round atomic mass to the nearest whole number)
7. Number of Neutrons
8. Write the isotopic notation for the most common isotope of silicon.

Silicon
14
Si
28.086

Using the square for manganese from the Periodic Table, identify the following:

1. Element Symbol
2. Atomic Number
3. Number of Protons
4. Number of Electrons
5. (Average) Atomic Mass
6. Mass Number (round atomic mass to the nearest whole number)
7. Number of Neutrons
8. Write the isotopic notation for the most common isotope of manganese.

Manganese
25
Mn
54.938

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Calculating Average Atomic Mass

Using the isotope data in the table below, calculate the average atomic mass and determine the identity of the element.

Mass (amu)	Percent Abundance
49.946	4.3%
51.941	83.8%
52.941	9.5%
53.939	2.4%

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Practice

- What is the atomic number for thallium? _____ What is the element symbol? _____
- How many protons are in an atom of radium? _____ How many electrons? _____
- How many protons are in an atom of cerium? _____ How many neutrons? _____

ESSENTIAL VOCABULARY

ANION

ATOMIC NUMBER

ION

NEUTRON

ATOM

CATION

ISOTOPES

NUCLEUS

ATOMIC MASS

ELECTRON

MASS NUMBER

PROTON

ATOMIC MASS UNIT