

Fill in the following chart:

Atom	Larger Size	Greater Ionization Energy	Lower Electronegativity
Rb or Sr	Rb	Sr	Rb
B or F	B	F	B
N or P	P	N	P
Be or Ca	Ca	Be	Ca

Fill in the following chart:

Atomic Mass	Number of electrons	Number of Protons	Number of Neutrons	Symbol of Element
209	82	82	127	Pb
127	53	53	74	I

Isotope  

$$\begin{array}{r} 209 \\ - 82 \\ \hline 127 \end{array}$$

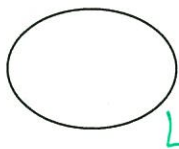
1. Put the following in order from least electronegative to most electronegative.

Cs, S, Na, Cl

Cs, Na, S, Cl

$$\begin{array}{r} \times 27 \\ - 53 \\ \hline 74 \end{array}$$

2. Identify the following as either a lithium atom or lithium ion. Provide reasoning for your choice.



(+) lost; shrinks

3. Arrange the following elements as described below: P, Mg, Sr, Ba, Cl

A. In order of decreasing atomic size: Ba Sr Mg P Cl

B. In order of increasing ionization energy: Ba Sr Mg P Cl

C. In order of decreasing electronegativity: Cl P Mg Sr Ba

4. Given the following theoretical element electron configurations, answer questions a-d.

A =  $4s^2$  Ca    B =  $3s^2 3p^6$  Ar    C =  $2s^2 2p^5$  F    D =  $3s^2 3p^3$  P    E =  $4s^2 3d^{10} 4p^4$  Se

a. Which has the lowest ionization energy?

A

b. Which belongs to the halogen family?

C

c. Which has the highest electronegativity?

C

d. Which is the largest atom?

A

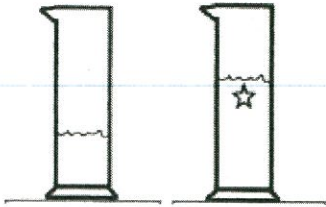
5. Arrange the following in order decreasing size: Na, Rb, Fr, Li

B → S

Fr Rb Na Li

6. Given the following information, calculate the volume and density of the object.

Mass = 5.5 g



Volume = 33.0 mL

Volume = 52.0 mL

Determine the volume.

$$\begin{array}{r} 52 \text{ mL} \\ - 33 \text{ mL} \\ \hline 19 \text{ mL} \end{array}$$

Determine the density.

$$D = \frac{m}{V} = \frac{5.5 \text{ g}}{19 \text{ mL}} = .289 \text{ g/mL}$$

must subtract to determine volume occupied of object

7. Classify each as a metal, nonmetal, or gas.

A. Mg metal

D. He gas

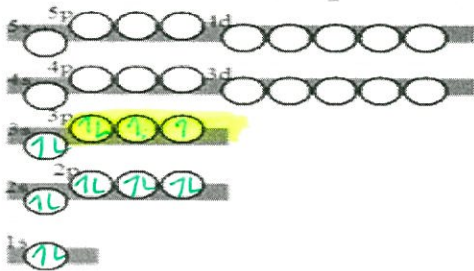
B. Bi metal

E. Br Non metal

C. As non metal

F. Ru metal

8. Complete the following orbital diagram for S, sulfur. Next, write the electron configuration in both long hand and short hand.



S

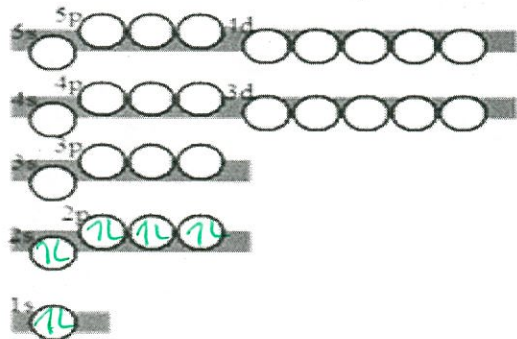
Long hand:  $1s^2 2s^2 2p^6 3s^2 3p^4$

Short hand:  $[Ne] 3s^2 3p^4$

9. Which of the following diagrams represents phosphide ion and which is phosphorous atom. Provide reasoning.



10. Complete the following orbital diagram for sodium ion,  $Na^+$ .



lost an  $e^-$   
so only 10 instead of 11

anion means gaining  $e^-$  so size increases

# Atoms, Molecules, and Ions

1. By knowing the number of protons a neutral atom has, you should be able to determine
- A) the number of neutrons in the neutral atom
  - B) the number of electrons in the neutral atom ✓
  - C) the name of the atom ✓
  - D) two of the above
  - E) none of the above

2.  ${}_{20}^{40}\text{Ca}^{2+}$  has
- A) 20 protons, 20 neutrons, and 18 electrons
  - B) 22 protons, 20 neutrons, and 20 electrons
  - C) 20 protons, 22 neutrons, and 18 electrons
  - D) 22 protons, 18 neutrons, and 18 electrons
  - E) 20 protons, 20 neutrons, and 22 electrons

3. Which of the following statements is (are) true?

- A)  ${}_{8}^{18}\text{O}$  and  ${}_{9}^{19}\text{F}$  have the same number of neutrons.
- B)  ${}_{6}^{14}\text{C}$  and  ${}_{7}^{14}\text{N}$  are isotopes of each other because their mass numbers are the same.
- C)  ${}_{8}^{18}\text{O}^{2-}$  has the same number of electrons as  ${}_{10}^{20}\text{Ne}$ .
- D) A and B
- E) A and C

4. The numbers of protons, neutrons, and electrons in  ${}_{19}^{39}\text{K}^{+}$  are:

- A) 20 p, 19 n, 19 e
- B) 20 p, 19 n, 20 e
- C) 19 p, 20 n, 20 e
- D) 19 p, 20 n, 19 e
- E) 19 p, 20 n, 18 e

5. An ion is formed

- A) By either adding or subtracting protons from the atom.
- B) By either adding or subtracting electrons from the atom
- C) By either adding or subtracting neutrons from the atom.
- D) All of the above are true.
- E) Two of the above are true.

6. Which of the following are incorrectly paired?

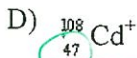
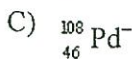
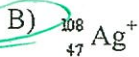
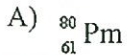
- A) K, alkali metal
- B) Ba, alkaline earth metal

- C) O, halogen
- D) Ne, noble gas
- E) Ni, transition metal

7. Which of the following are *incorrectly* paired?

- A) Sr, alkaline earth metal
- B) Ta, transition metal
- C) F, halogen
- D) H, noble gas
- E) Ru, transition metal

8. Which of the following has 61 neutrons, 47 protons, and 46 electrons?



$$\begin{array}{r} 0 \\ \times 108 \\ - 47 \\ \hline 61 n \end{array}$$

↑ means +1 (lost one)

not # 47 on periodic table; can not be correct

9. How many protons and electrons does the most stable ion for oxygen have?

# protons # electrons

- A) 10 p      8 e
- B) 8 p        6 e
- C) 6 p        8 e
- D) 8 p        8 e
- E) 8 p        10 e

not taught (quite)

10. You are given a compound with the formula  $\text{MCl}_2$ , in which M is a metal. You are told that the metal ion has 26 electrons. What is the identity of the metal?

- A) Fe
- B) Al
- C) Zn
- D) Co
- E) Ni

not taught

### Periodic Trends Practice

#### Multiple Choice

Identify the letter of the choice that best completes the statement or answers the question.

- All atoms are \_\_\_\_\_.
  - positively charged, with the number of protons exceeding the number of electrons
  - negatively charged, with the number of electrons exceeding the number of protons
  - neutral, with the number of protons equaling the number of electrons
  - neutral, with the number of protons equaling the number of electrons, which is equal to the number of neutrons
- The atomic number of an element is the total number of which particles in the nucleus?
  - neutrons
  - protons
  - electrons
  - protons and electrons

*mass = p + n  
AN = p + e*
- Isotopes of the same element have different \_\_\_\_\_.
  - numbers of neutrons
  - numbers of protons
  - numbers of electrons
  - atomic numbers
- Using the periodic table, determine the number of neutrons in  $^{16}\text{O}$ .
  - 4
  - 8
  - 16
  - 24

*16  
- 8  
8*
- Which of the following statements is NOT true?
  - Atoms of the same element can have different masses. *T*
  - Atoms of isotopes of an element have different numbers of protons. *F*
  - The nucleus of an atom has a positive charge. *T*
  - Atoms are mostly empty space. *T*
- If E is the symbol for an element, which two of the following symbols represent isotopes of the same element?
  - $^{20}_{10}\text{E}$
  - $^{20}_{11}\text{E}$
  - $^{21}_{9}\text{E}$
  - $^{21}_{10}\text{E}$
  - 1 and 2
  - 3 and 4
  - 1 and 4
  - 2 and 3

*must have same atomic #; diff. mass*
- Which of the following sets of symbols represents isotopes of the same element?
  - $^{91}_{42}\text{J}$ ,  $^{92}_{42}\text{J}$ ,  $^{93}_{40}\text{J}$
  - $^{50}_{19}\text{L}$ ,  $^{50}_{20}\text{L}$ ,  $^{50}_{21}\text{L}$
  - $^{84}_{38}\text{M}$ ,  $^{86}_{38}\text{M}$ ,  $^{87}_{38}\text{M}$
  - $^{138}_{59}\text{Q}$ ,  $^{133}_{55}\text{Q}$ ,  $^{133}_{54}\text{Q}$
- How is the number of neutrons in the nucleus of an atom calculated?
  - Add the number of electrons and protons together.
  - Subtract the number of electrons from the number of protons.
  - Subtract the number of protons from the mass number.
  - Add the mass number to the number of electrons.
- Which of the following isotopes has the same number of neutrons as phosphorus-31?
  - $^{32}_{15}\text{P}$
  - $^{32}_{16}\text{S}$
  - $^{29}_{14}\text{Si}$
  - $^{28}_{14}\text{Si}$

*P*

$$\begin{array}{r} 21 \\ - 15 \\ \hline 16 \text{ N} \end{array}$$

*32  
- 16  
16*

*Need to determine*

11. Complete the following table.

Symbol	# Protons	# Neutrons	# Electrons	Net Charge
$^{206}\text{Pb}$	82	124	82	0
Ga	31	38	28	3+ lose
Te	52	75	54	<del>2-</del>
$\text{Mn}^{2+}$	25	30	23	2+

same if charge  
no charge

$$\begin{array}{r} 206 \\ - 82 \\ \hline 124 \end{array}$$

affects e<sup>-</sup>

lose

12. Arsenopyrite is a mineral containing As, Fe, and S. Classify each element as metal, nonmetal, or metalloid.

As = metalloid    Fe = M    S = NM

IF neg; would mean gaining (add)