

Honors Chemistry

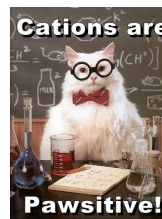
Chapter 4: Periodic Table Test Review **Answers**

Periodic Table Arrangement

1. Identify the number of valence electrons and stable ion that forms for the following elements:

- a. Be valence electrons: 2 ion: +2
b. O valence electrons: 6 ion: -2
c. Ar valence electrons: 8 ion: doesn't form ions

2. Distinguish between elements that form *cations* and *anions*.
cations are positive ions (elements LOSE electrons)
anions are negative ions (elements GAIN electrons)



3. Recognize the number of valence electrons for main group elements and write the group number, period, atomic number, name, symbol, and ending electron configuration for any element.

	Group	Period	Atomic #	ending e ⁻ configuration
a. Kr	18	4	36	3d ⁹
b. Cu	11	4	29	4p ⁶

2. State the **periodic law**:
the physical and chemical properties of elements are periodic functions of their atomic number
3. Distinguish between **metals**, **nonmetals**, and **metalloids** based upon chemical/physical properties and location on the periodic table.

	Metals	Nonmetals
physical appearance	shiny	dull
conductivity	conductors	non conductors
malleability	malleable, ductile	brittle
reaction with acid	reacts with acid	doesn't react with acid
location on PT	left of "staircase"	right of "staircase"

metalloids: a mixture of properties between both metals and nonmetals

4. Classify the following as: Metal (**M**), Metalloid (**S** for semiconductor), or Non-Metal (**N**)
- Mn **metal**
 - Ge **metalloid**
 - Dull crystal that crushes easily and has a low melting point **nonmetal**
 - Ductile substance that reacts with acid **metal**
 - Silvery white element that conducts electricity **metal**
 - Group 1 element **metal**
 - Group 18 element **nonmetal**
5. Be able to label the following areas on the periodic table and recognize the **properties** of the common groups/families:

period	group	1*	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
		Ia	IIa	IIIa**	IVa	Va	VIa	VIIa	VIIIa	VIIIa	VIIIa	IB	IIb	IIIa	IVa	Va	VIa	VIIa	VIIIb
1		H																	He
2		Li	Be											B	C	N	O	F	Ne
3		Na	Mg	Al	Si	P	S	Cl	Ar										
4		K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
5		Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
6		Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
7		Fr	Ra	Ac	****	****	****	****	****	****	****	****	****						
	6			Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu		
	7			Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr		

* Numbering system recommended by the International Union of Pure and Applied Chemistry (IUPAC)
 ** Previous IUPAC numbering system
 *** Numbering system recommended by the Chemical Abstracts Service
 **** For the names of elements 104–112, see Table 27.

Periodicity

6. Determine which two elements are the most similar and explain why?
- Fe, Al, O, F, Br
F, Br because they are both halogens (same group) and both have 7 valence electrons = similar properties
 - Mg, Si, N, Ba, Kr
Ba, Mg because they are both alkaline earth metals (same group) and contain 2 valence electrons

7. Define electronegativity, ionization energy, atomic radius, and electron affinity:

Electronegativity – the ability of an atom to attract electrons towards itself

increases across a period, decreases down a group

Ionization energy – the energy required to remove an electron from an atom

increases across a period, decreases down a group

Atomic radius – the size of an atom (radius of the electron cloud)

decreases across a period, increases down a group

Electron affinity – the energy required to add an electron to an atom

increases across a period, decreases down a group

8. Describe *electron shielding*.

Kernel electrons (inner electrons) *shield* the negative valence electrons from the pull/force of the positive nucleus

9. Using the electron cloud model, explain why the exact size of an atom is difficult to measure.

because the electron cloud (or orbital) is a 3-D PROBABILITY of where electrons may be located

10. Which metal has a larger radius: Li or Na? Why? Na is in period 4 vs Li in period 3, so Na has an extra energy level = greater electron shielding/ a greater distance from the positive charge of the nucleus

Which atom or ion has a larger radius: Li or Li⁺? F or F⁻? Why?

Li⁺ lost electrons and has the electron configuration of Helium, so radius decreases

F⁻ gains electrons to become “Neon”, so radius increases

11. Identify ions by their similarity to the electron configurations of noble gases.

S²⁻ = “Argon” noble gas configuration

Na⁺ = “Neon” noble gas configuration

12. Which of the following elements has the largest atomic radius: B, Al, Ga, or In?

13. Which of the following elements has the smallest ionization energy: K, As, N, Se?

14. Which of the following elements has the largest electronegativity: K, As, N, Se?

Lab Applications

15. **Reactivity Lab:** Discuss lab observations of trends in reactivity down the groups for metals.

Metals increase in reactivity down the periods (ie: Francium is A LOT more reactive than Lithium). Be able to explain WHY from your lab report!

Explain why Group 2 elements are less reactive than Group 1 elements (consider this question in terms of valence electrons and periodic trends).

Group 1 elements have 1 valence electron, while Group 2 elements have 2 valence electrons, so Group 1 elements are more reactive because it requires a lower amount ionization energy to lose 1 electron to form a stable octet than to lose 2 electrons

16. **Mendeleev and Alien Periodic Tables:** Recognize how to identify unknown elements based on common physical and chemical properties across the periods and down the groups.