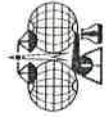


IUPAC Periodic Table of the Elements

1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17		18																																							
atomic number	Symbol	name	atomic weight	atomic number	Symbol	name	atomic weight	atomic number	Symbol	name	atomic weight	atomic number	Symbol	name	atomic weight	atomic number	Symbol	name	atomic weight	atomic number	Symbol	name	atomic weight	atomic number	Symbol	name	atomic weight	atomic number	Symbol	name	atomic weight	atomic number	Symbol	name	atomic weight																																						
1	H	hydrogen	1.008	2	He	helium	4.0026	3	Sc	scandium	44.956	4	Ti	titanium	47.887	5	V	vanadium	50.942	6	Cr	chromium	51.996	7	Mn	manganese	54.938	8	Fe	iron	55.845(2)	9	Co	cobalt	58.933	10	Ni	nickel	58.693	11	Cu	copper	63.546(3)	12	Zn	zinc	65.38(2)	13	B	boron	10.81	14	C	carbon	12.011	15	N	nitrogen	14.007	16	O	oxygen	15.999	17	F	fluorine	18.998	18	Ne	neon	20.180		
3	Li	lithium	6.94	4	Be	beryllium	9.0122	21	Y	yttrium	88.906	22	Zr	zirconium	91.224(2)	23	Nb	niobium	92.906	24	Mo	molybdenum	95.95	25	Tc	technetium	98.906	26	Ru	ruthenium	101.07(2)	27	Rh	rhodium	102.91	28	Pd	palladium	106.42	29	Ag	silver	107.87	30	Cd	cadmium	112.41	31	Ga	gallium	69.723	32	Ge	germanium	72.630(8)	33	As	arsenic	74.922	34	Se	selenium	78.971(8)	35	Br	bromine	79.901	36	Kr	krypton	83.798(2)		
11	Na	sodium	22.990	12	Mg	magnesium	24.304	39	Yt	yttrium	88.906	40	Zr	zirconium	91.224(2)	41	Nb	niobium	92.906	42	Mo	molybdenum	95.95	43	Tc	technetium	98.906	44	Ru	ruthenium	101.07(2)	45	Rh	rhodium	102.91	46	Pd	palladium	106.42	47	Ag	silver	107.87	48	Cd	cadmium	112.41	49	In	indium	114.82	50	Sn	tin	118.71	51	Sb	antimony	121.76	52	Te	tellurium	127.60(3)	53	I	iodine	126.90	54	Xe	xenon	131.29		
19	K	potassium	39.098	20	Ca	calcium	40.078(4)	57-71	lanthanoids					72	Hf	hafnium	178.49(2)	73	Ta	tantalum	180.95	74	W	tungsten	183.84	75	Re	rhenium	186.21	76	Os	osmium	190.23(3)	77	Ir	iridium	192.22	78	Pt	platinum	195.08	79	Au	gold	196.97	80	Hg	mercury	200.59	81	Tl	thallium	204.38	82	Pb	lead	207.2	83	Bi	bismuth	208.98	84	Po	polonium	209	85	At	astatine	210	86	Rn	radon	222
37	Rb	rubidium	85.468	38	Sr	strontium	87.62	89-103	actinoids					104	Rf	rutherfordium	261	105	Db	dubnium	262	106	Sg	seaborgium	263	107	Bh	bohrium	264	108	Hs	hassium	265	109	Mt	meitnerium	266	110	Ds	darmstadtium	267	111	Rg	roentgenium	268	112	Cn	copernicium	269	113	Nh	nihonium	270	114	Fl	flerovium	271	115	Mc	moscovium	272	116	Lv	livermorium	273	117	Ts	tennessine	274	118	Og	oganesson	276

Key:
 atomic number
 Symbol
 name
 atomic weight
 standard atomic weight



INTERNATIONAL UNION OF
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For notes and updates to this table, see www.iupac.org. This version is dated 28 November 2016.
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Basic Atomic Structure Worksheet

1. The 3 particles of the atom are:

- a. _____
- b. _____
- c. _____

Their respective charges are:

- a. _____
- b. _____
- c. _____

2. The number of protons in one atom of an element determines the atom's _____, and the number of electrons determines the _____ of the element.
3. The atomic number tells you the number of _____ in one atom of an element. It also tells you the number of _____ in a neutral atom of that element. The atomic number gives the "identity" of an element as well as its location on the periodic table. No two different elements will have the _____ atomic number.
4. The _____ of an element is the average mass of an element's naturally occurring atom, or isotopes, taking into account the _____ of each isotope.
5. The _____ of an element is the total number of protons and neutrons in the _____ of the atom.
6. The mass number is used to calculate the number of _____ in one atom of an element. In order to calculate the number of neutrons you must subtract the _____ from the _____.

7. Give the symbol of and the number of protons in one atom of:

Lithium _____
Iron _____
Oxygen _____
Krypton _____

Bromine _____
Copper _____
Mercury _____
Helium _____

8. Give the symbol of and the number of electrons in a neutral atom of:

Uranium _____
Boron _____
Chlorine _____

Iodine _____
Xenon _____

9. Give the symbol of and the number of neutrons in one atom of:

(Mass numbers are ALWAYS whole numbers...show your calculations)

Barium _____
Carbon _____
Fluorine _____
Europium _____

Bismuth _____
Hydrogen _____
Magnesium _____
Mercury _____

10. Name the element which has the following numbers of particles:

- a. 26 electrons, 29 neutrons, 26 protons _____
- b. 53 protons, 74 neutrons _____
- c. 2 electrons (neutral atoms) _____
- d. 20 protons _____
- e. 86 electrons, 125 neutrons, 82 protons _____
- f. 0 neutrons _____

11. If you know ONLY the following information can you ALWAYS determine what the element is? (Yes/No)

- a. Number of protons _____
- b. Number of neutrons _____
- c. Number of electrons in a neutral atom _____
- d. Number of electrons _____

12. Fill in the missing items in the table below.

NAME	SYMBOL	Z	A	# PROTONS	# ELECTRONS	# NEUTRONS	ISOTOPIC SYMBOL
a.	Na						
b.		17			18		
c. Potassium							
d.	P						
e. Iron					24		
f.				53			
g. Silver							
h.		36					
i.	W						
j.		29					
k.				49			
l.				79	78		
m.		16			18		

Name _____ Date _____ Class Period _____

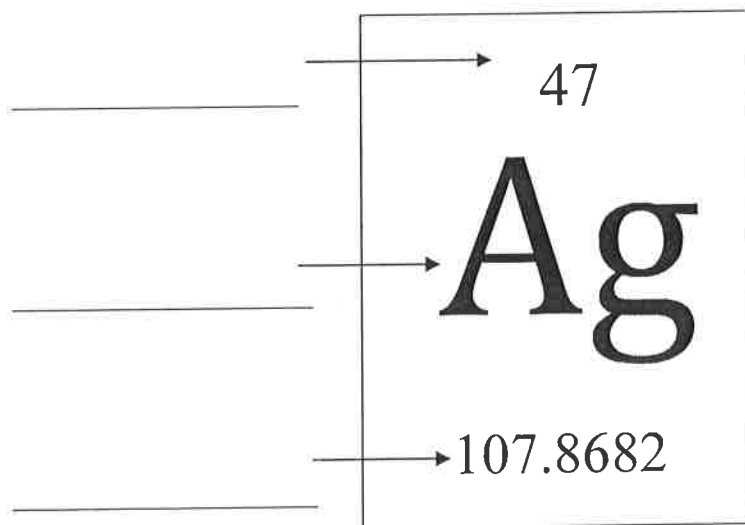
ATOMS

Fill in the table with the names of the three subatomic particles, their charges, and where they are found within the atom.

Name of Particle	Charge	Location

Determining the Number of Subatomic Particles in an Atom

1. On the periodic table, the _____ indicates the number of protons in an atom.
2. To determine the number of neutrons in an atom, subtract the _____ from the _____ of the element.
3. The _____ indicates the number of electrons in an atom.
4. In a **neutral** atom (no overall charge), the number of _____ and the number of _____ are equal.
5. Label the parts of the following diagram:



What is the name of this element?

6. The element in #5 has _____ protons, _____ neutrons, and _____ electrons.
7. The atomic number of the above element is _____.
8. The above element has an atomic mass of _____ amu.

DIRECTIONS: Use the periodic table and what you have learned about neutral atoms to fill in the missing information.

Name of Element	Atomic Symbol	Number of Protons	Number of Neutrons	Number of Electrons
Titanium	Ti	22	26	22
Neon		10		
	Li			3
		53	74	
	Pb	82		
Gold			118	
	K	19		19
Hydrogen		1		
		24		24
Sulfur				16
			32	27
	Hg		121	
Tin		50		
	Mg		12	
Boron	B			
			31	28
	W	74		
Phosphorus			16	
	Cl	17		17
Calcium	Ca			

Isotopes Worksheet

1. What is an isotope? _____

2. What does the number next to isotopes signify? _____

3. How can you tell isotopes apart? _____

For each of the following isotopes, write the number of protons, neutrons, and electrons.

	Chromium-58	Chromium-63
# of protons		
# of neutrons		
# of electrons		

	Carbon-12	Carbon-16
# of protons		
# of neutrons		
# of electrons		

	Nitrogen-15	Nitrogen-20
# of protons		
# of neutrons		
# of electrons		

	Sulfur-23	Sulfur-25
# of protons		
# of neutrons		
# of electrons		

	Sodium-12	Sodium-20
# of protons		
# of neutrons		
# of electrons		

	Selenium-30	Selenium-35
# of protons		
# of neutrons		
# of electrons		

Fill in the isotope names and any missing information, including isotope numbers from the chart. Use your periodic table and the information provided.

# of protons	25	
# of neutrons	17	15
# of electrons		

# of protons	32	
# of neutrons	30	32
# of electrons		

# of protons		
# of neutrons	48	51
# of electrons		46

# of protons		
# of neutrons	113	111
# of electrons	55	

	Iron-	Iron-
# of protons		
# of neutrons	27	30
# of electrons		

	Iodine-	Iodine-
# of protons		
# of neutrons	32	35
# of electrons		

	Germanium-	Germanium-
# of protons		
# of neutrons	33	36
# of electrons		

	-10	-12
# of protons		6
# of neutrons		
# of electrons	6	

	-22	-25
# of protons		
# of neutrons		
# of electrons	11	

	-54	-56
# of protons		
# of neutrons	24	
# of electrons		

Ions Worksheet

Complete the following:

1. For each of the positive ions listed in column 1, use the periodic table to find in column 2 the total number of electrons that ion contains. The same answer may be used more than once.

_____ 1. Al^{+3}	A. 2
_____ 2. Fe^{+3}	B. 10
_____ 3. Mg^{+2}	C. 21
_____ 4. Sn^{+2}	D. 23
_____ 5. Co^{+2}	E. 24
_____ 6. Co^{+3}	F. 25
_____ 7. Li^{+1}	G. 36
_____ 8. Cr^{+3}	H. 48
_____ 9. Rb^{+1}	I. 76
_____ 10. Pt^{+2}	J. 81

2. For each of the following ions, indicate the total number of protons and electrons in the ion.

Ion	Number of Protons	Number of Electrons
Co^{+2}		
Co^{+3}		
Cl^{-1}		
K^{+1}		
S^{-2}		
Sr^{+2}		
Al^{+3}		
P^{-3}		

3. Write the chemical symbol for the ion with 12 protons and 10 electrons.
4. Write the chemical symbol for the ion with 33 protons and 36 electrons.
5. Write the chemical symbol for the ion with 29 protons and 27 electrons.

6. How many protons, neutrons, and electrons are present in the ${}_{28}^{59}\text{Ni}^{+2}$ ion?
7. How many protons, neutrons, and electrons are present in the ${}_{40}^{91}\text{Zr}^{+4}$ ion?
8. How many protons, neutrons, and electrons are present in the ${}_{34}^{79}\text{Se}^{-2}$ ion?
9. Write the complete chemical symbol for the ion with 84 protons, 125 neutrons, and 80 electrons.
10. Write the complete chemical symbol for the ion with 27 protons, 32 neutrons, and 25 electrons.

Name _____ Period _____

Atoms, Isotopes, and Ions

Atoms

- The number of protons in an atom determines the identity of the atom. $\text{Atomic \#} = \# \text{ Protons}$
- In a neutral atom, the number of positive protons equals the number of negative electrons. $\# \text{ Protons} = \# \text{ Electrons}$
- Protons and neutrons both have a mass of 1 amu. The mass of the electron is negligible compared to the mass of the proton and neutron. Thus the mass number, or the mass of the atom, is the sum of the number of protons and neutrons. $\text{Mass \#} = \# \text{ Protons} + \# \text{ Neutrons}$

Name	Symbol	Atomic #	Mass #	# Protons	# Neutrons	# Electrons
Selenium					46	
			222	86		
					118	79
		11			12	

Isotopes

- The number of neutrons in any specific type of atom can vary. Atoms of the same element with different numbers of neutrons are called isotopes.
- Isotopes are distinguished from each other by including the mass number with the name or symbol.

Name	Symbol	Atomic #	Mass #	# Protons	# Neutrons	# Electrons
	^{235}U					
	^{238}U					
Carbon-12						
Carbon-13						

Ions

- As we have seen, in a neutral atom, the number of protons and the number of electrons is equal.
- Atoms can gain or lose electrons to become ions. Ions are charged atoms resulting from the difference in number of positive protons and negative electrons.
- A cation is a positive ion. A cation results when an atom loses electrons. # Protons > # Electrons
- An anion is a negative ion. An anion results when an atom gains electrons. # Electrons > # Protons
- Ions are distinguished from atoms by including the ion charge as a superscript in the symbol.

Name	Symbol	Atomic #	Mass #	# Protons	# Neutrons	# Electrons	Cation or Anion?
	Al ⁺³				14		
Iron ion			56			24	
				15	15	18	
	F ⁻¹		19				