

Name: _____

Mass number
(Number of protons plus neutrons)



Charge (To get electrons, start with protons and do the opposite of the charge)

Atomic number
(Number of protons)

Complete the following chart:

Element or Ion	Atomic Number	Average Atomic Mass (use p.t.)	Mass Number (round if not given)	Protons	Electrons	Neutrons
H						
H ⁺						
$^{12}\text{C}_6$						
$^7\text{Li}_3^+$						
$^{35}\text{Cl}_{17}$						
$^{39}\text{K}_{19}$						
$^{24}\text{Mg}_{12}^{2+}$						
As ³⁻						
Ag						
Ag ⁺						
S ²⁻						
U						

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The Atom

1. How many protons, neutrons, & electrons?

- Xe-133 P^+ , P^+ , P^+ , P^+
- Mg-23 P^+ , P^+ , P^+ , P^+
- Mg^{2+} P^+ , P^+ , P^+ , P^+
- Mg^{2+} P^+ , P^+ , P^+ , P^+
- Mg^{2+} P^+ , P^+ , P^+ , P^+
- Br-81 P^+ , P^+ , P^+ , P^+

II. Identifying Atoms.

- How many protons and electrons are present in a nitrogen atom? _____ protons, _____ electrons
- What is the name of the element that has atoms containing 17 protons? _____
- How many protons, neutrons, and electrons are present in the following ions?

- $^{59}\text{Ni}^{2+}$ P^+ , P^+ , P^+ , P^+
- $^{79}\text{Se}^{2-}$ P^+ , P^+ , P^+ , P^+

4. Write the chemical symbol for the following ions (ex. H⁺ or S²⁻).

- 12 protons and 10 electrons: _____
- 74 protons and 68 electrons: _____
- 33 protons and 36 electrons: _____

5. Write the complete chemical symbol for the ion with 27 protons, 32 neutrons, and 25 electrons.

(Ex. $^{34}\text{Se}^{2-}$)

III. Label these as either "isotopes" or "different elements."

- Element D has 6 protons and 7 neutrons.
Element F has 7 protons and 7 neutrons.
- Element J has 27 protons and 32 neutrons.
Element L has 27 protons and 33 neutrons.
- Element X has 17 protons and 10 neutrons.
Element Y has 18 protons and 17 neutrons.
- $^{14}\text{X}_6$ and $^{14}\text{Y}_7$
- $^{12}\text{X}_6$ and $^{14}\text{Y}_6$
- Element P has an atomic number of 92 and has a mass number of 238. Element S has 92 protons and 143 neutrons.

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ISOTOPES AND AVERAGE ATOMIC MASS

Name _____

Elements come in a variety of isotopes, meaning they are made up of atoms with the same atomic number but different atomic masses. These atoms differ in the number of neutrons.

The average atomic mass is the weighted average of all the isotopes of an element.

Example: A sample of cesium is 75% ^{132}Cs , 20% ^{135}Cs and 5% ^{137}Cs . What is its average atomic mass?

Answer: $.75 \times 132 = 99.75$
 $.20 \times 135 = 26.4$
 $.05 \times 137 = 6.7$
Total = 132.85 amu = average atomic mass

Determine the average atomic mass of the following mixtures of isotopes.

1. 80% ^{127}I , 17% ^{124}I , 3% ^{129}I	
2. 50% ^{17}Au , 50% ^{19}Au	
3. 15% ^{54}Fe , 85% ^{56}Fe	
4. 99% ^1H , 0.8% ^2H , 0.2% ^3H	
5. 95% ^{14}N , 3% ^{15}N , 2% ^{16}N	
6. 98% ^{12}C , 2% ^{14}C	

Atomic Emission Spectrum of the Hydrogen Atom

Use your references packet to answer the following questions:

1) In which transition is the most energy released?

- a) $n = 3$ to $n = 2$
- b) $n = 3$ to $n = 1$
- c) $n = 5$ to $n = 2$
- d) $n = 1$ to $n = 3$

2) Which transition required the largest amount of energy input?

- a) $n = 1$ to $n = 3$
- b) $n = 4$ to $n = 1$
- c) $n = 3$ to $n = 4$
- d) $n = 2$ to $n = 1$

3) a) What wavelength of light is produced during the transition from $n = 4$ to $n = 1$?

b) What type of energy is produced? _____

4) a) What wavelength of light is produced during a transition from $n = 5$ to $n = 2$?

b) What color light is produced? _____

5) a) What wavelength of light is produced during a transition from $n = 3$ to $n = 2$?

b) What color light is produced? _____

6) If violet light of wavelength 4.1×10^7 m is released, what transition did the electron make?

$n =$ _____ to $n =$ _____

7) Put in order from lowest to highest FREQUENCY: (Note as wavelength decreases, frequency increases!)

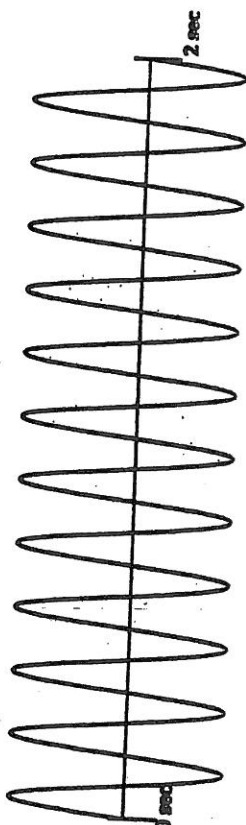
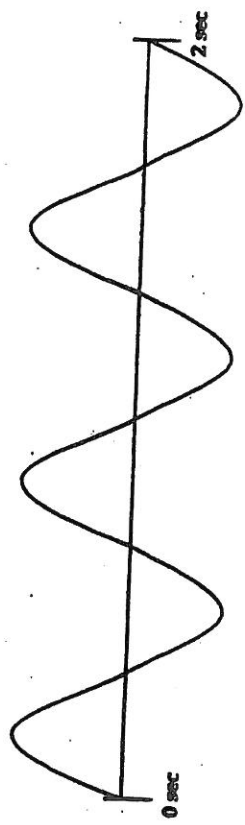
a) radio waves, gamma rays, IR, X-rays, UV, microwaves

b) blue, red, violet, orange

8) Put in order from lowest to highest ENERGY: (Note as wavelength decreases, energy increases!)

a) gamma rays, IR, radio waves, UV, red light, violet light

Characteristics of Electromagnetic Waves (Radiation)
 Identify the crest, trough, wavelength, amplitude, and frequency of the following wave.
 λ = wavelength ("lambda") in meters or nanometers
 f = frequency (Hertz (Hz) or s^{-1}) = cycles/second



- Practice**
- Calculate the frequency of the waves above (# cycles / # seconds):
 - Wave #1: _____
 - Wave #2: _____
 - As wavelength increases, frequency _____
 - As wavelength decreases, frequency _____
- Wavelength and frequency have a/an _____ relationship!
- As frequency increases, the energy of the wave _____
 - As the wavelength increases, the energy of a wave _____
- Energy and frequency have a/an _____ relationship!
 ➤ Energy and wavelength have a/an _____ relationship!

(5)

ELECTRON CONFIGURATIONS

Write the electron configuration for each element. DO NOT ABBREVIATE!

- Be _____
- S _____
- Ne _____
- Na _____
- As _____
- Br _____
- Y _____
- W _____
- Po _____
- U _____

Write the ABBREVIATED electron configuration for each element.

- Cu _____
- Si _____
- Sn _____
- Cs _____
- Se _____
- Pb _____
- Al _____
- P _____
- Mo _____
- Np _____

(6)

ION CONFIGURATIONS

Write the electron configuration for each ION. DO NOT ABBREVIATE!

- 1) Be^{2+} _____
- 2) Al^{3+} _____
- 3) O^{2-} _____
- 4) Na^+ _____
- 5) As^{3+} _____
- 6) Br^- _____

Write the ABBREVIATED electron configuration for each element.

- 7) Cu^{2+} _____
- 8) Si^4 _____
- 9) Sn^{2+} _____
- 10) In^{3+} _____
- 11) Se^{2-} _____
- 12) Pb^{4+} _____

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ORBITAL NOTATION

Write the abbreviated orbital notation for each element. (Hint: You need to write the electron configuration first!)

- 1) O
- 2) Mg
- 3) Ti
- 4) Sc
- 5) P
- 6) Ir
- 7) At
- 8) W
- 9) U
- 10) Fr

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VALENCE ELECTRONS

Name _____

The valence electrons are the electrons in the outermost principal energy level. They are always s or s and p electrons. Since the total number of electrons possible in s and p sublevels is eight, there can be no more than eight valence electrons.

Determine the number of valence electrons in the atoms below.

Example: carbon

Electron configuration is $1s^2 2s^2 2p^2$.
Carbon has 4 valence electrons.

- fluorine _____
- phosphorus _____
- calcium _____
- nitrogen _____
- argon _____
- potassium _____
- helium _____
- magnesium _____
- sulfur _____
- lithium _____
- carbon _____
- iodine _____
- oxygen _____
- barium _____
- aluminum _____
- hydrogen _____
- xenon _____

Chapter 4-5 Review - Atomic Models and Atomic Str.

- The atomic number is the number of _____
- The mass number is the number of _____
- What is the number above the symbol on the periodic table? _____
- What is the number below the symbol on the periodic table? _____
- Put these particles in order from lightest to heaviest:
- proton, neutron, electron, $\frac{4}{2}He$, $\frac{1}{1}H$
- Most of an atom's mass comes from which particle(s)? _____
- What are the charges of these particles? proton: _____, neutron: _____, electron: _____
- If an atom has a charge of $3+$, has it lost or gained electrons? _____
- If an atom of nitrogen has 10 electrons, its charge is _____
- If an atom of lithium has 2 electrons, its charge is _____
- If you changed the number of _____ in an atom, you would change its identity.
- If you changed the number of _____ in an atom, you would change its charge.
- If you changed the number of _____ in an atom, you would change its mass only.
- Identify the substance that contains 9 protons, 10 neutrons, and 10 electrons. _____
- How many electrons are in each of the following?
a) Al^{3+} _____
b) Br^{-1} _____
c) Ca^{2+} _____
d) O^{2-} _____
- Ions are charged atoms. If an atom has a charge, it must have a different number of _____ compared to _____
- Neutral atoms of the same element can vary in their number of _____
- In Sodium-23:
a) What does 23 refer to? _____
b) How many protons, neutrons, and electrons does it have? p: _____, n: _____, e: _____
- Determine the number of protons, neutrons and electrons for:
 $^{56}_{27}Co^{2+}$ p: _____, n: _____, e: _____

Practice and Review (Electron Configuration):

Example: $1s^2 2s^2 2p^6 3s^2 3p^4 3d^1 4p^5 5s^2 4d^2$

1. What is the element represented above? _____
2. How many valence electrons does this element have? _____
3. This element is in Row _____ and Column _____
4. The electron configuration of this element contains how many s sublevels? _____
5. The electron configuration of this element contains how many p sublevels? _____
6. How many electrons are found in d sublevels in the element above? _____
7. How many electrons are found in s sublevels in the element above? _____

Your Turn! ☺ : $1s^2 2s^2 2p^6 3s^2 3p^4 3d^1 4p^3$

8. How many electrons are found in s sublevels in the element above? _____
9. How many valence electrons does this element have? _____
10. This element is in Row _____ and Column _____
11. The electron configuration of this element contains how many d sublevels? _____
12. What is the name of the element represented above? _____
13. The electron configuration of this element contains how many s sublevels? _____
14. How many electrons are found in d sublevels in the element above? _____
15. How many total electrons are found in the element above? _____
16. The outermost energy level for this element is Energy Level # _____

Try another just to make sure you get it! ☺ : $1s^2 2s^2 2p^6 3s^2 3p^4 3d^1$

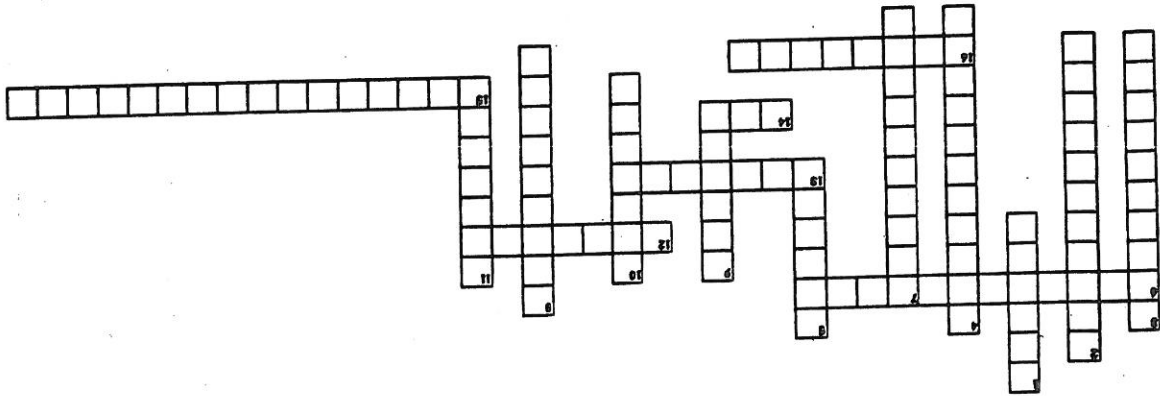
17. How many valence electrons does this element have? _____
18. This element is in Row _____ and Column _____
19. The electron configuration of this element contains how many d sublevels? _____
20. What is the name of the element represented above? _____
21. How many electrons are found in p sublevels in the element above? _____
22. How many total electrons are found in the element above? _____
23. The outermost energy level for this element is Energy Level # _____

Write the electron configurations for these three noble gases:

24. Neon: _____
 25. Argon: _____
 26. Krypton: _____
- All noble gases (with the exception of helium) have _____ valence e.
 - In the outermost energy level, which sublevels are filled? _____

27. The chemical properties of an element are determined by its number of _____

Atomic Theory



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- Down**
1. Element with 11 protons
 2. Closest possible energy level to the nucleus
 3. Distance from peak to peak on a wave
 4. Ring around the nucleus (where electrons are)
 5. Particle with a positive charge in the nucleus
 7. Protons plus neutrons
 8. Number of wave peaks that pass a point in a second
 9. A packet of light energy
 10. A packet of energy
 11. Atoms of the same element that have different numbers of neutrons

- Across**
6. Number of protons (identifies the element)
 12. Center of the atom
 13. Particle with a neutral charge in the nucleus
 14. An atom that has gained or lost an electron (and becomes charged)
 15. When an electron moves down to a lower energy level and releases energy
 16. Particle that weighs nothing

energ