Name: _____**Answer Key**_____ Period: _____ Date: _____

Chem 11 Unit 6 Atomic Theory Review Worksheet

1. Name the scientist who:
   a) Developed the model of atom — **J. Dalton**
   b) Discovered the electron — **J.J. Thomson**
   c) Discovered the proton and the nucleus through the gold foil experiment — **E. Rutherford**
   d) Discovered the neutron — **J. Chadwick**
   e) Discovered radioactivity — **H. Becquerel**
   f) Determined the mass and charge of electron — **R. Millikan**

2. What is the mass of a proton, neutron and an electron?

   Proton = 1.67×10^{-24} g Neutron = 1.67×10^{-24} g Electron = 9.11×10^{-28} g

3. Compare the similarities and differences between Bohr's model and the modern Quantum Mechanical model of the atom.

   Both Bohr's model and the Quantum Mechanical model of the atom have a nucleus, which is an extremely small, dense region in the center of the atom that contains most of the atom's mass and all of its positive charge. Both models have electrons whose energy is quantized. Bohr thought that he could describe the exact path taken by an electron, but the Quantum Mechanical model states that we cannot specify the exact path of the electron, only the region where an electron is most likely to be found. This region is called an orbital. Additionally, there is more than one type of orbital.

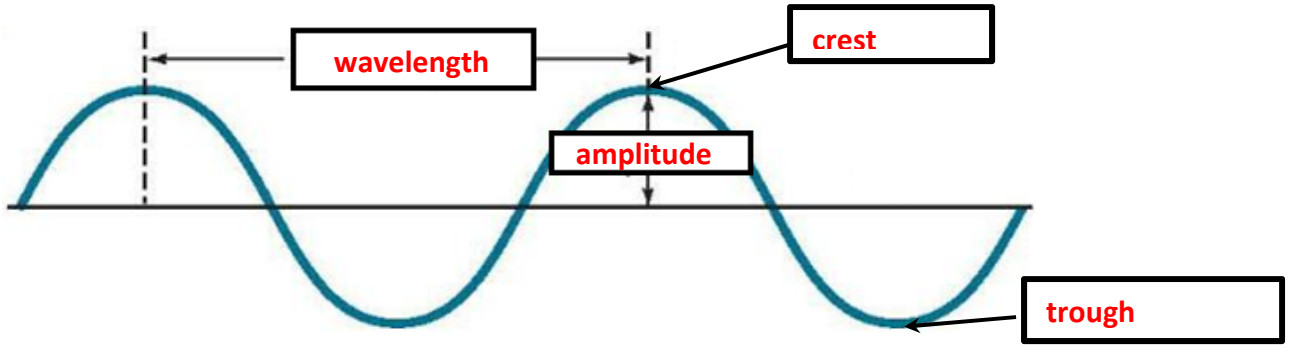
4. Complete the following table.

Symbol	Atomic Number	Mass Number	Protons	Neutrons	Electrons
$^{38}_{18}Ar$	**18**	**38**	**18**	**20**	**18**
$^{18}_{8}O$	**8**	**18**	**8**	**10**	**8**
$^{36}_{16}S^{2-}$	**16**	**36**	**16**	**20**	**18**
X^-	**17**	**37**	**17**	20	18
Mg^{2+}	**12**	26	**12**	14	10

5. Calculate the average atomic mass of nickel that has five naturally occurring isotopes: 67.88% nickel-58 (mass = 57.9353 u), 26.23% nickel 60 (mass = 58.9332 u), 1.19% nickel-61 (mass = 60.9310 u), 3.66% nickel-62 (mass = 61.9283 u), and 1.08% nickel-64 (mass = 63.9280 u).

   Mass = (0.6788)(57.9353) + (0.2623)(58.9332) + (0.0119)(60.9310) + (0.0366)(61.9283) + (0.0108)(63.9280)
   Mass = 39.33 + 15.46 + 0.725 + 2.27 + 0.6904
   Mass = 58.47 u

6. Label the following diagram.



7. Calculate the frequency and energy of the colour yellow (wavelength = 588 nm) released by helium. ($c = \lambda\upsilon$ where $c = 3.00 \times 10^8$ m/s and $E = h\upsilon$ where $h = 6.62 \times 10^{-34}$ Js)

$\lambda = 588$ nm $= 588 \times 10^{-9}$ m $= 5.99 \times 10^{-7}$ m

$$\upsilon = \frac{c}{\lambda} = \frac{3.00 \times 10^8\ m/s}{5.88 \times 10^{-7} m} = 5.10 \times 10^{14} Hz\ or\ 1/s\ or s^{-1}$$

$E = h\upsilon = (6.62 \times 10^{-34}$ Js$)(5.10 \times 10^{14} Hz) = 3.38 \times 10^{-19}$ J

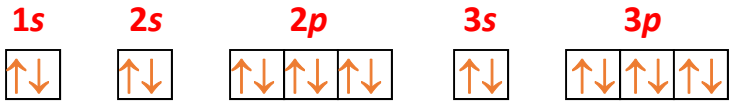
8. In the visible light spectrum, which colour of light has the longest wavelength? Which colour of light has the highest frequency? Which colour of light has the highest energy?

Red has the longest wavelength.
Violet has the highest frequency.
Violet has the highest energy.

9. Draw the orbital diagram, write the electron configurations and the core notation of the following.

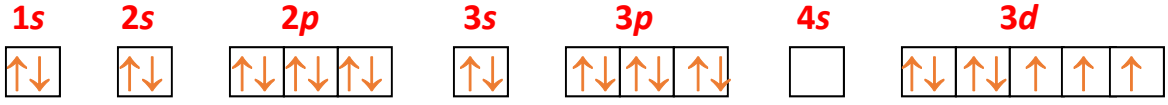
a) P^{3-}

$1s^2 2s^2 2p^6 3s^2 3p^6$
$[Ne] 3s^2 3p^6$



b) Ni^{3+}

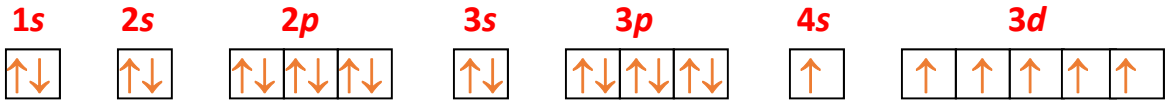
$1s^2 2s^2 2p^6 3s^2 3p^6 4s^0 3d^7$
$[Ar] 3d^7$



c) Cr

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

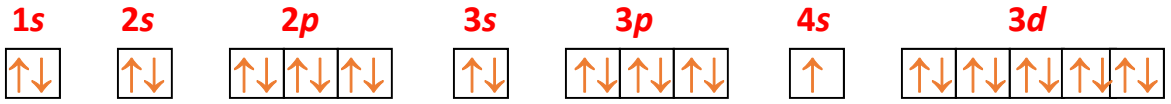
[Ar] $4s^1 3d^5$



d) Cu

$1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^{10}$

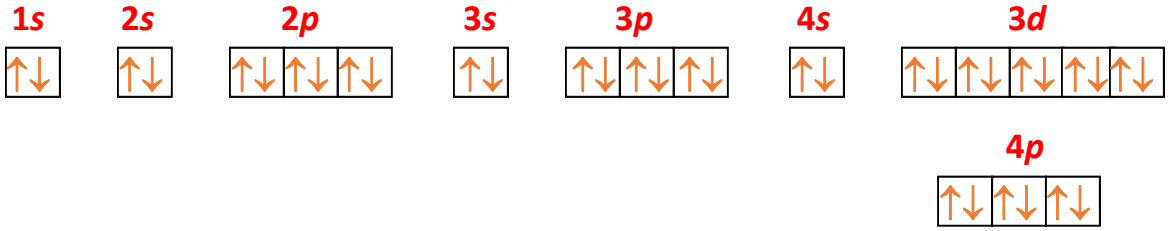
[Ar] $4s^1 3d^{10}$



e) Sr^{2+}

$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6$

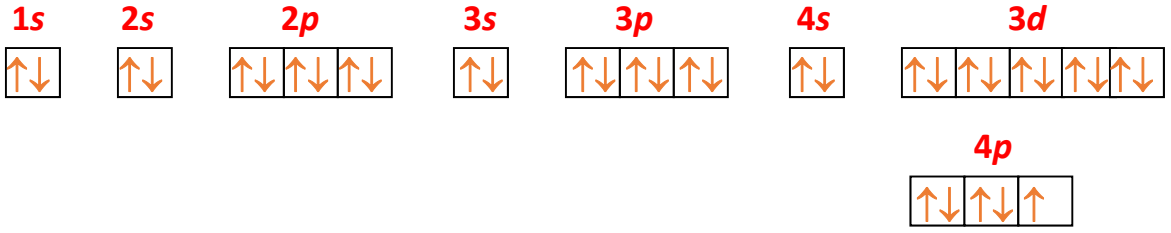
[Ar] $4s^2 3d^{10} 4p^6$



f) Br

$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^5$

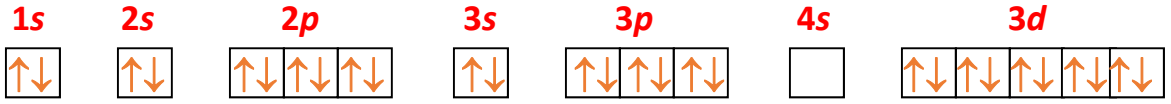
[Ar] $4s^2 3d^{10} 4p^5$



g) Cu^+

$1s^2 2s^2 2p^6 3s^2 3p^6 4s^0 3d^{10}$

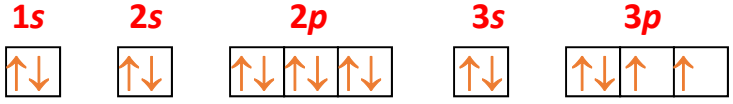
[Ar] $3d^{10}$



h) S

$1s^2 2s^2 2p^6 3s^2 3p^4$

[Ne]$3s^2 3p^4$



10. Define the term isoelectronic. List 5 ions that are isoelectronic with Argon.

Isoelectronic species have the same electron configurations (same number of electrons). P^{3-}, S^{2-}, Cl^-, K^+, Ca^{2+} are examples of ions that are isoelectronic with Argon.

Vocabulary List

Isotope
Frequency
Wavelength
Amplitude
Orbital
Quantized/Energy Levels
Ground State
Isoelectronic
Proton
Neutron
Electron
Atomic Number
Atomic Mass
Mass Number
Excited State
Orbital Shape