Name: Date:

ELECTRON DOT DIAGRAMS WORKSHEET

	ELEMENT	ELECTRON CONFIGURATION	NOBLE GAS CONFIGURATION	HIGHEST OCCUPIED ENERGY LEVEL	# OF VALENCE ELECTRONS	ORBITAL NOTATION OF H.O.E.L.	ELECTRON DOT DIAGRAM
1. EX	magnesium	$1s^2\ 2s^2\ 2p^6\ 3s^2$	[Ne] $3s^2$	3	2	$\underset{3s}{\uparrow\downarrow}$	: Mg
2.	carbon						C
3.	sulfur						S
4.	barium						Ba
5.	nickel						Ni
6.	oxygen						O
7.	arsenic						As
8.	lead						Pb
9.	lithium						Li
10.	neon						Ne
11.	bromine						Br

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12.	sodium						Na
13.	chlorine						Cl
14.	argon						Ar
15.	calcium						Ca
16.	zinc						Zn
17.	potassium						K
18.	iodine						I
19.	cobalt						Co
20.	nitrogen						N
21.	fluorine						F
22.	iron						Fe
23.	phosphorus						P
24.	aluminum						Al

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Problem Set #4 Name:
Date:

Part 1 - Answer the following questions about the element manganese (Mn).

1. What is the atomic number of manganese?

2. What is the total number of electrons in a neutral atom of manganese?

3. What is the electron configuration of manganese?

4. How many valence electrons are there in a neutral atom of manganese?

5. In what sublevel(s) - give # and letter - are the valence electron(s) located?

6. What is the highest occupied energy level (HOEL) of an atom of manganese?

7. What is the noble gas configuration for manganese?

8. Draw the orbital notation for the highest occupied energy level (HOEL). Circle the electron with the highest energy (in the HOEL).

9. Write the four quantum numbers for the electron you circled in #8.
   n = ℓ = m = s =

10. Draw the electron dot diagram for manganese.

11. Is the electron you circled in #8 the electron with the highest energy in a neutral atom of manganese? Why or why not? Explain.

Part 2 - Solve the following problems. Show your work.
An electron in an atom has a frequency of 5.172×10^{14} Hz.

12. How much energy does this electron have?

13. What is the wavelength?

14. What color of light is emitted?

15. Does a hydrogen atom emit light at this wavelength? Why or why not? Explain.

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Emission Spectra Lab

Pre-Lab Questions:

1. According to Bohr's atomic model, where may an atom's electrons be found?
2. How do electrons become excited?
3. State the equation that is used to determine the energy content of a packet of light of specific frequency.
4. What form of energy emission accompanies the return on excited electrons to the ground state?

Write and/or draw your observations as you view the emission spectra.

DATA TABLE

Gas	Observations
incandescent	
hydrogen (H_2)	
carbon dioxide (CO_2)	
helium (He)	
neon (Ne)	
water vapor (H_2O)	
Air	
mercury (Hg)	
Argon	
Krypton	
Xenon	
nitrogen (N_2)	
iodine (I_2)	
oxygen (O_2)	
fluorescent	

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FLAME TESTS FOR METALS LAB

Background: The active metals of groups 1 and 2 can be "excited" in a flame. The energy (in the form of heat) in the flame causes the electrons in the metal to jump up into higher energy levels. When the electrons fall from the excited state, they produce light. Each metal produces a characteristic color of light.

Purpose: To identify the presence of a metal found in each solution by observing the color produced when metal compounds are excited in a flame. To determine the identity of a metal ion in an unknown solution.

Lab Safety:
** ALWAYS WEAR YOUR SAFETY GOGGLES! **
** TIE BACK LONG HAIR! **

Procedure:
1. Select one wooden splint from the container for the element you are testing.
2. Place it into the flame as demonstrated by your instructor. Place burned wooden splints into beaker of water.
3. Carefully observe the color of the flame and record your observations.
4. Test the remainder of the solutions.
5. Compare the known solutions with the unknown solution and record your observations.
6. Clean up your lab station as directed by your instructor.

Data: Record the color of the flame for each of the known solutions.

Metal Ion	Color of Flame
Lithium	
Sodium	
Potassium	
Calcium	
Barium	
Copper	
Strontium	
Magnesium	
Unknown ___	

Questions:
1. What is the identity of the unknown based on your observations? How did you know?
2. According to the Bohr model of the atom, what happens in the atom that causes colors to be emitted during these flame tests?
3. What do you think would happen if the unknown substance contained a mixture of two compounds? Could each metal be identified?
4. Suppose you are working in a police crime laboratory and are trying to identify a poison that was used in a crime. How could a knowledge of flame tests help you?
5. Understanding the flame test properties of the group 1 and 2 metals, what is another application of using flame tests? (Do not use the example from the previous question.)