REVIEW QUESTIONS Chapter 9

1. Determine the wavelength in the diagram shown below:



2. Arrange the following electromagnetic radiation in increasing order of wavelength:

	X-rays	Radiowaves	Visible light	Microwaves
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x-rays	<	visible light	<	microwaves	<	radio waves
shortest						longest

3. Arrange the following orbitals in increasing order of energy:



4. Identify each of the following elements from their electron configurations:

a)	$1s^2 2s^2 2p^4$	oxygen (O)
b)	$[Ar] 4s^2 3d^7$	cobalt (Co)
c)	[Ne] $3s^2 3p^3$	phosphorous (P)

5. Shown below are excited states for some elements. Identify each element and write its ground state configuration:

a)	$1s^2 2s^2 2p^6 3s^1 3p^1$	Mg	$1s^2 2s^2 2p^6 3s^2$
b)	$[Ar] 4s^2 3d^4 4p^1$	Mn	[Ar] 4s ² 3d ⁵
c)	$1s^2 2s^2 2p^6 3s^2 3p^4 4s^1$	Cl	<u>1s² 2s² 2p⁶ 3s² 3p⁵</u>

6. Using only a periodic table, write the notations requested for each element below:

Sulfur (S): $1s^2 2s^2 2p^6 3s^2 3p^4$ (complete configuration)

Selenium (Se): [Ar] 4s² 3d¹⁰ 4p⁴ (abbreviated configuration)

Nickel (Ni): (orbital notation for valence electrons)

 $\begin{array}{c|c} \uparrow \downarrow & \uparrow \\ \hline 4s & & 3d & & \end{array}$

7. Give symbol and name the element in the fourth period of the periodic table with:

a)	5 valence electrons	arsenic (As)
b)	a total of four 4p electrons	selenium (Se)
c)	a total of three 3d electrons	vanadium (V)
d)	a complete outer shell	krypton (Kr)

8. Write complete electron configuration for each of the following ions:



What do all the electron configurations above have in common?

They all have noble gas electron configurations

9. Using electron configurations, explain why oxygen tends to form a 2– ion while calcium forms a 2+ ion.

Oxygen has 8 electrons and forms a noble gas configuration by gaining 2 electrons to form O^{2-} ion:

 $1s^2 2s^2 2p^6$

Calcium has 20 electrons and forms a noble gas configuration by losing 2 electrons to form Ca^{2+} ion:

1s² 2s² 2p⁶ 3s² 3p⁶

10. According to the quantum mechanical model for the hydrogen atom, which transition produces light with longer wavelength: 3p to 2s or 4p to 2s? Give clear explanation and reasoning.

The 3p to 2s transition has lower energy than 4p to 2s. Therefore it produces a light with lower frequency and longer wavelength.

- 11. Complete each statement below with a suitable word or phrase:
 - A) Based on Bohr's model of atom, the electrons exist in <u>energy levels</u> around the nucleus.
 - B) The arrangement of the electrons around the nucleus is called <u>electron configuration</u>.
 - C) A particle of light is referred to as a(n) **photon**.
 - D) The group number of representative elements represents the <u>number of valence electrons.</u>
 - E) The number of waves per unit of time is called <u>frequency</u>.
 - F) Electrons that exist in the same orbital must possess **opposite spins**.
 - G) When electrons descend from higher energy levels to lower ones they

<u>emit light</u>.