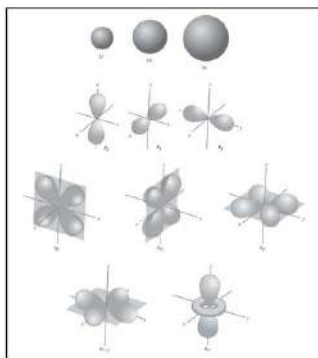


## Quantum Theory/Periodic Table Test Review

1. What are the four quantum numbers and what do they indicate? *principle (n)- number of main energy levels; orbital (l)- number of sublevels; magnetic (m)- orientation on axis; spin (+1/2 or -1/2)- spin of electron pair*
2. How many electrons can occupy a
  - a. S sublevel- 2
  - b. P sublevel- 6
  - c. D sublevel- 10
  - d. F sublevel- 14
3. State the Pauli Exclusion Principle. *pairs of electrons cannot have the same spin in the same orbital (no two electrons can have the same set of quantum numbers)*
4. State the Aufbau Principle. *electrons must occupy the lowest available energy level*
5. What is the electron configuration, orbital notation, and noble gas notation for the following elements?
  - a. Nitrogen  $1s^2 2s^2 2p^3$ ,  $[\text{He}] 2s^2 2p^3$
  - b. Magnesium  $1s^2 2s^2 2p^6 3s^2$ ,  $[\text{Ne}] 3s^2$
  - c. Cadmium  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10}$ ,  $[\text{Kr}] 5s^2 4d^{10}$
6. Describe the shape of the various sublevels in their magnetic quantum number.



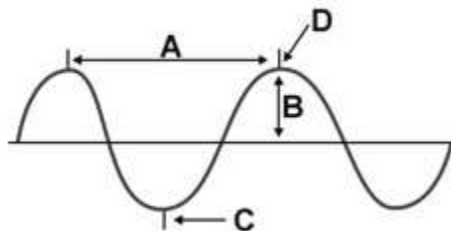
7. What are the notations associated with a principle quantum number?  $n=1, n=2, n=3, n=4, n=5, n=6, n=7$
8. What are the notations associated with an orbital quantum number?  $s (0), p (1), d (2), f (3)$
9. What are the notations associated with a magnetic quantum number?  $s (0), p (-1, 0, +1), d (-2, -1, 0, +1, +2), f (-3, -2, -1, 0, +1, +2, +3)$
10. What are the notations associated with a spin quantum number?  $+1/2, -1/2$
11. Write the quantum numbers associated with the LAST electron placed in Cobalt's configuration.  $(3, 2, -1, -1/2)$
12. Indicate the maximum number of electrons in an atom that can have as part of their set of four quantum numbers for each of the following:
  - a.  $n=2$     8
  - b.  $n=3, l=1$     6
  - c.  $n=5, l=3, m=-2, s=-1/2$     1

13. What contribution did Doberniere make to the creation of the periodic table?  
*Triad Theory, grouping by similar properties*
14. What contribution did Newlands make to the creation of the periodic table? *Law of Octaves; increasing atomic mass*
15. Mendeleev is known for developing the modern *periodic* table and for writing the first *periodic law*. Mendeleev's table was based on grouping elements with similar *properties* and placing the elements in order of increasing *atomic mass*. Mendeleev left spaces in his periodic table because he predicted undiscovered elements based on their *properties*.
16. What group did Ramsey discover on the periodic table? *noble gases*
17. What did Mosely do to "fix" Mendeleev's table? *changed the order to increasing atomic NUMBER*
18. List the location, group name, and metal/metalloid/nonmetal classification of the following elements:
  - a. Na- *IA, Alkali Metals, metal*
  - b. Ca- *IIA, Alkaline Earth Metal, metal*
  - c. Ni- *VIII B, transition element, metal*
  - d. C- *IVA, carbon group, nonmetal*
  - e. Br- *VIIA, halogen, nonmetal*
  - f. Nd- *4f, lanthanide, metal*
  - g. U- *5f, actinide, metal*
  - h. B- *IIIA, boron group, metalloid*
19. A horizontal row of blocks on the periodic table are called a(n) *period*. It represents the number of *orbitals* in an element's atom.
20. A vertical column of blocks on the periodic table are called a(n) *group (family)*. It represents elements with similar chemical *properties*, and all elements within a group have the same number of *valence electrons*.
21. What element is located at  $1s^2 2s^2 2p^4$ ? *oxygen*
22. What element is located at  $[\text{Ne}] 3s^1$ ? *sodium*
23. What is the most reactive metallic group? *alkali metals*
24. What is the most reactive nonmetallic group? *halogen*
25. How is atomic radius calculated?  *$\frac{1}{2}$  distance from nuclei of two identical elements*
26. What is ionization energy? What are the trends associated with it? *energy needed to remove an electron; increase  $\rightarrow$   $\uparrow$*
27. What are the correct terms for the following?
  - a. neutral element *atom*
  - b. negative ion *anion*
  - c. positive ion *cation*
28. How does the size of the atomic radii compare between an atom, cation, and anion? *(largest to smallest) anion  $\rightarrow$  atom  $\rightarrow$  cation*
29. What trends are associated with atomic radii? *increase  $\leftarrow$   $\downarrow$*
30. Does the ionization energy increase or decrease as more and more electrons are removed from one atom? *increase*
31. How many valence electrons are in the following elements' atoms?

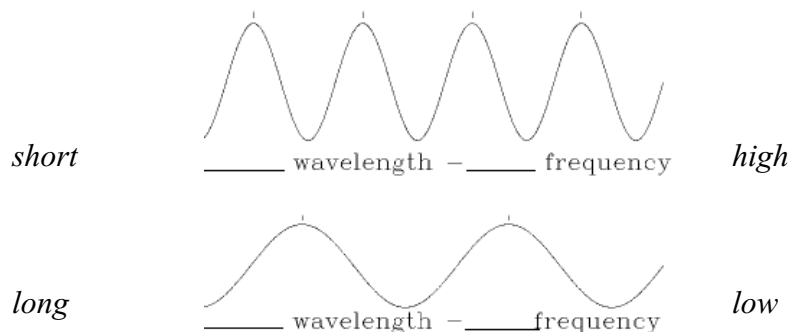
- a. Carbon – 4
- b. Selenium- 6
- c. Magnesium- 2
- d. Fluorine- 7

32. Which groups on the periodic table have the most negative electron affinity? *IIA (2), IIB (12), VIIIA (18)*
33. REVIEW ALL OF YOU PRACTICE HOMEWORK ON ELECTRON CONFIGURATION, PERIODIC TRENDS, ETC...

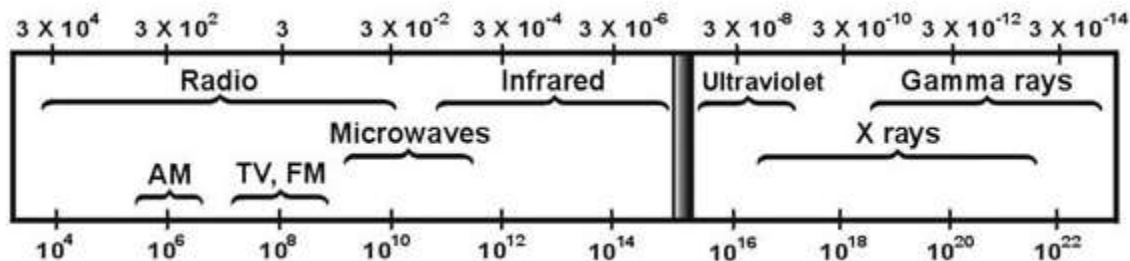
34. Identify the parts of the wave:  
*a- wavelength*  
*b- amplitude*  
*c- trough*  
*d-crest*



35. Describe the wavelength and frequency of the waves shown below:



36. Answer the following questions using the chart below:



- a. Which type of wave has a wavelength of approximately  $10^{-8}$  meters? *ultraviolet*
  - b. Which type of wave has a wavelength of approximately  $10^2$  meters? *radio (a.m.)*
37. What is the frequency of a light wave with a wavelength of  $2.6 \times 10^{-8}$  m?  *$1.15 \times 10^{16}$  hz*
38. A photon is emitted from an atom with an energy of  $5.26 \times 10^{-17}$  J. What is the wavelength of the photon?  *$4 \times 10^{-9}$  m*