

3. (10 pts) Blue-Ray DVD players operate at a frequency of $7.41 \times 10^{14} \text{ s}^{-1}$.
- Set-up and solve for the wavelength (in nm).

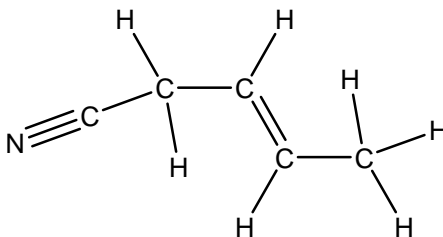
b. Set-up and solve for the energy of a mole of photons of this light.

4. (5 pts) Rank the following in order of smallest atomic size to largest: O, S, P, Ge, and F.

5. (3 pts) Circle the atom with the highest electronegativity in each pair:

- C – F
- Ge – P
- O – C

6. (2 pts) The molecule below has _____ sigma bonds and _____ pi bonds.



7. (40 pts) For each of the following molecules or ions: draw the correct Lewis Dot Structure, give the BD and NBD, determine the molecular geometry, give the hybridization of the central atom and determine if the molecule is polar or nonpolar. **Include all resonance structures.**



BD: _____
NBD: _____
Molecular Geometry: _____
Hybridization: _____
Polarity: _____



BD: _____
NBD: _____
Molecular Geometry: _____
Hybridization: _____
Polarity: _____



BD: _____
NBD: _____
Molecular Geometry: _____
Hybridization: _____
Polarity: _____



BD: _____
NBD: _____
Molecular Geometry: _____
Hybridization: _____
Polarity: _____

8. (10 pts) Indicate whether or not the following quantum numbers or orbitals can exist using Y for yes and N for no. For those that **cannot exist, explain why.**

Circle

If no, then explain why.

- | | | |
|---|--------|-------|
| a. 10s | Y or N | _____ |
| b. 2d | Y or N | _____ |
| c. $n = 2, l=3, m_l = 0, m_s = \frac{1}{2}$ | Y or N | _____ |
| d. 4f | Y or N | _____ |
| e. $n=7, l=6, m_l = -3, m_s = 1$ | Y or N | _____ |

III. Essay: (10 pts) In 4 – 6 grammatically correct sentences, answer **ONE (and only one)** of the following questions. If you answer both questions, I will only grade the first one that you answer.

- Explain the difference between a sigma and a pi bond.
- What does the Schrodinger equation describe and how do the quantum numbers relate to it?