

## Review Questions-ANSWER KEY

### Chemistry 123

### Organic Chemistry

1. Provide the Lewis dot structures for the following compounds.

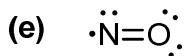
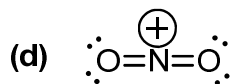
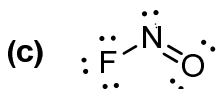
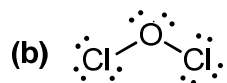
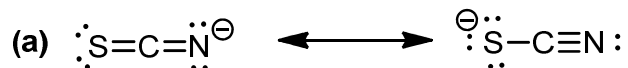
(a)  $\text{SCN}^-$

(b)  $\text{Cl}_2\text{O}$

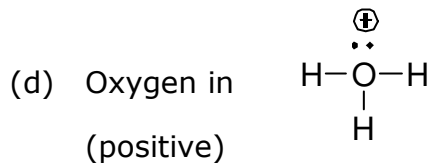
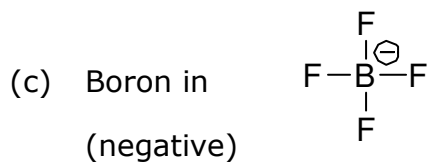
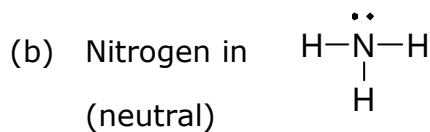
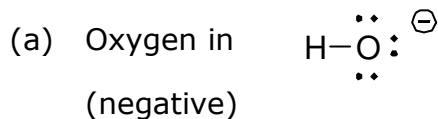
(c)  $\text{FNO}$

(d)  $\text{NO}_2^+$

(e)  $\text{NO}$



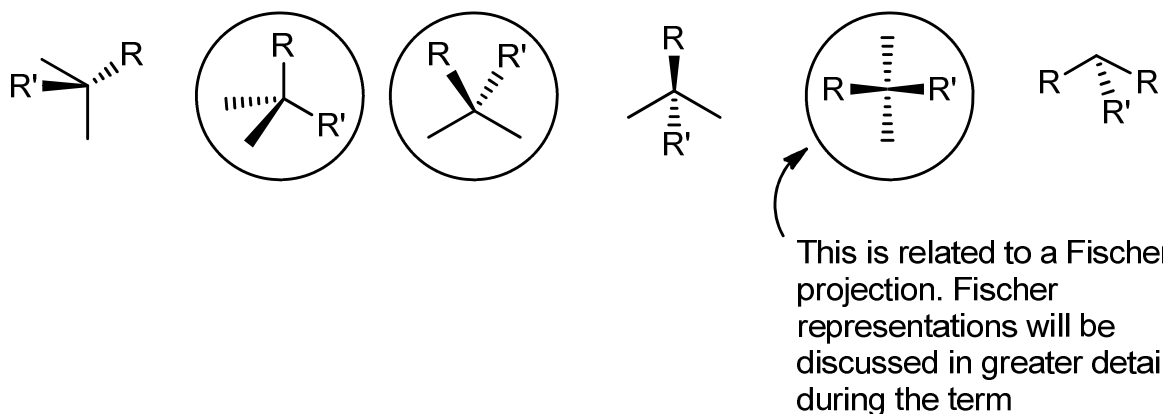
2. Determine the formal charge of each of the indicated atoms (not all lone pairs are shown).



3. Select the more electronegative atom in each of the following pairs.

- |       |       |
|-------|-------|
| (a) F | (b) N |
| (c) O | (d) O |
| (e) S | (f) N |

4. Shown below are several representations of tetrahedral carbons (R and R' are generic substituents); some are good and some are poor. Circle the drawings that are good representations.



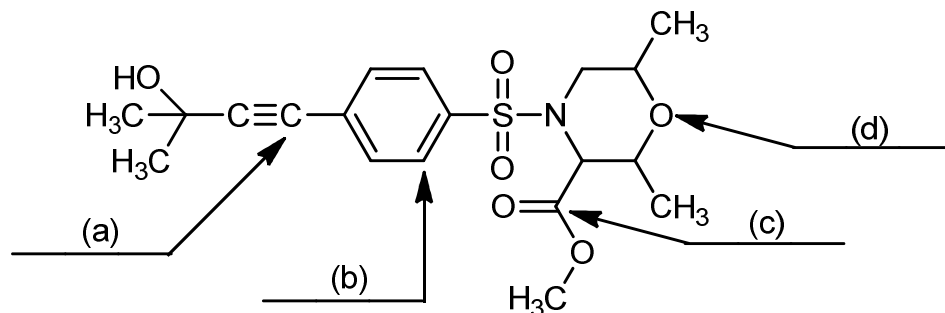
5. Determine the hybridization of each of the indicated atoms.

- |  |   |
|--|---|
| (a) Carbon in $\text{CCl}_4$ is $sp^3$ | (b) Nitrogen in $\text{NH}_3$ is $sp^3$ |
| (c) Carbon in $\text{HCN}$ is $sp$     | (d) Nitrogen in $\text{HCN}$ is $sp$    |
| (e) Carbon in $\text{CO}_2$ is $sp$    |   |

6. Classify each of the following as a Lewis acid or Lewis base.

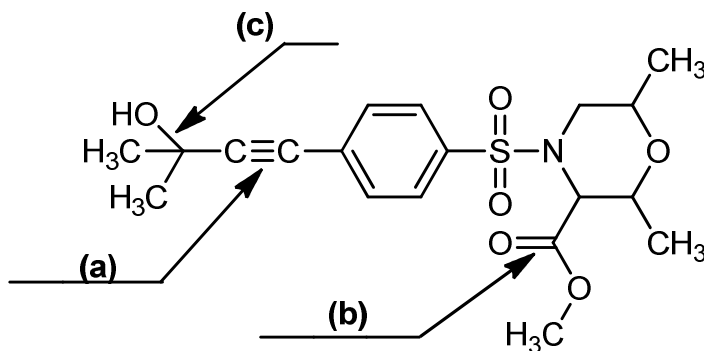
- |  |  |
|--|--|
| (a) $\text{BF}_3$ is a Lewis acid        | (b) $\text{NH}_3$ is a Lewis base          |
| (c) $\text{H}_2\text{O}$ is a Lewis base | (d) $\text{Mg}^{2+}$ is a Lewis acid       |
| (e) $\text{I}^-$ is a Lewis base         | (f) $\text{H}_2\text{N}^-$ is a Lewis base |

7. The compound with the structure below may be biologically active against arthritis. Write the hybridization for each of the indicated atoms in the structure.



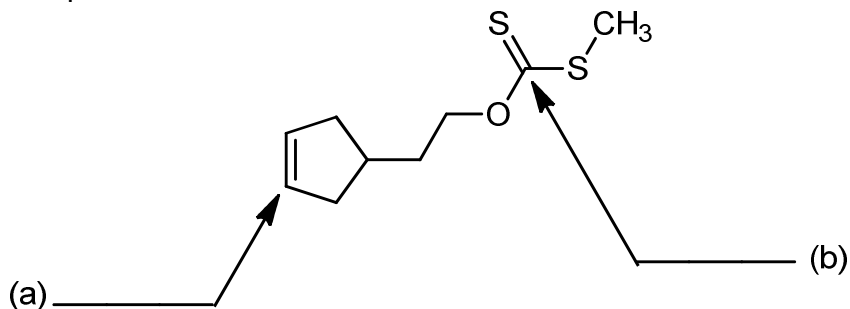
Answers: (a)  $sp^3$ , (b)  $sp$ , (c)  $sp^2$ , (d)  $sp^3$

8. Identify the bonding for each of the indicated bonds in the structure.



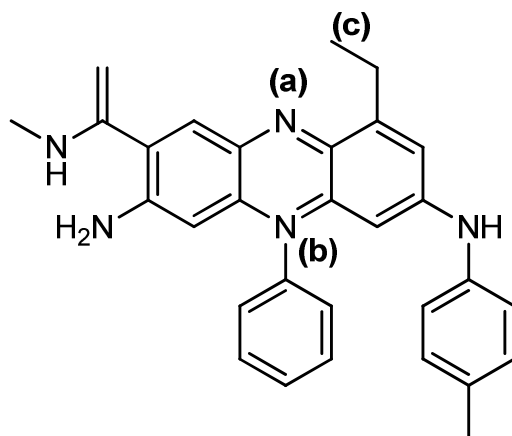
Answers: (a)  $\sigma_{sp^3-sp}$ ,  $\pi_{2p-2p}$ ,  $\pi_{2p-2p}$  (b)  $\sigma_{sp^2-sp^2}$ ,  $\pi_{2p-2p}$  (c)  $\sigma_{sp-sp^2}$

9. For the molecule shown below, give the hybridization of the atoms indicated by the arrows. Lone pairs are not shown.



(a)  $sp^2$ , (b)  $sp^2$

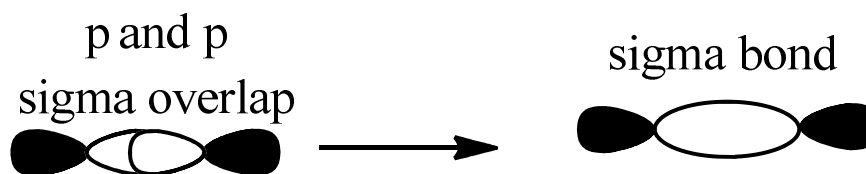
10. Provide the hybridization and formal charge (if any) for all the indicated atoms in the following compound.



A: (a)  $sp^2$  (b)  $sp^2$ , +1 (c)  $sp^3$

11.

- (a) Draw a sigma bond between two 2p orbitals.



- (b) Draw a pi bond between two 2p orbitals.

