

ORGANIC CHEMISTRY- ASSUMED KNOWLEDGE

The following list describes assumed knowledge from your A-level work in organic chemistry; you should take the opportunity over the vacation to do some revision of this, and the Hornby and Peach text (Foundations of Organic Chemistry (Oxford Chemistry Primers, 9) would be an excellent starting point. Over the page is a short set of problems which you should also try (without recourse to texts!). If you cannot complete this without difficulty, then you should specifically revise those areas. You should also learn the elements of the Periodic Table, up to Argon (element 18), at least.

A. *STRUCTURE AND BONDING*: the importance of electrons

1. Lewis Structures: Rules for writing Lewis structures.
2. Valence Electrons.
3. Atomic Orbitals: s,p,d
4. Bonding. σ - and π -bonds (single, double and triple bonds)

B. *ACIDS AND BASES*

1. Lowry-Bronsted - Proton acceptors/donors.
2. Lewis - Electron pair acceptors/donors.
3. Acid-base equilibria, equilibrium constants, pH and pKa.

C. *COMMON REACTION TYPES*

1. Substitution; Addition; Elimination.
2. Electrophiles (electron-poor) and nucleophiles (electron-rich) species react together.
3. Intermediates: carbocations, carbanions, radicals.

D. *MOLECULAR PROPERTIES*

1. Calculation of molecular formula from combustion data
2. Constitutional isomerism

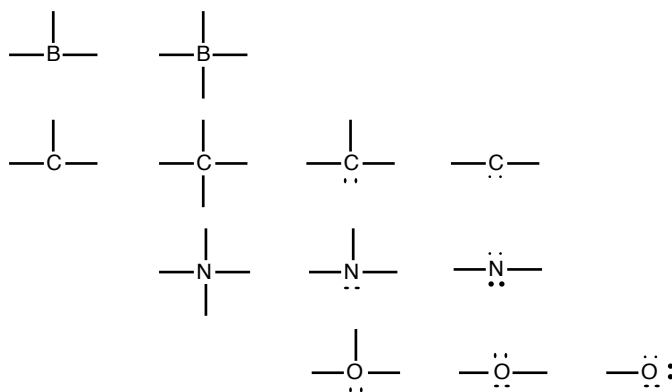
E. *NOMENCLATURE*

It is essential that you are familiar with the rules for naming simple organic compounds (alkanes, alkenes, alkynes, alkyl halides, ketones, aldehydes, esters, amides, epoxides, amines).

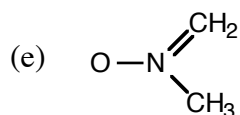
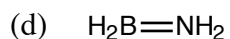
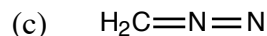
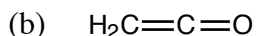
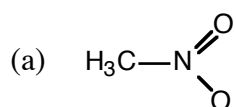
Problems

If you understand the above topics thoroughly, the following questions should present no difficulty for you. If you do find these questions challenging, you need to do revision of your basic knowledge before you start your course.

- Calculate the empirical formulae of compounds with the following percentage compositions.
(a) C, 61.21 ; H, 6.17; O, 32.62%.
(b) C, 38.94 ; H, 5.45; Cl, 38.32; O, 17.29%.
(c) C, 56.49; H, 4.74; Cl, 27.79, N, 10.99%.
- When 4.021mg of an organic substance is burned, 5.898mg of CO₂ and 2.415mg of H₂O are formed. What is the percentage composition of the compound? If the MW of the compound is 90.08, what is the compound's molecular formula? Suggest a suitable structure for this compound.
- Assign formal charges to the following atomic groups.



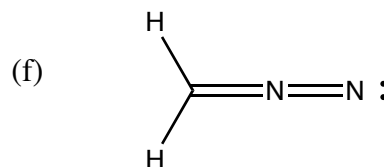
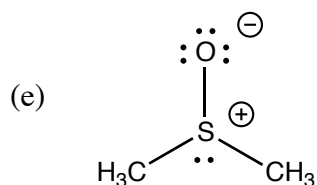
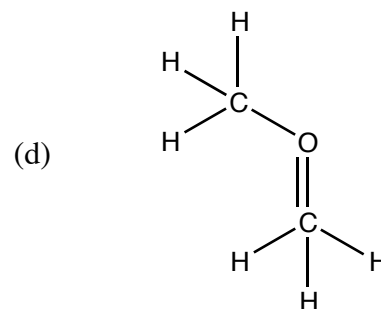
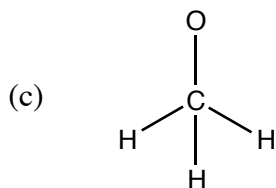
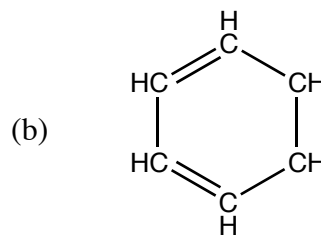
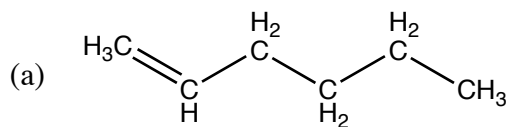
- Assign lone pairs and charges to each of the atoms in the following structures:



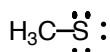
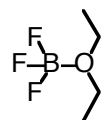
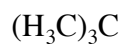
- Write a correct Lewis structure for each of the following:



6. Which of the following chemical structures are incorrect? Write out a corrected structure.



7. Indicate correct charges on the following structures:



8. Indicate the number of lone pairs required in the following structures, to complete the octets of all atoms:

