

Note: This list is not necessarily exhaustive; ultimately, you are responsible for whatever came up in class!

You can ignore the items that are stroked out.

Similarly, and items in the "practice quiz" and "practice questions" that deal with the stroked out items can be ignored.

Bonding

Orbital diagrams, energy level diagrams & electron config. for row 1 & row 2 atoms
 s, p orbitals (shape, orientation, phase, filling with electrons)
 Hybridized orbitals: sp , sp^2 , sp^3 (shape, geometry) & remaining unhybridised orbitals
 Hybridization for C, N, O atoms and associated angles between bonds (& nonbonding orbitals, if any)
 MO Theory, describe details of bonding and antibonding for (s,s) σ and (p,p) π bonds
 "bonding results from overlap of same phase orbitals being filled w/ electrons"
 σ bonds, describe & recognize (s,s ; s,sp ; s,sp^2 ; s,sp^3 ; sp,sp ; sp^2,sp^3 ; sp^3,sp^3)
 π bonds, describe & recognize (sideways overlap of p orbitals)
 Multiple bonds : 1 σ plus one or more π bonds
 VSEPR Theory
 predict molecular shape, bonding angles & hybridization of atoms based on "number of e^- clouds" (incl. those of high energy species)
 Given a structural formula, locate non-bonding electrons & describe hybridization of any atom, bonding angles and overall geometry of the molecule
 Electronegativity, know trends in PT, apply to differentiate ionic/ polar/ nonpolar bonds
 recognize symbols re: polarity and apply to formulas
 derive molecular polarity from bond polarity for simple molecules
 know "modified octet rule"
 assess whether a given Lewis structure is feasible
 Formal charges, determine & locate for given Lewis structures
 Resonance,
 define & determine whether structures are related by resonance
 place correct curved arrows to derive one resonance structure from another
 if curved arrow(s) are shown on one structure derive the alternative resonance structure
 devise alternative resonance structures for simple cases
 Formulas
 differentiate between dash, condensed, bond-line, and molecular formulas
 derive one from the other, as far as possible
 apply the conventional method to show 3D structures
 recognize constitutional isomers

Reaction Theory

define reactions at the macro and micro level
 know the basic ideas of the collision theory for chem. rxns
 understand the terms associated w/ reaction diagrams
 4 classes of rxn: addn, elimin, substitn, rearr.
 define, recognize and give examples
 2 types of rxns:
 homolytic and heterolytic, define & describe
 know symbols for homo- and heterolytic e^- mvmt
 know & apply rules of e^- mvmt
 show e^- mvmt if reactants & products are given
 Acids/Bases
 B/L concept, define
 "conjugate" acid/base, define and derive
 K_a , pK_a , define & predict acid/base rxns
 Lewis concept, define
 associate Lewis acid w/ the terms electron acceptor, electron sink, low energy empty orbital, electrophile
 associate Lewis base w/ the terms electron donor, electron source, lone pairs, nucleophile

Functional Groups & IR

correlate names & structure of 14 F.G.s
 identify F.G.s in organic structures
 give examples of cmpds w/ specified F.G.s
 use IR correlation charts to identify F.G.s
 physics of IR spectroscopy

Alkanes/ Cycloalkanes

describe relevant molecular features
 name first 10 straight chain hydrocarbons
 recognize simple alkyl and halogen substituents:
 Me, Et, Pr, iPr, Bu, iBu, sBu, tBu, F, Cl, Br, I
 know/ apply concepts of constitutional isomerism and isomeric substituents
 recognize & give examples of primary, secondary, tertiary, quaternary C's, H's and F.G.s
 name alkyl/ halo substituted alkanes/cycloalkanes
 apply concept of cis/trans isomerism to substituted cycloalkanes
 Reactions (know substrate, reagent(s), product(s)):
 combustion, halogenation, cracking