***Chem 22*** **Homework set 1**

End-of-chapter problems from Hornback: **Ch 5**: 25, 27, 28, 31, 32, 35. You can work the following "backward" (i.e. go from the name in the SG to the structure): 24, 30, 33; **Ch 12**: All problems contain a mixture of nomenclature that we're not covering and some that we are.

**1.** Draw the following compounds. Show stereochemistry as appropriate. Pay particular attention to the presence or absence of the prefix *cyclo*-. The ratio of resulting frustration to ease of correction (let's call this the F/C ratio) is very high for this, EH? (that's Canadian for "EH?")

alcohols —
(a) (*R*)-5-methyl-3-hexanol
(b) (*S*)-1,2-pentanediol
(c) *trans*-3-hexen-1-ol
(d) (*S*)-2-cyclobutenol
(e) 2-methyl-4-pentyn-2-ol

ethers —
(f) (*E*)-1-ethoxy-2-bromopropene
(g) *cis*-1-methoxy-3-methylcyclobutane
(h) (*S*)-4-isopropoxy-2-hexyne

amines —
(i) (*R*)-3-heptanamine
(j) N-ethylcyclobutanamine
(k) N,N-dimethyl-3-buten-1-amine

aromatic compounds —
(l) *p*-vinylphenol
(m) *o*-*tert*-butoxyaniline
(n) 3,4-dichlorotoluene
(o) *trans*-4-isopropyl-1-(*p*-methoxyphenyl)cyclohexane

ketones —
(p) 4-methyl-2-pentanone
(q) 1-pentyn-3-one
(r) 1,3-cyclohexanedione
(s) (*Z*)-4-phenyl-3-buten-2-one

aldehydes —
(t) *m*-(bromomethyl)benzaldehyde
(u) (*Z*)-3-heptenal
(v) butanedial
(w) 1-cyclopropenecarbaldehyde

(x) Please check that you didn't make the *cyclo*-/not mistake. Please.

**2.** Organic chemists often use common names instead of Official Systematic IUPAC Names for simple compounds. You should be able to figure these out...

(a) diphenyl ether
(b) tributyl amine
(c) benzyl chloride
(d) isopropyl alcohol
(e) methyl *tert*-butyl ether
(f) methyl ethyl ketone
(g) trimethylammonium chloride

**3.** Here's a little chemistry review...

(a) Phenol has a $pK_a$ of 10. Write the acid-base reaction of phenol and NaOH. Which way does the equilibrium lie? What is $K_{eq}$? What is $\Delta G°$?

(b) Anilinium ion (the conjugate acid of aniline) has a $pK_a$ of about 5. Write the acid-base reaction of aniline and aqueous hydrochloric acid. Which way does the equilibrium lie? What is $K_{eq}$? What is $\Delta G°$?

(c) Draw the two chair conformations of the compound in prob #1, part o. Which is more stable?

(d) Draw all of the stereoisomers of 3-hepten-5-yne-2-ol.

(e) Ozonolysis is a fun and unique reaction that you probably remember from last semester. Draw the alkenes that would produce the following compounds upon treatment with ozone followed by dimethylsulfide.

(i) 2-pentanone and propanal
(ii) 3-ethylhexanedial
(iii) benzaldehyde (only product)

(f) The nitro group of nitrobenzene, Ph–$NO_2$, cannot be properly described by a single Lewis structure. Draw the resonance structures that make up the "first-order" description of nitrobenzene. Then there are several minor resonance contributors that account for the wee bits of positive charge on the Cs ortho and para to the $NO_2$ group. Draw these.

(g) Here's a quick prelude to Monday's discussion section. How many different $^1H$ NMR signals would you expect for the following molecules? (i.e., we don't see a distinct signal for every single H because some of these are equivalent by symmertry. So how many Hs or sets of equivalent Hs are there?)

(i) 1-hexanol
(ii) 1-hexene
(iii) 1,1-dimethylcyclopentane
(iv) 2-ethoxypropane

***Chem 22***
*Spring 2010* *Name* _____
**HW set 1**
*15 points; due Fri, Jan 29 at the beginning of class.*

**1.** Draw.
(a) (*R*)-3-phenoxy-2-cyclopentenol

(b) *m*-propyl-N-cyclopropylaniline

(c) (*S*)-3-ethoxycyclohexanone in its most stable conformation. (It will much easier to draw if you put the carbonyl group at the extreme left or right of the chair.)

(d) (*E*)-4-chloro-4,6-heptadienal

(e) 4-(1-cyclobutenyl)-1-(*p*-nitrophenyl)-3-butyn-2-one