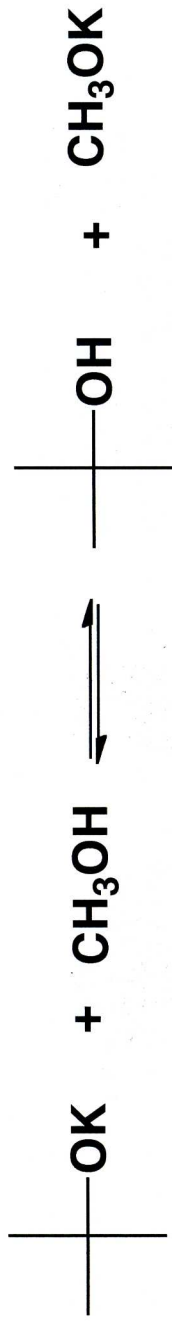


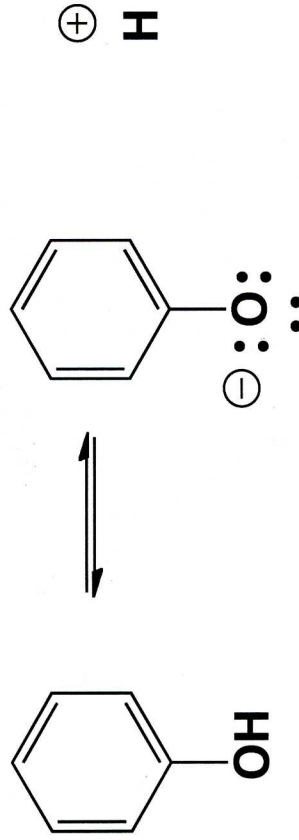
Acidity



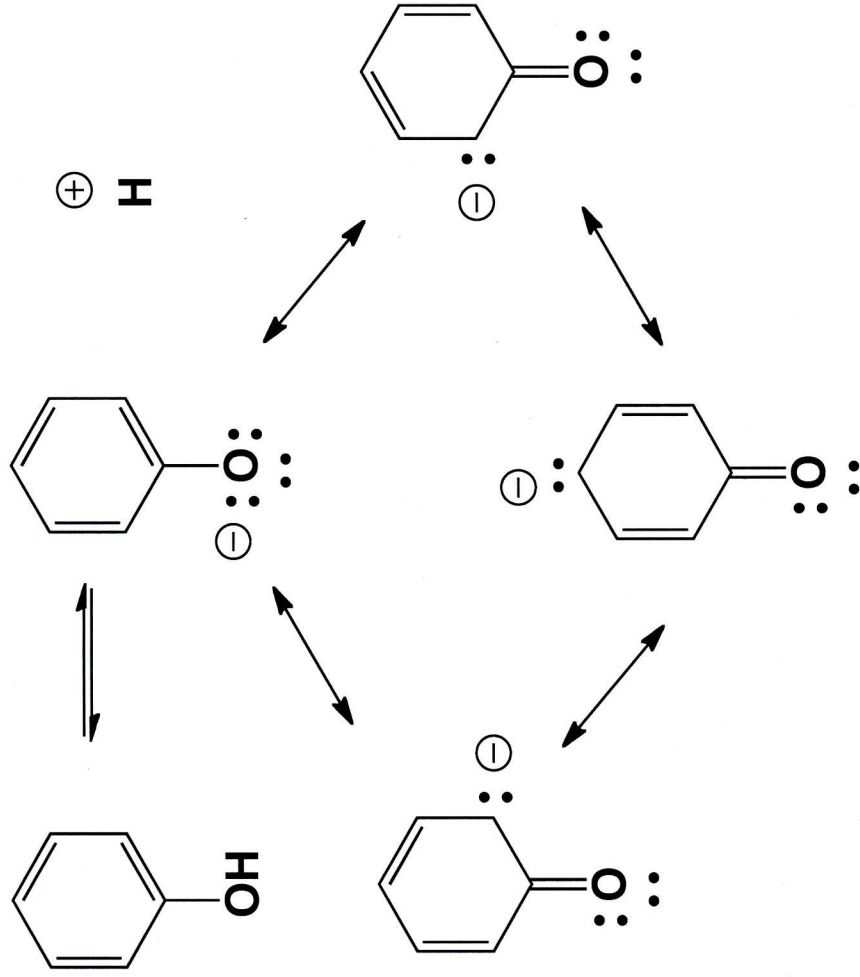
Where does equilibrium lie ? Far to right

Stronger base and stronger acid always react quickly to give weaker acid and weaker base

Phenol has a pK_a value of 10
it is more much acidic (about 6 orders of magnitude) than water (pK_a 15.7)
and methanol (pK_a 16) since it has lower pK_a value)



Acidity

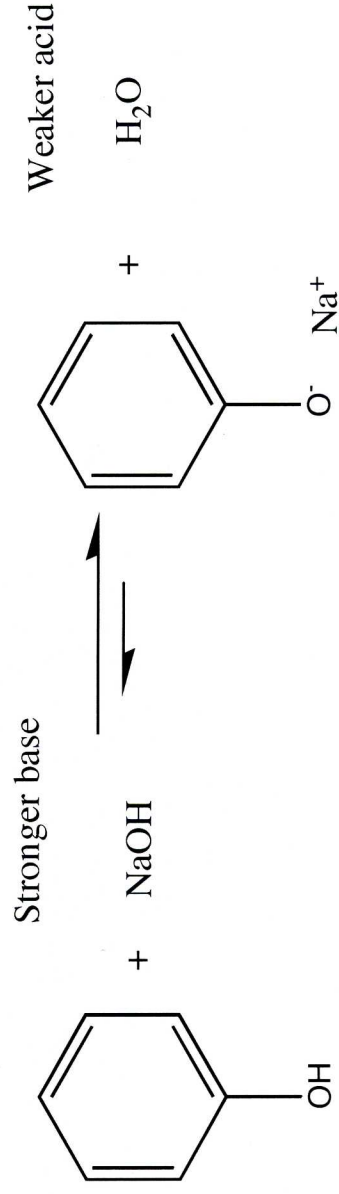


$\oplus \text{H}$

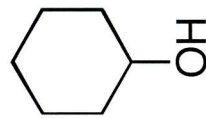
The phenoxide anion is stabilized through resonance
It has 4 resonance forms that delocalize negative charge

Stronger acid

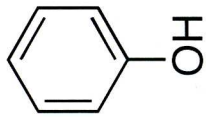
Weaker base



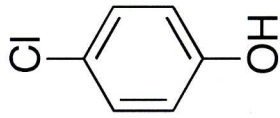
Acidity



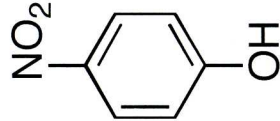
cyclohexanol
 $pK_a = 18$



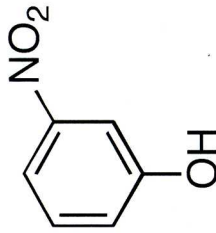
phenol
 $pK_a = 10$



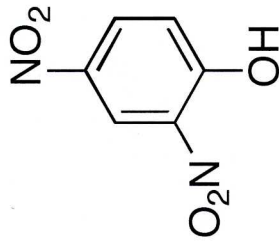
4-chlorophenol
 $pK_a = 9.3$



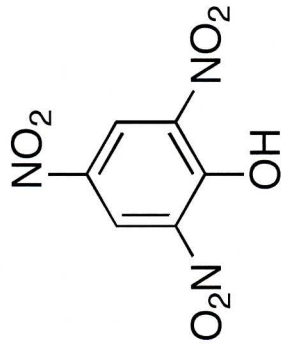
4-nitrophenol
 $pK_a = 7$



3-nitrophenol
 $pK_a = 9.3$



2,4-dinitrophenol
 $pK_a = 4.5$



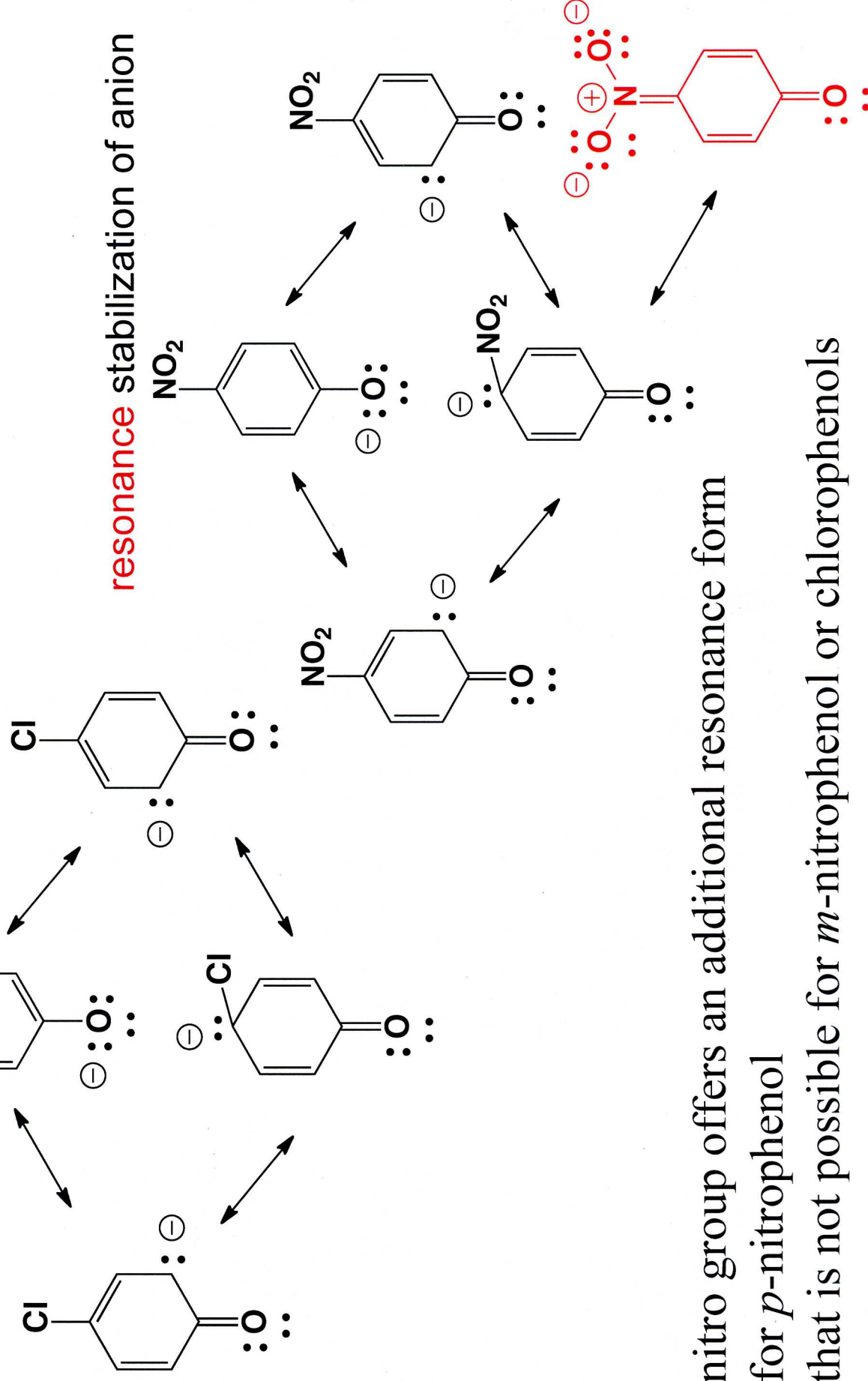
2,4,6-trinitrophenol
picric acid
 $pK_a = 0.5$

pK_a values show phenol is 10^8 more acidic than cyclohexanol

What is the influence of substituents ? inductive & resonance

Acidity

Inductive stabilization of anion



nitro group offers an additional resonance form for *p*-nitrophenol that is not possible for *m*-nitrophenol or chlorophenols

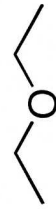
Ethers

$R-O-R'$, where R and R' can be the same or different, but cannot be carbonyl ($C=O$)



Nomenclature:

name the two organic groups and add ether



diethyl ether

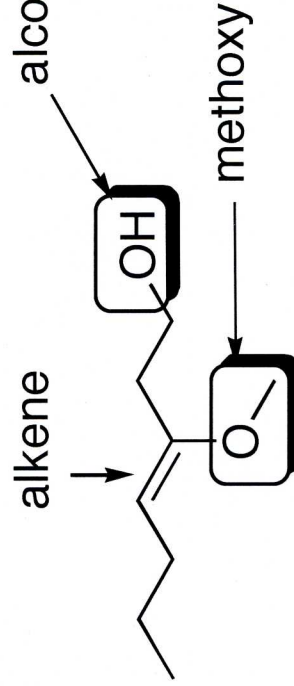


dimethyl ether



ethyl methyl ether

or ether part is considered to be an alkoxy substituent.



(Z)-3-methoxyhept-3-en-1-ol

(Z)-3-methoxy-3-hepten-1-ol

Ethers: Properties

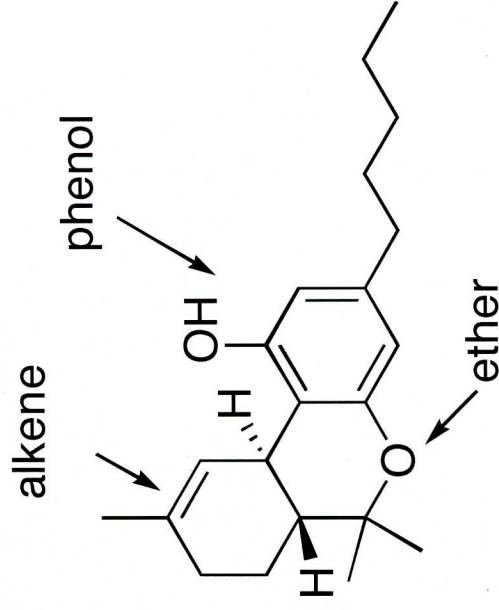
Intermediate polarity - usually have dipoles & can accept Hydrogen bonds

Not miscible with water - very slight solubility

Good solvents for many organic compounds

Less dense than water $\rho < 1.0$ - float on water

Usually chemically unreactive - inert to base - can react with very strong acid



Tetrahydrocannabinol
(THC)

be able to identify different functional groups

be able to identify stereogenic centres

be able to determine molecular formula

be able to determine reactions discussed in class

e.g. reaction with Br_2 or Br_2 and light

Stereochemistry Review

Stereochemistry is refers to the three dimensional arrangement of atoms in space

Stereoisomers are different compounds (different physical properties) that have the same connectivity but a different 3D arrangement of atoms

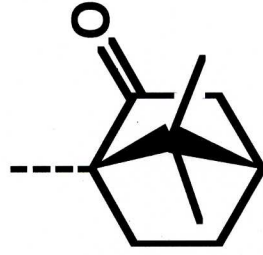
Conformers are different shapes of the same compound

obtained by rotation around single bonds - usually rapid at room temp
15-20 kcal/mole available at room temp

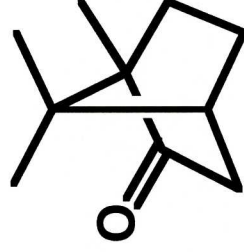
Resonance Forms are different pictures of the same compound

obtained by movement of electrons keeping atom positions same

Molecules are 3 dimensional objects - we depict in 2 dimensions



and



camphor structures - same or different?

different: they are enantiomers

Stereochemistry Review

A **chiral** molecule (or object) is one that has a non-superposable mirror image

achiral molecule has mirror images that are superimposable

if there is a plane of symmetry within molecule is achiral

Stereoisomers that are non-superposable mirror image of each other are **enantiomers**.

All other stereoisomers (which are not mirror images) are called **diastereomers**

Compare:

