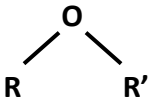
SCH 4U

SINGLE BONDED FUNCTIONAL GROUPS

FUNCTIONAL GROUP	NAME
R – OH attachment of –OH may be classified as primary (1^o), secondary (2^o), or tertiary (3^o)	**Alcohol**
R – X **(where X = F, Cl, Br, I)**	**Alkyl halide** **(haloalkane)**
	**Ether**
$R – NH_2$ primary – 1^o or R – NHR' secondary – 2^o or R – NR'R'' tertiary – 3^o	**Amines**

Molecules with the same functional groups …

- react the same way -- similar chemical properties
- have similar physical properties (bp, mp, solubility)

- determined by intermolecular forces (between molecules)

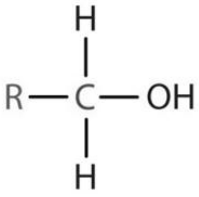
decreasing strength ↓

1. hydrogen bonds – (N – H, O – H, F – H)
2. dipole-dipole interactions (between polar molecules)
3. dispersion forces (between non polar molecules)
   -- increases as size of molecule increases

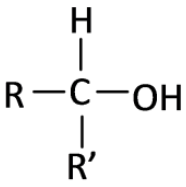
Molecules with both polar and non polar parts…

- longer non polar part, less polar
- greater the polarity, the higher the mp/bp; increased solubility

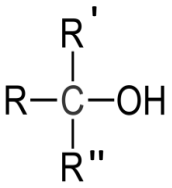
① ALCOHOLS:



1°



2°



3°

IUPAC NAMING:

1. longest carbon chain with – OH.

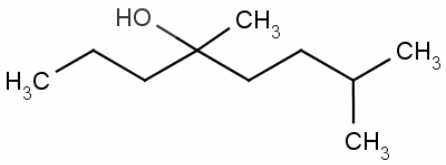
2. change – e ending of alkan**e** with – ol
   EG. methane becomes methanol.
   OR if there are more than 1 hydroxyl group, leave – e ending and name as alkan**ediol**, or alkan**etriol**, etc.

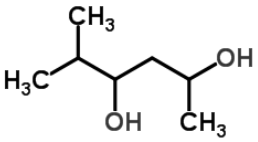
3. add position number (if 2°) in front for C with – OH.

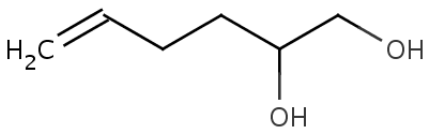
4. name and number substituents as prefixes.

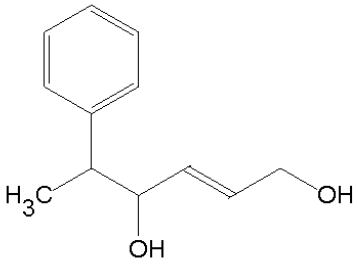
NOTE: Alcohol numbering takes priority over alkene numbering: thus, an alkenol.

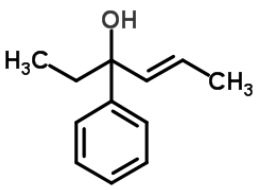
EXAMPLES: Name each compound.

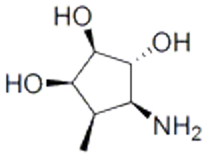
1. 

2. 

3. 

4. 

5. 

6. 

② ETHERS:

- 2 alkyl groups joined by – O –
- **R – O – R'**

IUPAC NAMING:

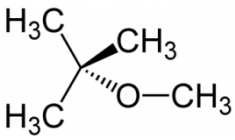
1. longest carbon chain

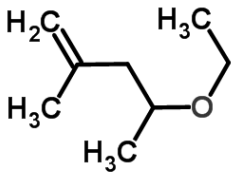
2. name and number substituent alkoxy group(s)

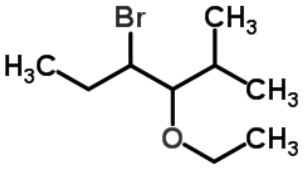
COMMON NAMING:

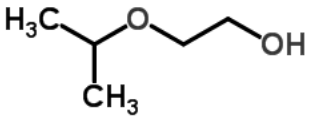
Alkyl groups + ether (all separate) → no numbering

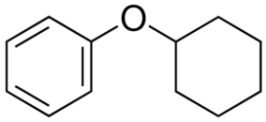
EXAMPLES: Name each compound.

1. 

2. 

3. 

4. 

5. 

PROPERTIES:

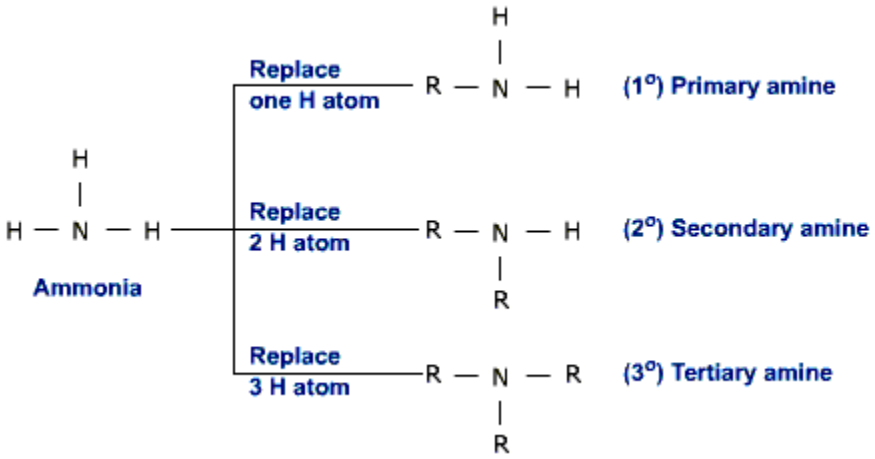
1. Polarity < alcohols, since C – O is a less polar bond than O – H.

2. No hydrogen bonds themselves, but with δ^+_H of H_2O.

3. Solubility decreases as # of C's increases.

4. Mp/Bp of ethers is less than alcohols with same # of C's.

③ AMINES:



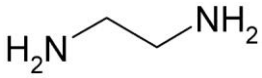
IUPAC NAMING:

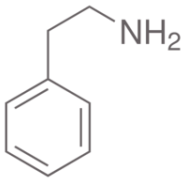
1. longest carbon chain attached to N
   - Change – e to – amine, and include position # of carbon attached to N.

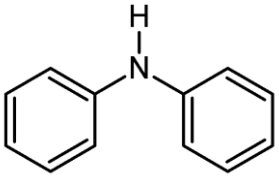
2. other shorter alkyl groups → No position #, but use N – or N,N – di

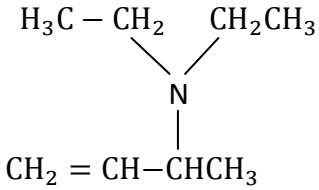
EXAMPLES: Name each compound.

1. 

2. 

3. 

4. 

5. 

PROPERTIES:

1. C – N & N – H are polar bonds, but not as polar as – OH bonds.
   $\overset{\delta^+ \quad \delta^-}{\longrightarrow}$ $\overset{\delta^- \quad \delta^+}{\longleftarrow}$
2. N – H forms H bonds.

3. since polar, if # of C's ≤ 4, dissolves in water. As # C's increases, solubility decreases.

4. Mp/Bp: 1° (primary) and 2° amines are greater than 3° (since it has no N – H bonds)

5. – fishy smell due to decay, decomposition
   – very weak bases