

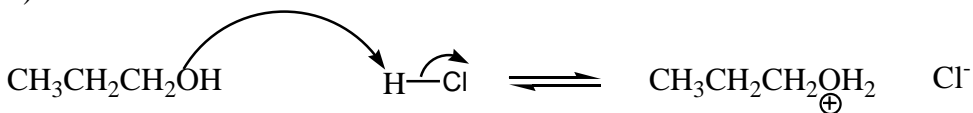


3) Draw in arrows to link the following structures.

a)



b)



4) List the following acids in order of increased acidity; 2-bromoethanoic acid, 2-chloroethanoic acid, 2-fluorethanoic acid, 2-bromoethanoic acid.

Bromoethanoic acid < chloroethanoic acid < fluoroethanoic acid

5) List the following compounds by order of increased acidity, hydrofluoric acid, nitric acid, phenol ( $\text{C}_6\text{H}_5\text{OH}$ ), ethane ( $\text{C}_2\text{H}_4$ ).

Ethane < phenol < hydrofluoric acid < nitric acid

6) Define the following reagents with the terms; Lewis Acid, Lewis Base, nucleophile, electrophile, carbanion, carbocation. Use as many terms as possible to define the reagent eg.  $^-\text{OH}$  = Lewis base, nucleophile (but not carbanion).

a)  $\text{H}_3\text{C}^-$  = Lewis base, nucleophile, carbanion

b)  $\text{H}_3\text{CCOO}^-$  = Lewis base, nucleophile

c)  $(\text{CH}_3\text{CH}_2)_3\text{N}:$  = Lewis base, nucleophile

d)  $\text{CH}_3^+\text{CHCH}_2\text{CH}_3$  = Lewis acid, electrophile, carbocation

e)  $\text{HC}\equiv\text{C}^+$  = Lewis acid, electrophile, carbocation

7) Using double-headed arrows illustrate the electron motion required to generate two resonance structures of the following compound.

