: Acidic Strength :

: Oxyacid :

i) $HClO_4 > HIO_3 > HClO_2 > HOCl$

ii) $HClO_4 > H_2SO_4 > HNO_3 > HNO_2$

iii) $H_2SO_4 > H_2SO_3$ [more is the +ve oxidation state of central atom stronger is the acid].

iv) $HNO_3 > HNO_2$

v) $H_3PO_2 \quad H_3PO_3 \quad H_3PO_4$

Hydra acid :

i) $HI > HBr > HCl > HF$ [(i), (ii), (iii) size factor dominating].

ii) $H_2Te > H_2Se > H_2S > H_2O$

iii) $RSH > ROH$.

iv) $HCl > H_2S$

v) $HF > H_2O > NH_3 > CH_4$ [iv & v) en dominating]

Organic acid :

i) $HC\equiv C-CO_2H > CH_2=CH-CO_2H > CH_3CH_2-CO_2H$. (−I)

ii) o-nitrophenol > Phenol > o-cresol. (−I / +I)

iii) o-bromophenol > m-bromophenol > p-bromophenol. (−I)

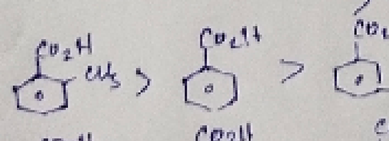
iv) oxalic acid > Malonic acid > Succinic acid (−I)

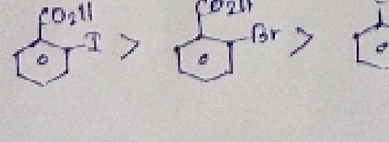
v) Propanoic acid < 3-bromo propanoic acid < 2-nitropropanoic acid (−I)

vi) $CH_3-CO_2H > CH_2Cl-CO_2H > \underset{F}{CH_2}-CO_2H > \underset{Cl}{CH_2}-CO_2H$. (−I)

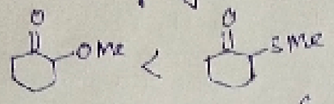
vii) p-nitrophenol > o-nitrophenol > m-nitrophenol (H-bonding)

viii) o-nitrobenzoic acid > p-nitrobenzoic acid > m-nitrobenzoic acid

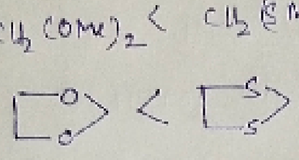
ix)  (viii) & (ix) [ortho effect]

x)  [ortho effect]

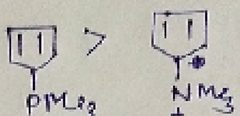
Acidic strength due to d-orbital resonance for conjugate base.

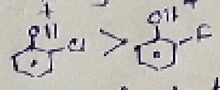
a) 

b) $CH_2(COMe)_2 < CH_2(SMe)_2$

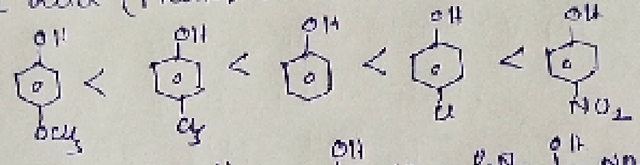
c) 

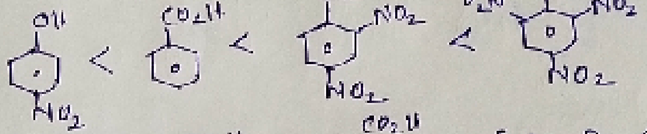
d) $CHCl_3 > CHF_3$

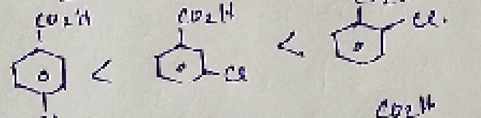
e) 

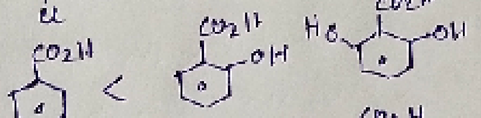
f) 

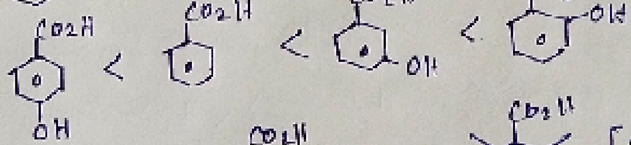
Organic acid (Phenol & benzoic acid derivative)

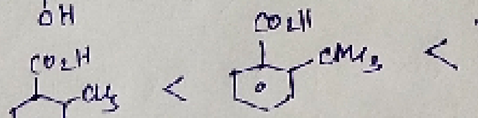
a) 

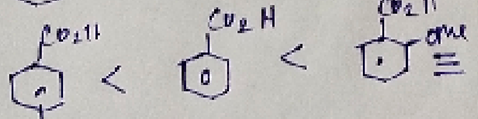
b) 

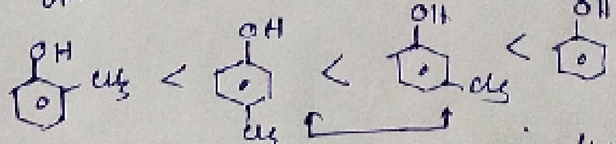
c) 
[for Br, same order observed].

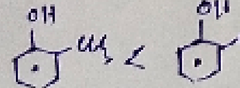
d) 
[C.B stability with H-bonding].

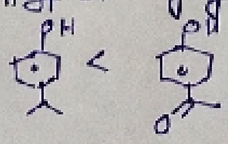
e) 

f) 
[ortho effect].

g) 
(Experimental values)

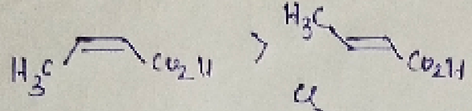
h) 
Hyperconjugation effect.

i) 

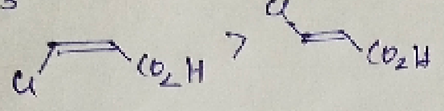
j) 

Some aliphatic compound / alicyclic compound.

i) $H-C\equiv CH > CH_2=CH_2 > CH_3-CH_3$ 3

ii)  [cis isomer > Trans isomer]

(Acidic strength)

iii) 

iv) $H_3\overset{+}{N}-CH_2-CH_2OH > H_2N-CH_2CH_2-OH > H_2N-CH_2CH_2CH_2-OH$.

v) $F_3C-CO_2H > Cl_3C-CO_2H > F_3C-OH > Cl_3C-OH$
$> CHCl_3 > CHF_3 > CH_4 > Me_3C-H$.

vi) (Carboxylic acid) $RCO_2H >$ (Carbonic) acid H_2CO_3
$>$ Carbolic acid 

vii) $H-\underset{O}{\overset{||}{C}}-CH_2-\underset{O}{\overset{||}{C}}-H > H_3C-\underset{O}{\overset{||}{C}}-CH_2-\underset{O}{\overset{||}{C}}-CH_3 > H_3CO-\underset{O}{\overset{||}{C}}-CH_2-\underset{O}{\overset{||}{C}}-OCH_3$

viii) $CH_3OH > H_2O > RCH_2OH > R_2CHOH > R_3C-OH$

Among all alcohols only CH_3OH is slightly more acidic than H_2O.

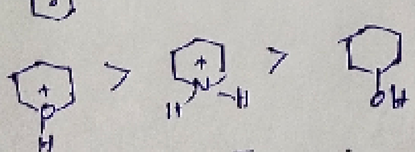
ix) $C_6H_5OH > C_6H_{11}OH > (C_6H_5)_3C-H$.

x) Cyclopentane carboxylic acid > cyclopentanedione
> cyclopentanone > cyclopentene.

xi) $F_3C-SO_3H > F_3C-CO_2H > CH_3CO_2H > RSH \not\gg$  $> ROH$

xii)  $> RSH > ROH$

xiii)  $>$ 

xiv) 

xv) $H_3O^+ > H_2O > \bar{O}H$ xvi) $\overset{+}{N}H_4 > NH_3 > \bar{N}H_2$

xvii) $HCO_2H >$  $> CH_3CO_2H$

Overall acidic strength : [Inorganic & organic compounds]

Acidic strength ↑
Ka ↑ pKa ↓

$HF+SbF_5$ or $(HF+SbF_5+SO_3)$ > $HClO_4$ > HI > H_2SO_4 > HBr
(super acid)
> HCl > RSO_3H > $CH(CN)_3$ > HNO_3 > HF > HNO_2
> RCO_2H > H_2CO_3 > H_2S > HCN > NH_4^+ >  > RSH > CH_3OH > H_2O >  > RCH_2OH > R_2CHOH
> R_3C-OH > $HC\equiv CH$ > Ph_3CH > Ph_2CH_2
> $H_2 \simeq NH_3$ > $PhCH_3$ > PhH > $CH_2=CH_2$
> CH_4 > CH_3-CH_3 > $(CH_3)_3CH$.

Points to be noted :

⇒ Super acid is strongest acid reported.

⇒ Me_3C-H is weakest acid reported.

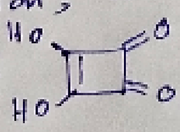
⇒ F_3C-SO_3H (Triflic acid) is strongest organic acid reported.

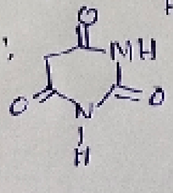
⇒ weak base/acid ≡ stable & strg base/acid ≡ unstable
S.A + S.B ⇌ W.A + W.B equilibrium is shifted to forward direction

⇒ 1° Alcohol > 2° Alcohol > 3° Alcohol (Acidic strength / Ka)

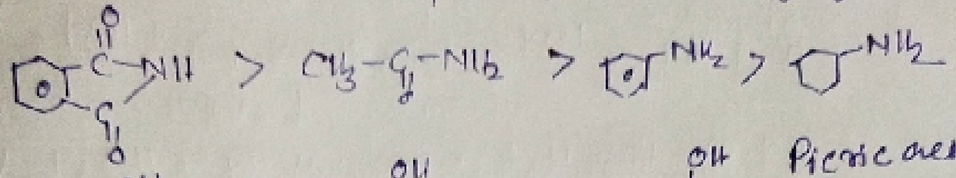
⇒ C.B is aromatic anion; strg acid e.g. 

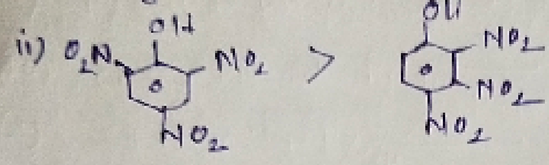
⇒ C.B is anti-aromatic anion; weak acid 

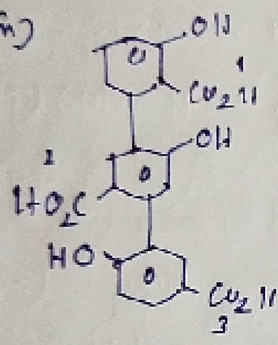
⇒ Squaric acid ; strg acid 

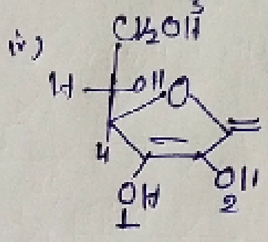
⇒ Barbituric acid ;  strong acid.

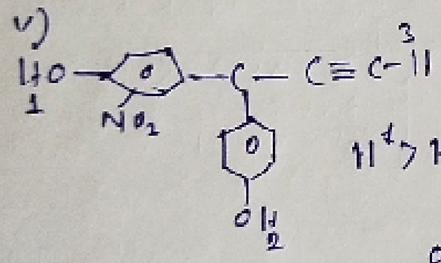
: Miscellaneous Examples: (Acidic strength)

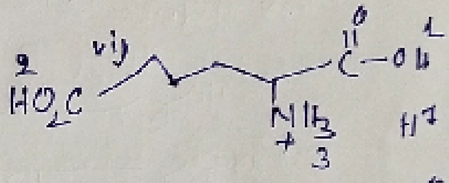
i) 

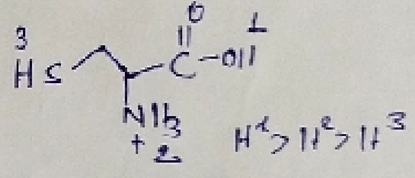
ii) 
Picric acid (Strong acid)

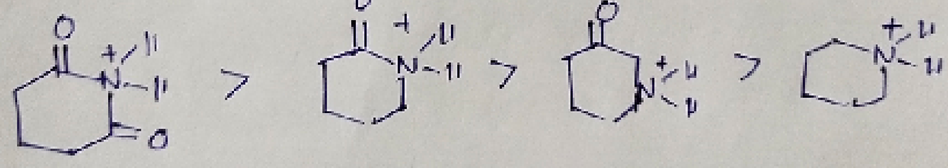
iii) 
$H^1 > H^2 > H^3$

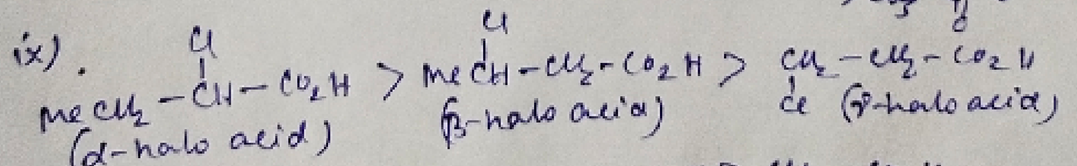
iv) 
Ascorbic acid (Strong acid)
$H^4 > H^2 > H^3$

v) 
$H^1 > H^2 > H^3$

vi) 
$H^1 > H^2 > H^3$

vii) 
$H^1 > H^2 > H^3$

viii) 

ix) 

x)