
OC SHEET SOLUTION

# ACID AND BASE



Team
OC
Allen
Kota

# Acidic & Basic STRENGTH

## Exercise - I

**Ans → 1**

(i) a > b > c > d due to inductive effect.

Because Acidic strength $\alpha$ -I $\alpha \frac{1}{+I}$

-I ⇒ $-NO_2 > -F > -Ph$

+I ⇒ $-CH_3$

ii) a > b > c due to -I effect.

Acidic strength $\alpha$ -I

and -I effect (↓) when distance (↑).

iii) c > b > a due to -I effect

more -Cl atom's

more -I effect.

iv) a > b > c due to +I effect

more $-CH_3$ groups

more +I effect and

Acidic strength $\alpha \frac{1}{+I}$

v) $c > b > a$ due to $-I$ effect

$-I$ effect $\Rightarrow$ $sp(c) > sp^2(c) > sp^3(c)$

$-C\equiv C > -C=C > -C-C$

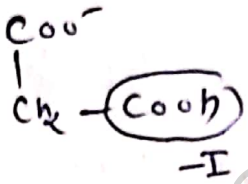
vi) $a > b > c$ Due to $-I$ effect

$-COOH$ shows $-I$ effect

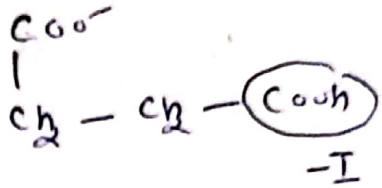
distance (↑) $-I$ effect (↓).

Conjugate base :-


(P)




(Q)




(R)

Stability of Conjugate base $P > Q > R$

So

Acidic strength $\Rightarrow$ $a > b > c$

vii) $d > c > b > a$ Due to

Bond – dissociation energy.

weaker the bond, greater Acidic strength.

viii) $d > c > b > a$ on the basis of

E.N.

[Electronegativity]

ix] $d > b > a > c$

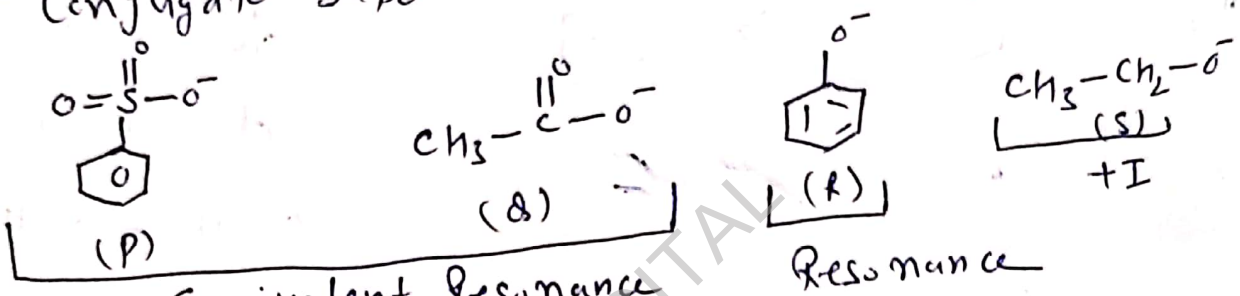
Between a, b & c by -I effect

and in [d] Acidic strength of

$-\overset{\oplus}{N}H_3 > -OH$

[x] $d > a > c > b$

Conjugate base.




stability of Conjugate base : $P > Q > R > S$

So Acidic strength : $d > a > c > b$



Ans → 2 (a) $Br-CH_2-\overset{\overset{O}{\|}}{N}\rightarrow O$ > $CH_3-CH_3$

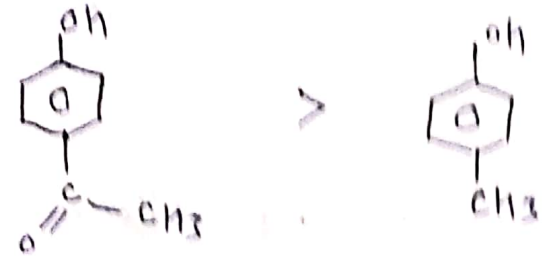
Conjugate base : $Br-\overset{\ominus}{C}H-\overset{\overset{O}{\|}}{N}\rightarrow O$ (Stable by Resonance) ; $CH_3-\overset{\ominus}{C}H_2$ (unstable by +I)

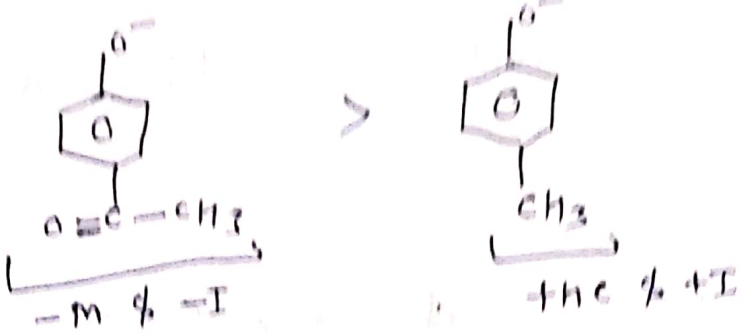
[b] $CH_3-\overset{\overset{O}{\|}}{C}-CH_3$ < $CH_3-\overset{\overset{O}{\|}}{C}-CH_2-CN$

Conjugate base stability

$CH_3-\overset{\overset{O}{\|}}{C}-\overset{\ominus}{C}H_2$ < $CH_3-\overset{\overset{O}{\|}}{C}-\overset{\ominus}{C}H-C\equiv N$

-M & -I

[c]  >

Conjugate base :- Stability 

-M & -I

+HC & +I

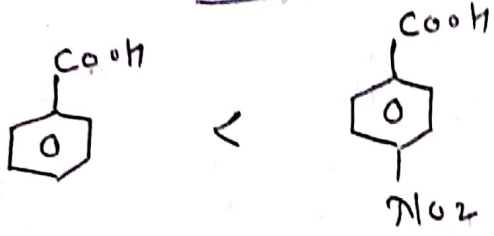
[d] 

due to bond-dissociation energy.

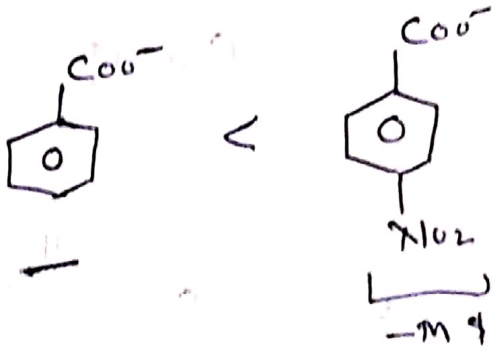
O-H > S-H

Ans :- 3

Acidic strength ∝ Stability of Conjugate base.

(a) 

Acidic strength

Stability of Conjugate base :- 

-M & -I

Ans - 3 (b) $CH_3-CH_2-CH_2-OH < CH_3-CH=CH-OH$

Acidic Strength

Stability of Conjugate base!

$CH_3-CH_2-CH_2-O^-$ (+I) $<$ $CH_3-CH=CH-O^-$ (Resonance)

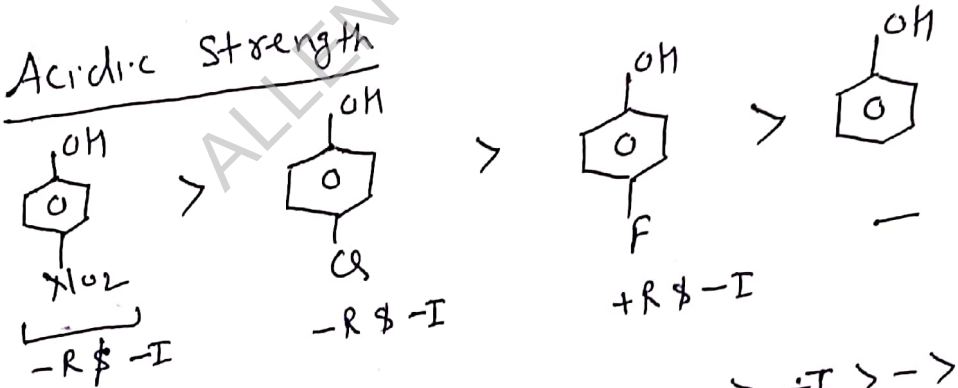
[C] $CH_3-CH=CH-CH_2-OH < CH_3-CH=CH-OH$

Acidic strength

Stability of Conjugate base!

$CH_3-CH=CH-CH_2-O^- < CH_3-CH=CH-O^-$ (Resonance)

Ans:- 4 Acidic Strength

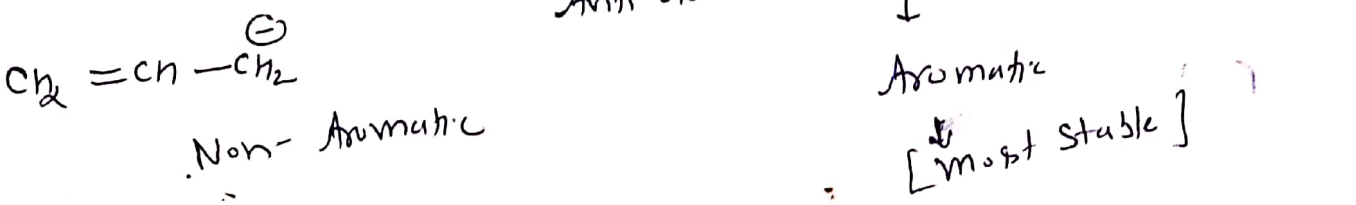



Acidic strength order? $\Rightarrow$ $-R > -M.C > -I > -> +I > +hc > +R$

Ans → C

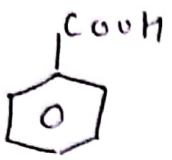
Ans:-5 [B] due to Stability of Conjugate base

Conjugate base!

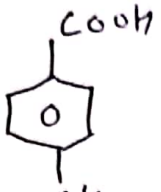


Ans→6 Acidic strength of benzoic Acid

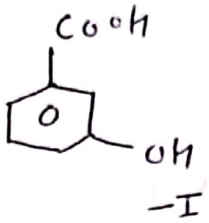
ortho effect > −R > −H.C. > −I > − > +I > +H.C. > +R



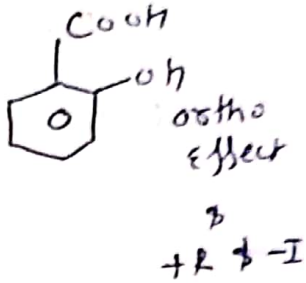

−




+R & −I




−I



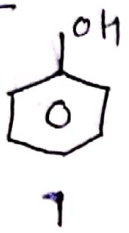

ortho effect

&

+R & −I

So Answer → B

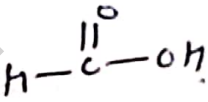
Ans→7 Acidic strength (↑) then pH value (↓)




1

$CH_3-CH_2-OH$

2



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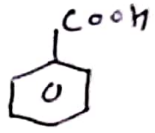
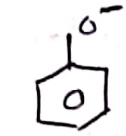



4

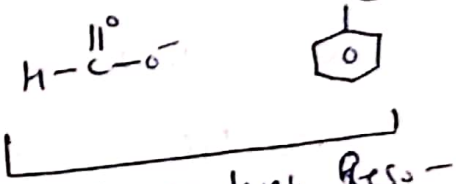
Conjugate base :



Resonance

$CH_3-CH_2-O^-$

+I



Equivalent Resonance

So Acidic strength :- 3 > 4 > 1 > 2

So pH ⇒ 2 > 1 > 4 > 3

Ans→B

Ans→B

Ans→A due to −I Effect

$-I \Rightarrow -\overset{\oplus}{N}R_3 > -NH-R$

in (I) & (II) distance of $-NH-CH_3$ (↑)

Effect of −I (↓).

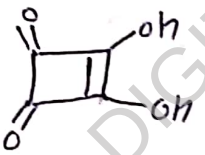
Ans → 9

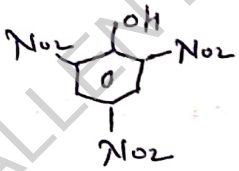
Compounds having more Acidic strength than $H_2CO_3$, give $CO_2$ gas when react with $NaHCO_3$.

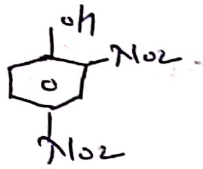
Acidic strength :-

All Carboxylic acid

All Sulphonic acid

Squaric acid 

Picric acid 

2, 4- Dinitro Phenol 

E. T. C.

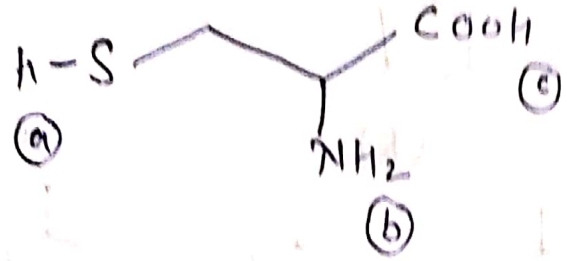
$>$ $H_2CO_3$ Carbonic Acid

So that All given Compounds reacts with $NaHCO_3$ giving $CO_2$.

So, Ans → A

Q-10

(i) Acidic strength [↑] than pKa value [↓]

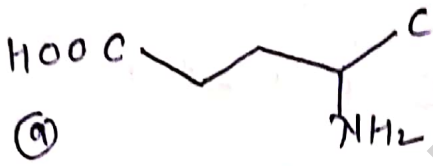



Acidic strength c > a > b

So pKa value b > a > c

b → 10.8
a → 8.3
c → 1.8

(ii)




for between (a) & (b)

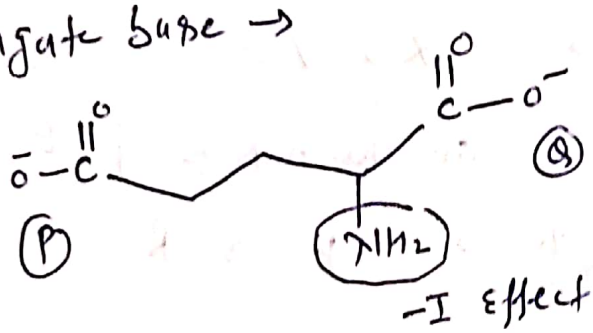
Acidic strength of $-\overset{O}{\overset{\|}{C}}-OH > -NH_2$

because Conjugate base of $-\overset{O}{\overset{\|}{C}}-OH$ stabilised by Resonance.

So Acidic strength

a, b > c

Conjugate base →




-I effect

So Stability of a > P

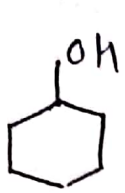
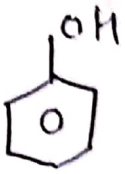
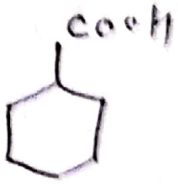
So Acidic strength of b > a

So final order of Acidic strength b > a > c

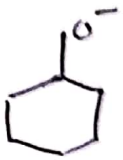
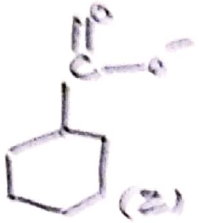
pKa value → c > a > b

c → 9.67
a → 4.25
b → 2.19

[Q.11] Acidic Strength [↑] pKa value [↓]

a)   

(P) (Q) (R)

Conjugate base ⇒   

(X) (Y) Resonance (Z) Equivalent Resonance

So Stability order $Z > Y > X$

So Acidic strength $R > Q > P$

So pKa value ⇒ $P > Q > R$

[b] $C-C-C\equiv C-H$ (P), $C-C-C=C-H$ (Q), $C-C-C-C-H$ (R)

Conjugate base ⇒ $C-C-C\equiv C^{\ominus}$ (X), $C-C-C=C^{\ominus}$ (Y), $C-C-C-C^{\ominus}$ (Z)

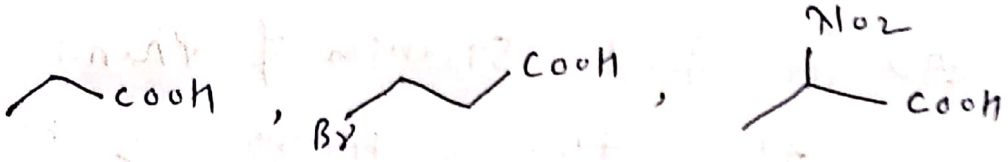
Stability order ⇒ $X > Y > Z$

on the basis of E.N.

So Acidic strength ⇒ $P > Q > R$

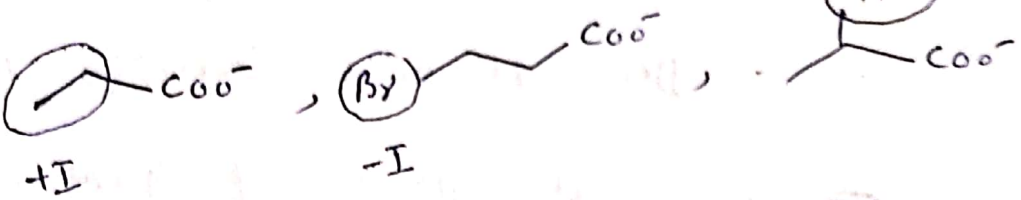
pKa value ⇒ $\underline{R > Q > P}$

Q.11 (c)



(P) (Q) (R)

Conjugate base ⇒



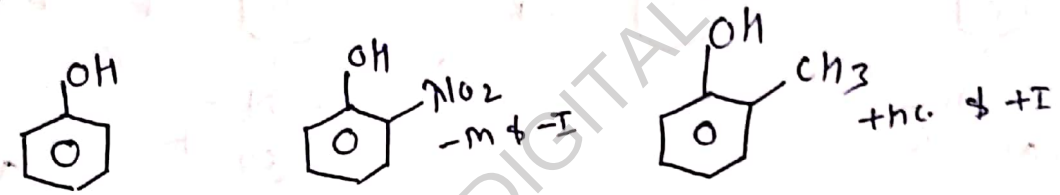
(X) (Y) (Z)

Stability order ⇒ Z > Y > X

Acidic strength ⇒ R > Q > P

So pKa value ⇒ P > Q > R

(d)

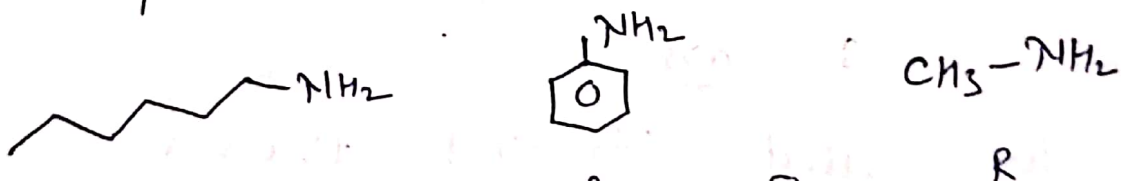


(P) (Q) (R)

Acidic strength :- Q > P > R

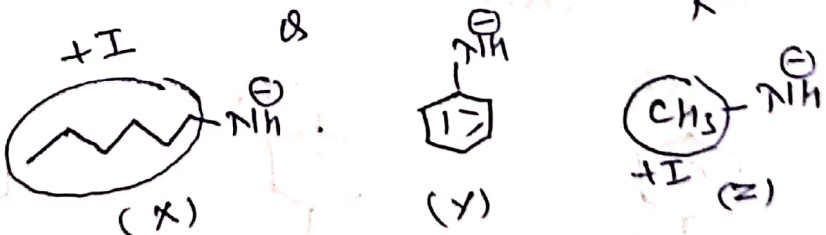
So pKa value ⇒ R > P > Q

(e)



P Q R

Conjugate base ⇒



(X) (Y) [Resonance] (Z)

Stability :- Y > Z > X

So Acidic Strength :- Q > R > P

So pKa value ⇒ P > R > Q

Q.12 ~~(OR)~~ for Acidic Strength of Phenol

$+R$ / $-R$ > $+H.C$ / $-H.C$ > Hydrogen bonding > $+I$ / $-I$

⇒ $-$ effect (↑) Acidic Strength while $+$ effect (↓).

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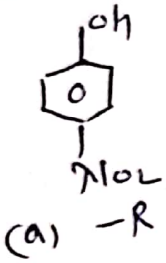
⇒ for Acidic Strength of Benzoic Acid

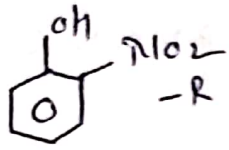
ortho effect > $-R$ > $-H.C$ > $-I$ > $-$ > $+\dot{I}$ > $+H.C$ > $+R$

ortho effect → Steric effect, H.B.

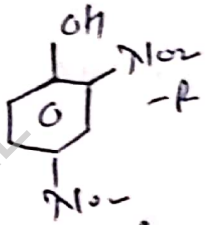
(i)



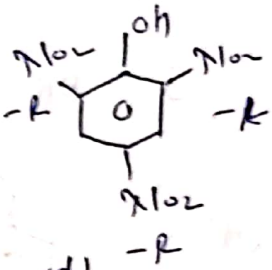
(a) $-R$



(b) $-R$



(c) $-R$



(d) $-R$

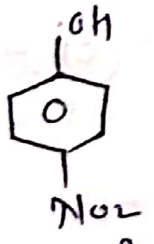
So Acidic Strength :- d > c > a, b

in (a) & (b) $-R$ effect Common So next effect decide Acidic Strength So Hydrogen bonding decide Acidic Strength.

So a > b

So final Acidic Strength :- d > c > a > b

(ii)



(a) $-R, -I$

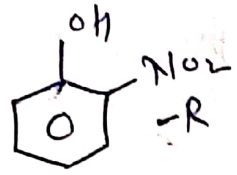
(b) $-R, -I$

(c) $+H.C, +I$

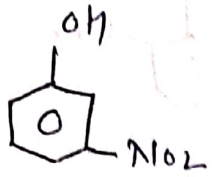
So Acidic Strength :- a > b > c

Q. 12

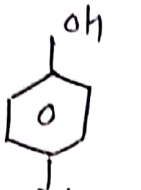
(iii)



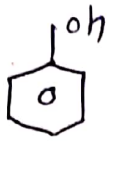

(a)




(b)




(c)



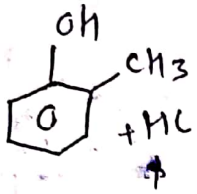

(d)

Acidic strength :- a, c > b > d

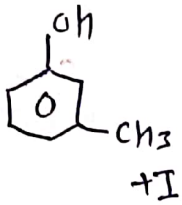
for a & c next effect Hydrogen bonding decide Acidic strength.

So Acidic strength :- c > a > b > d

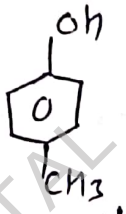
(iv)



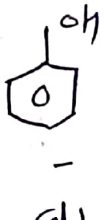

(a)




(b)




(c)




(d)

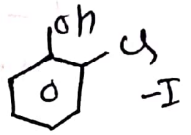
So Acidic Strength :- d > b > a, c

for a & c next effect decide Acidic strength. we know that +H.C. doesn't depend on distance but inductive effects depends on distance. So next effect +I decide.

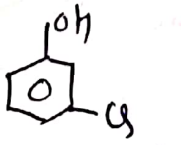
So c > a.

So final Acidic Strength order ⇒ d > b > c > a

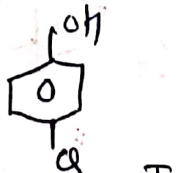
(v) # In the Case of Halogen, only -I effect decide Acidic strength.




(a)



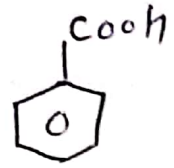

(b)



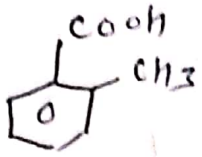

(c)

Acidic Str. →

a > b > c

(vi) 

(a)

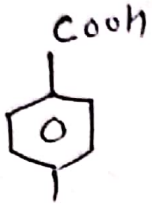


(b) ortho effect

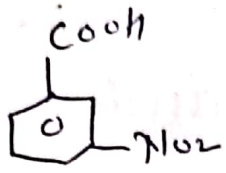
effect → –

ortho effect

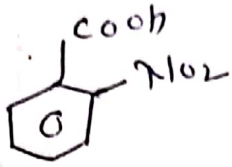
Acidic strength :- b > a

(vii) 

(a) –R



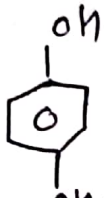
(b) –I



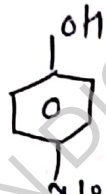
ortho effect

(c)

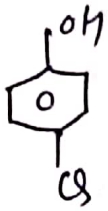
Acidic strength :- c > a > b

Q. 13 (i) 

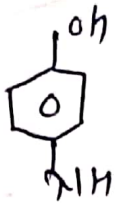
(a) CH3 +I +H.C



(b) –R –I

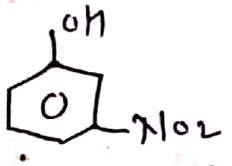


(c) –R –I

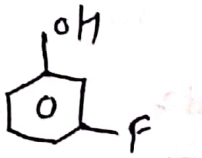


(d) +R –I

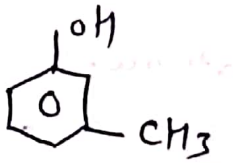
So Strongest Acid is [b]

(ii) 

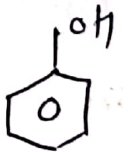
(a) –I



(b) –I

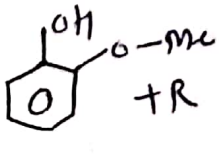


(c) +I

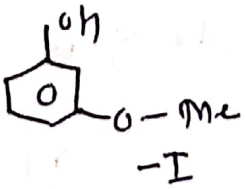


(d)

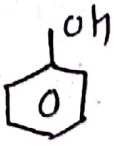
So strongest Acid is ⇒ [a]

(iii) 

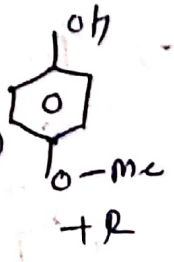
(a) +R



(b) –I



(c) –

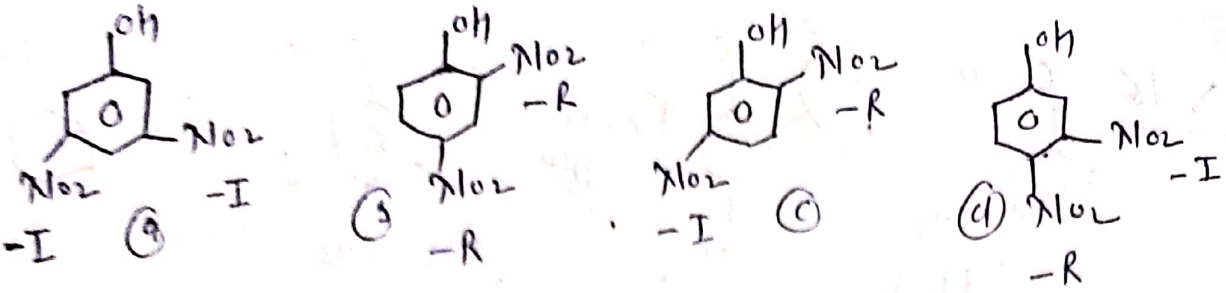


(d) +R

So Strongest Acid ⇒ (b)

**Q.13**

(iv)




So Strongest Acid → (b)

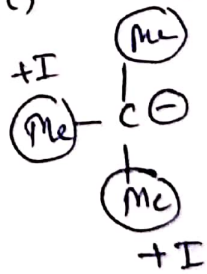
**Q.14** According to Bronsted - Lowry Concept Strong Acid, transfers it's $H^+$ to water Solvent.

in options a, b & c Acid transfer it's $H^+$ from breaking of Covalent bond. while in option (c) H-f + SbF5 present in ionic form $H^+SbF_6^-$ which is Easily transfer $H^+$ when dissolved in $H_2O$ Solvent. So Strongest Acid is [C].

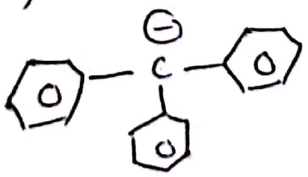
**Q.15**

$CH \equiv CH$ (a) $\quad CH_2 = CH_2$ (b) $\quad Me_3C-H$ (c) $\quad Ph_3C-H$ (d)

Conjugate base:- $CH \equiv C^{\ominus}$ (P) $\quad CH_2 = CH^{\ominus}$ (Q)




(R)

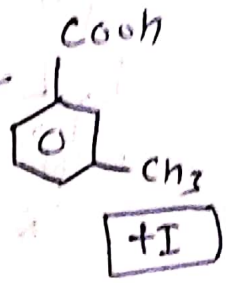


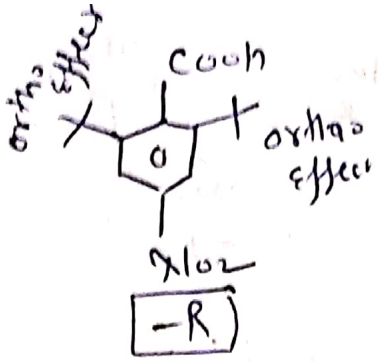
(S)

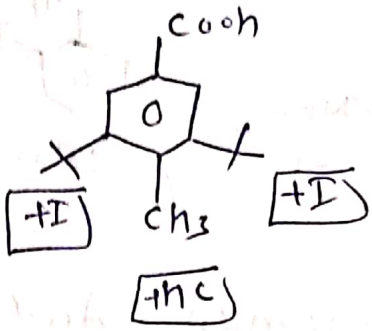
least Stable Conjugate base is (R) So

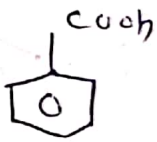
(c) is weakest Acid.

Q.16



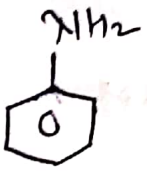



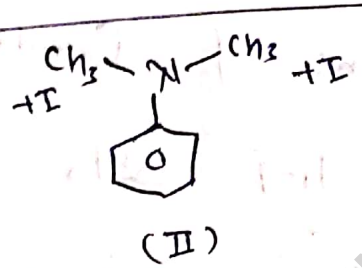



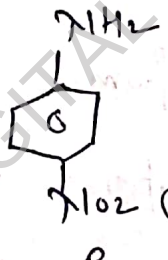

So [B] is most Acidic.

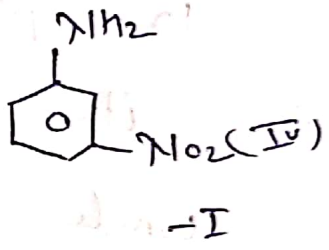
Q.17 Basic strength of Aniline in general ** follow following order? ⇒

+R > +H.C. > +I > - > -I > -H.C. > -R > ortho effect




So Basic strength :- II > I > IV > III

Ans → C

Q.18 [redacted].

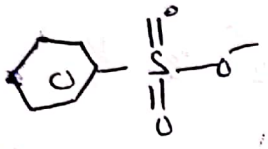
Same as question number 16.

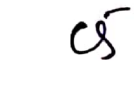
Q.19 Conjugate base of Acid which is more stable than Conjugate base of $H_2O \rightarrow [OH^-]$ is more Acidic than water.

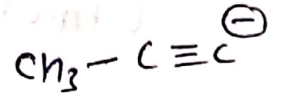
Conjugate base of $H_2O$

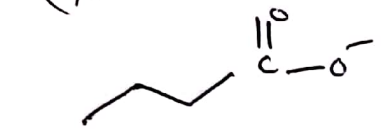
Conjugate base of $H_2O \Rightarrow \bar{O}H$

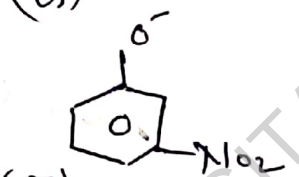
and Conjugate base of given Acids are $\Rightarrow$

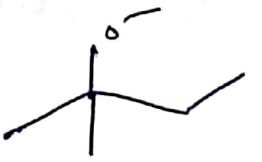
(P) 

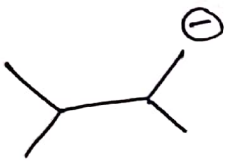
(Q) 

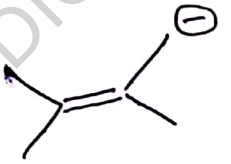
(R) 

(S) 

(T) 

(U) 

(V) 

(W) 

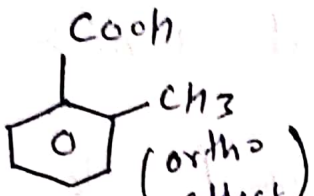
(X) $\bar{O}H$

P, Q, S, T are more stable than $OH^-$ while R, U, V, W are less stable than $OH^-$ So

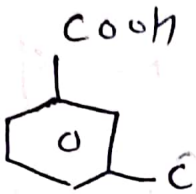
a, b, d, e are more Acidic than water.

**So. Ans $\Rightarrow$ 4**

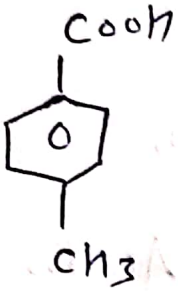
Q.2.

(1) 

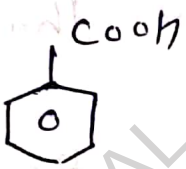
(ortho effect)

(2) 

(+I)

(3) 

(+h.c)

(4) 


So, Acidic Strength :- 1 > 4 > 2 > 3

Ans → C

# Acidic & Basic Strength Sheet

Ex # O-II (Q 1-17) solution

(Akash Gupta IIT OC dipta)

Qus 1

(i) $a > b > c > d$

On the basis of Electronegativity (E.N.).

(along the period) $CH_3^{\ominus} > NH_2^{\ominus} > OH^{\ominus} > F^{\ominus}$

$\therefore$ less will be the E.N. more will be the donating capacity to 1s orbital of $H^+$.

(ii) $a > b > c > d$

on the basis of size (along the group)

$F^{\ominus} > Cl^{\ominus} > Br^{\ominus} > I^{\ominus}$

$\longleftarrow$

small size, more $e^{\ominus}$ density, Basic strength ↑

(iii) $c > b > d > a$

$Me_2NH > MeNH_2 > Me_3N > NH_3$

$\therefore$ on the basis of Inductive and Solvation Effect as Medium is Aqueous ($H_2O$).

(iv) $d > c > b > a$

$\therefore$ On the basis of only Inductive Effect as (Gas phase)

(V) $a > b > c$

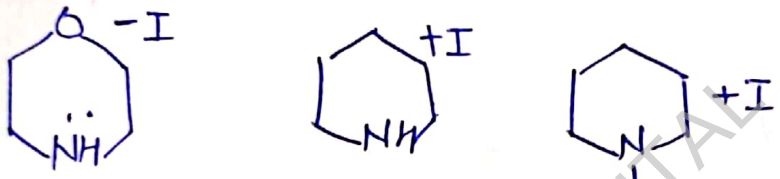
$R-\ddot{N}H_2$ localised

$Ph-\ddot{N}H_2$ delocalised

$R-\underset{\underset{O}{\|}}{C}-\ddot{N}H_2$ delocalised with more E.N. atom oxygen

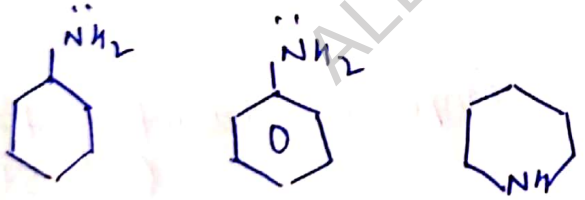
Basic strength $\propto \frac{1}{\text{delocalisation}}$

(VI) $c > b > a$




B.S. $\propto +I \propto \frac{1}{-I}$ on the basis of Inductive Effect.

(Vii)



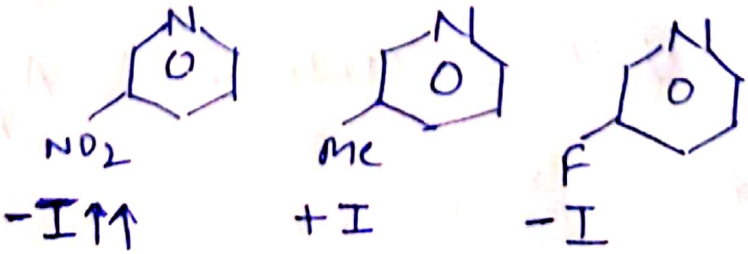

localised +I

delocalised

localised +I ↑↑

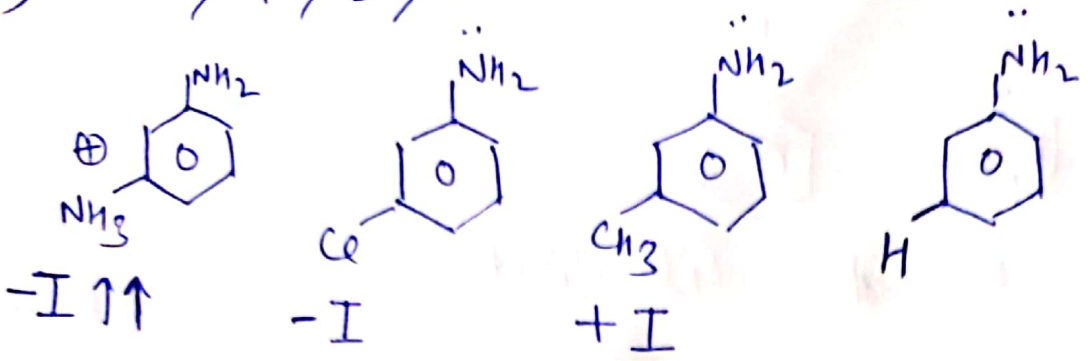
$c > a > b$

(viii) $b > c > a$




B.S. $\propto +I \propto \frac{1}{-I}$ $[-I \Rightarrow -NO_2 > -F]$

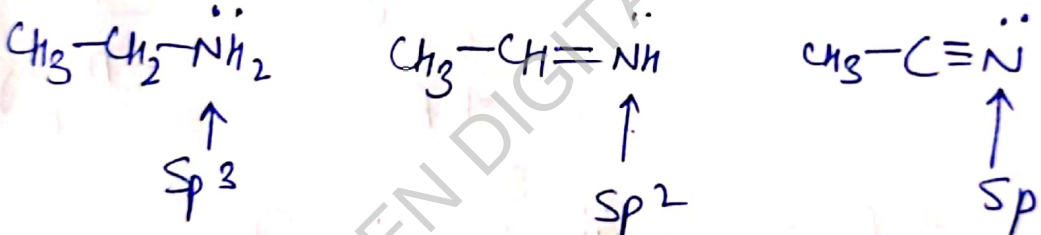
(ix) c > d > b > a




∴ on the basis of inductive effect, as groups are attached at meta position.

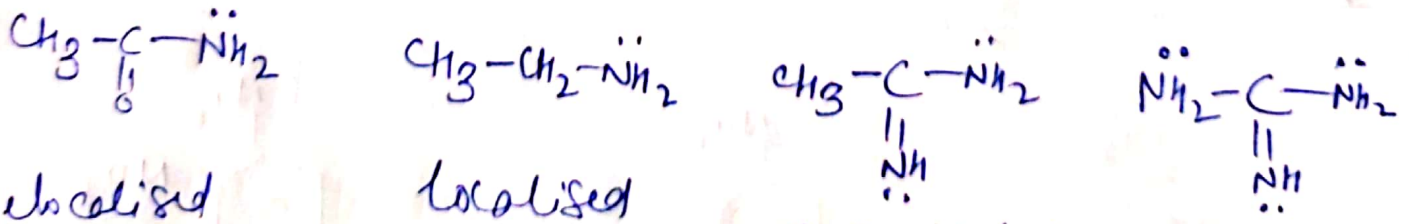
---

Ques 2 (i) a > b > c




∴ more %S character, more E.N. thus less basic strength.

(ii)




delocalised with oxygen

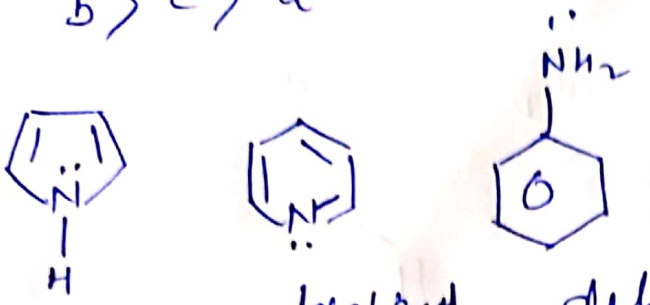
localised

2 Equivalent R.S. of it's conjugate Acid

3 Equivalent R.S. of it's conjugate Acid (Guanidine)

d > c > b > a

(iii) b > c > a



more delocalised due to Aromaticity

localised

delocalised

(IV) d > c > b > a

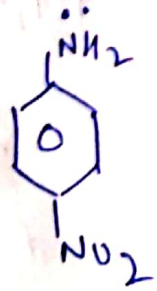
[Basic strength $\propto$ +M group $\propto \frac{1}{-M \text{ group} / -R}$

$+R$ $-O_2$

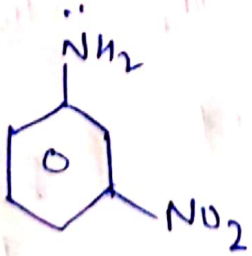
$\{ +M \Rightarrow -\ddot{N}H_2 > -\ddot{O}Me \}$

$\{ -M \Rightarrow -NO_2 > -C\equiv N \}$

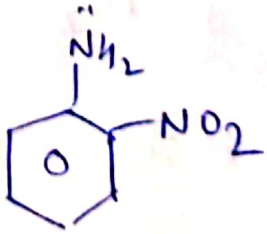
(V) b > a > c



$-M$ group



$-I$

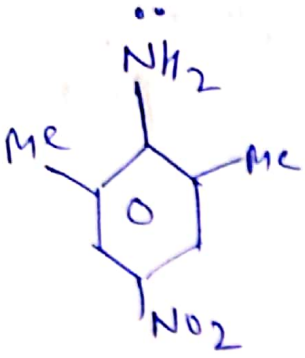


$-M$

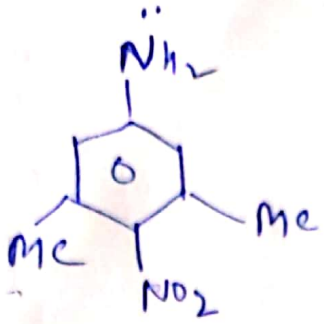
SIP (Steric Inhibition of protonation)

$\therefore$ Due to SIP "C" is least basic

(vi) b > a



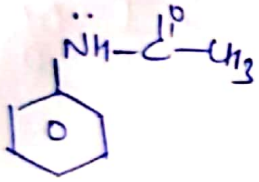
−M of $NO_2$ group and SIP so less basic



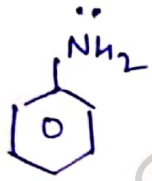
(Steric Inhibition of Resonance)

Due to SIR $NO_2$ group is out of plan, so no −M Effect, Basic Strength increasis.

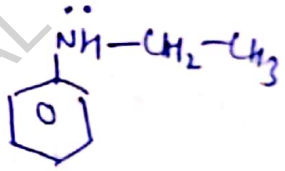
(vii)



more delocalised



delocalised

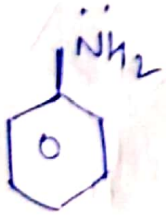


delocalised, but has +I of Ethyl group

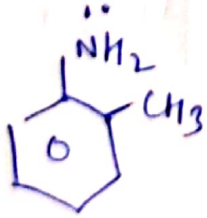
c > b > a

(viii)

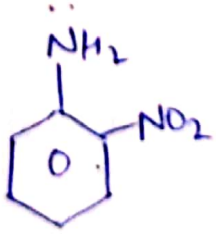
d > a > b > c



Delocalised

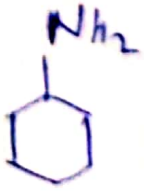


SIP



SIP

−M(−$NO_2$)

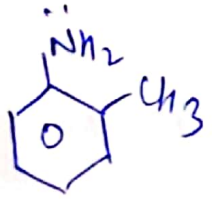


localised

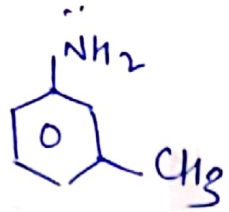
∴ SIP decreases basis Strength

SIP ⇒ Steric Inhibition of protonation.

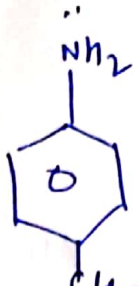
(IX) d > c > b > a



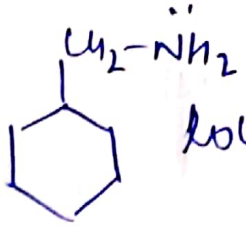

SIP




+I




+H




localised

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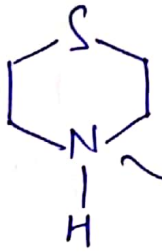
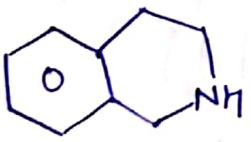
Ques 3 (i) ("d")



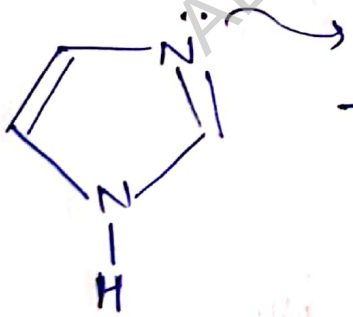

→ $sp^3$ (localised) and less -I of sulphur

(ii) (b)

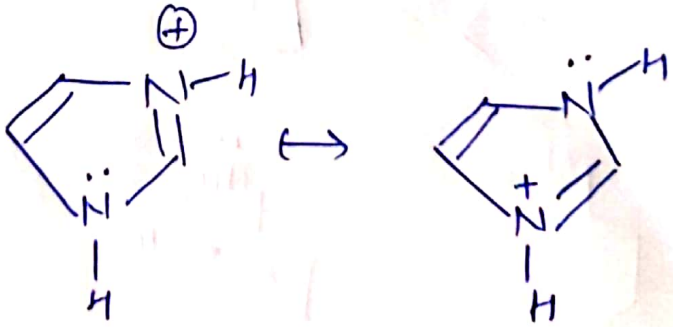



→ $sp^3$ (localised) So most basic among.

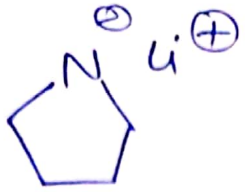
(iii) (a)




$H^{\oplus}$ → Conjugate Acid




(2 Equivalent R.S of Conjugate Acid, So most basic).

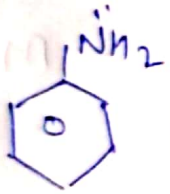
(iv) (a)  most basic due to negative charge.

---

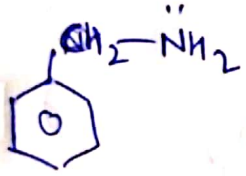
Ques 4 (i) b > a > d > c

∴ On the basis of E·N· factor, more E·N·, less basic strength.

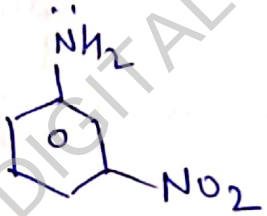
(ii) b > a > c > d



delocalised

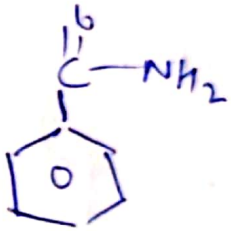


localised



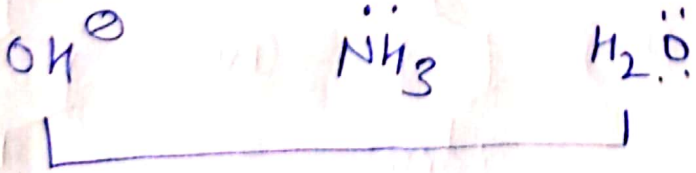
-I

delocalised

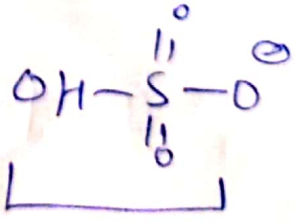


Most delocalised with oxygen

(iii) a > b > c > d



localised

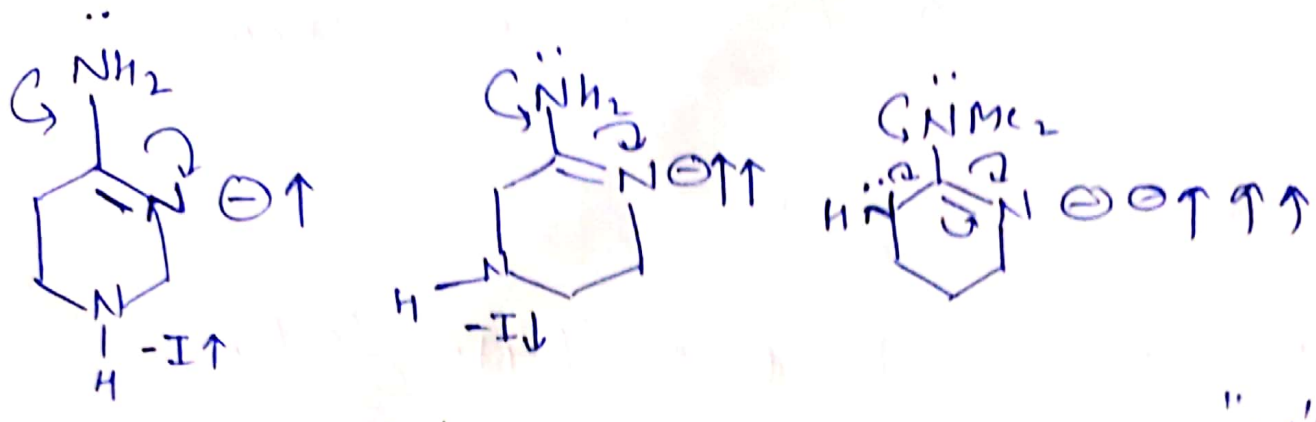


delocalised

anion > neutral

basic strength.

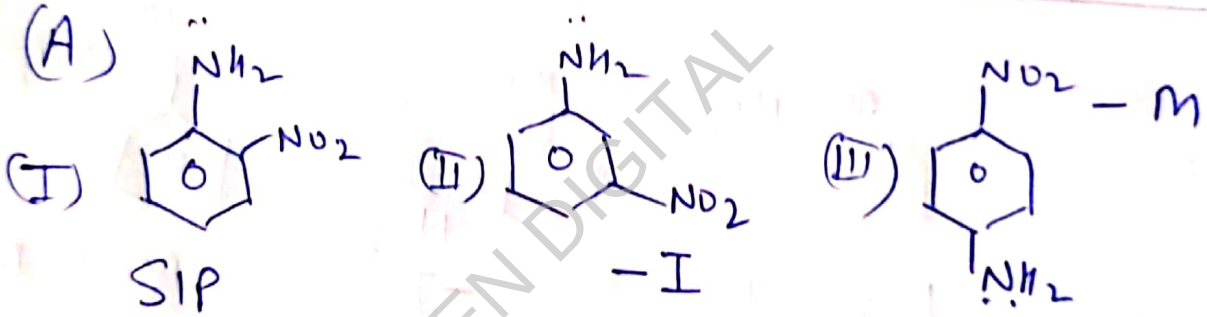
Qus 5 Ans (A)



∴ 3rd has more negative on "N" due to double side +M factor.

---

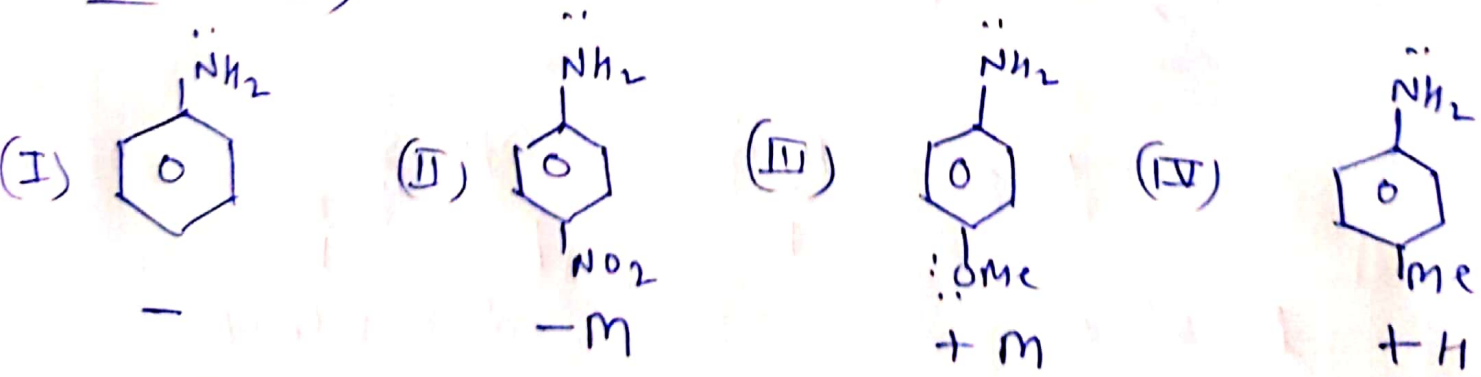
Qus 6 (A)




II > III > I

---

Qus 7 (A)




[ B.S. ∝ +M, +H, +I ∝ 1/(−M, −I) ]

III > IV > I > II

Ques 8 (A)  ∴ least basic due to more delocalisation of lone pair, contributing in aromaticity.

---

Ques 9 (a) $CH_3-NH_2$ > $CF_3-NH_2$

($CH_3$: +I; $CF_3$: −I)

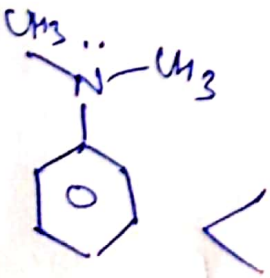
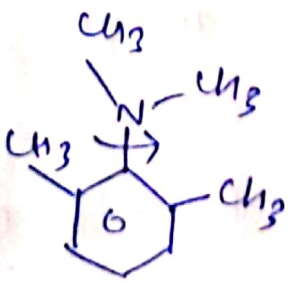
(b) $CH_3-C(=O)-NH_2$ < $NH_2-C(=NH)-NH_2$

(more delocalised with Oxygen, i.e. more EN. atom). (Guanidine)

(c) $CH_3-CH_2-CH_2-NH_2$ > $CH_3-C\equiv N:$

($NH_2$: $sp^3$; $C\equiv N$: sp)

$$\left[B.S. \propto \frac{1}{E.N.}\right]$$

(d)  < 

delocalised

localised due to SIR Effect, $-\ddot{N}(CH_3)_2$ Not participate In Resonance.

Ques 10 (a) $H_2\ddot{O}:$ > $H_3O^{\oplus}$ (2)

lone pair available — weaker base

(b) $Cl^{\ominus} < SH^{\ominus}$ (1)

weaker base — due to E.N. factor (same period)

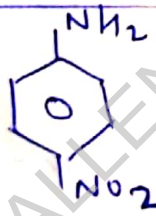
(c) $F^{\ominus}$ (least basic due to most E.N.) (1)

(d) HF ( " ) (1)

(e) $SeH^{\ominus}$ (due to size factor, along the group).

---

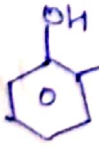
Ques 11 (a) (2)




$-M$ of $-NO_2$

(b) (1) due to more delocalisation

(c) (2)  not an anion.

(d) (2)  due to $-I$ of $-CF_3$ weaker base.

---

Ques 12 (a) 1 > 2 > 3

$OH^{\ominus}$ — localised

$CH_3-\overset{\overset{O}{\|}}{C}-O^{\ominus}$ — delocalised

$Cl^{\ominus}$ — size factor

(b) 3 > 2 > 1 on the basis of E·N.
$sp^3 > sp^2 > sp$ (order of B·S.)

(c) 2 > 1 > 3 same E·N. factor sp carbon has more E·N. so more −I, less basic strength.

(d) 3 > 1 > 2 localised has more Basic Strength.

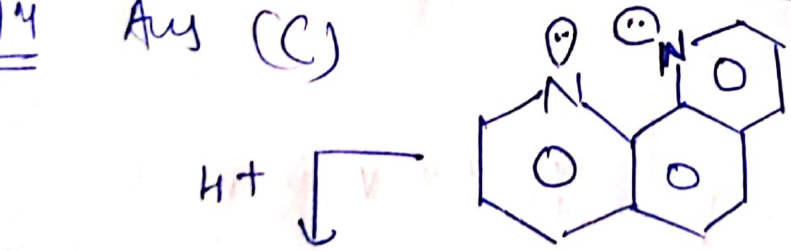
---

Ques 13 (a) 3 > 1 > 2 ( $CH_3-\ddot{N}H_2$ lone pair — $CH_3-\overset{+}{N}H_3$ — $CH_3-\overset{\ominus}{N}H$ anion )

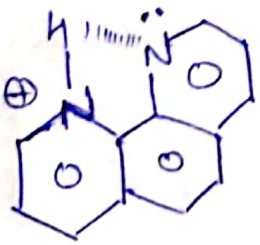
(b) 3 > 2 > 1 on the basis of E·N.

---

Ques 14 Ans (C)

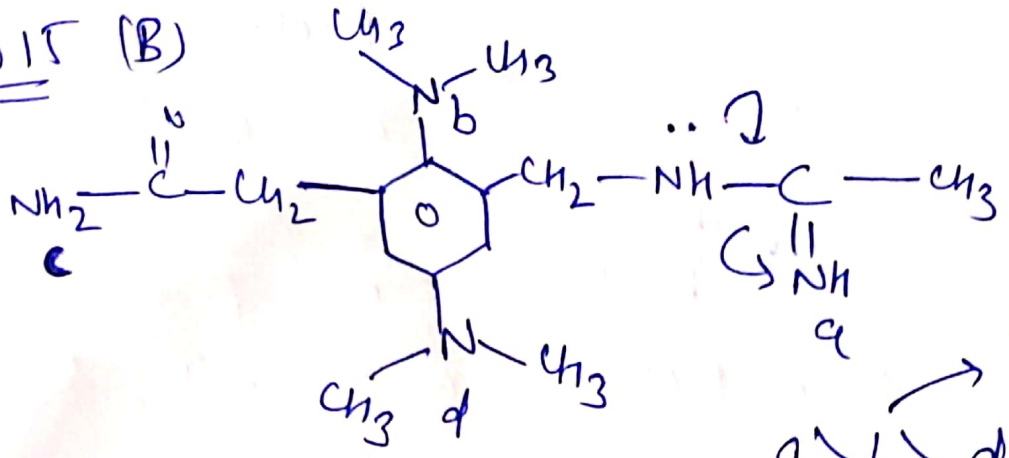


∴ Due to Strong chelate of conjugate Acid



→ Strong chelate

Ques 15 (B)



a > b > d > c

a → localised due to SIR

b → most delocalised i.e. with oxygen.

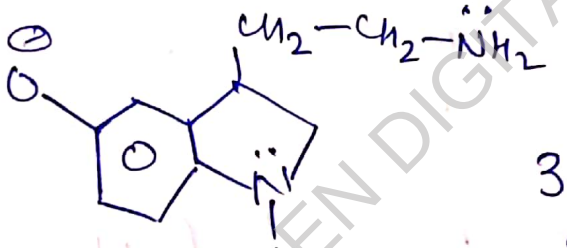
d → less delocalised

c → anion formed

---

Ques 16

Ans (3)



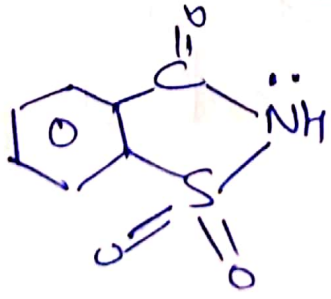
3 basic group

$-\ddot{O}^{\ominus}$, $-\ddot{N}H-$, $-\ddot{N}H_2$



---

Ques 17 Ans (6)



→ very much delocalised with 3 oxygen.

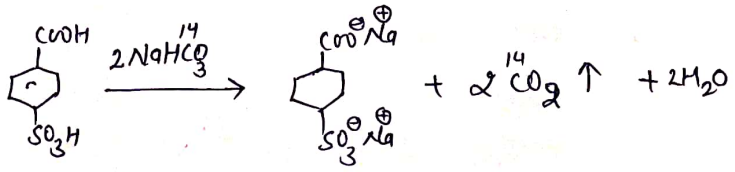
So, all are more basic than saccharin.

Acidity - Basicity Ex-III

Exercise # S-I

Q1) Ans-(C)

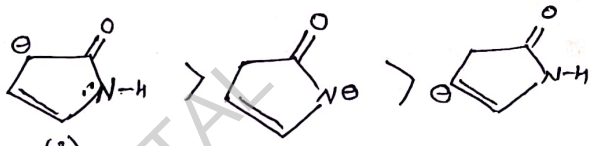
Soln :-




Q2) Ans-(C)

Soln :- Acidic strength $\propto$ stability of anion

order of stability of anion $\Rightarrow$



(2) Aromatic compd

-ive at more EN atom

Q3) A) R,S,T (B) PRST (C) PQRST (D) PQRST

Soln :-

*i) compds which are more acidic than $H_2O$ will react with NaOH

*ii) compds which are more acidic than $H_2CO_3$ will give $NaHCO_3$ Test

*iii) compds having acidic hydrogen gives acid-base reaction with NaH (Base)

*iv) compds having acidic hydrogen/active hydrogen gives $H_2$ gas on reaction with Na (metal)

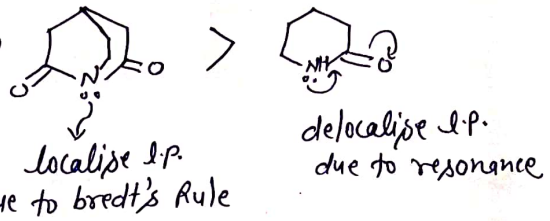
*v) Compds which are more acidic than $NH_3$ will react with $NaNH_2$

Q4) Ans → (i), ii, iii, iv, v, ix

Q5) Ans-(D)

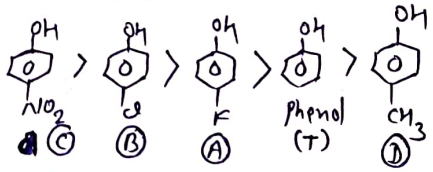
* statement (I) is false b/z compd (I) is less acidic than compd (II) due +I effect of $-NO_2$ group
* statement-II is True

Q6) Ans-(A)

* Basic strength ⇒ 


Q7) A) P,T (B) R (C) Q (D) S,T

Q8) A) R (B) -S (C) P (D) Q,T

* $\boxed{\text{Acidic strength} \propto K_a \propto \frac{1}{pK_a}}$
* order of Acidic strength (or $K_a$) ⇒ 

(C) (B) (A) (D)
* order of $pK_a$ ⇒ (C) < (B) < (A) < phenol < (D)

Q9) Ans-(A)

Q10) Ans-(A)

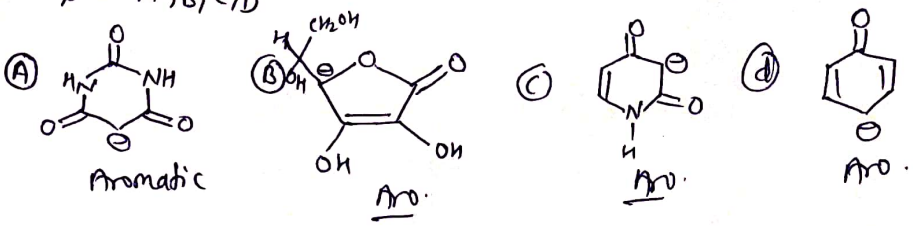
Q11) Ans- A, D

Q12) Ans-(D)

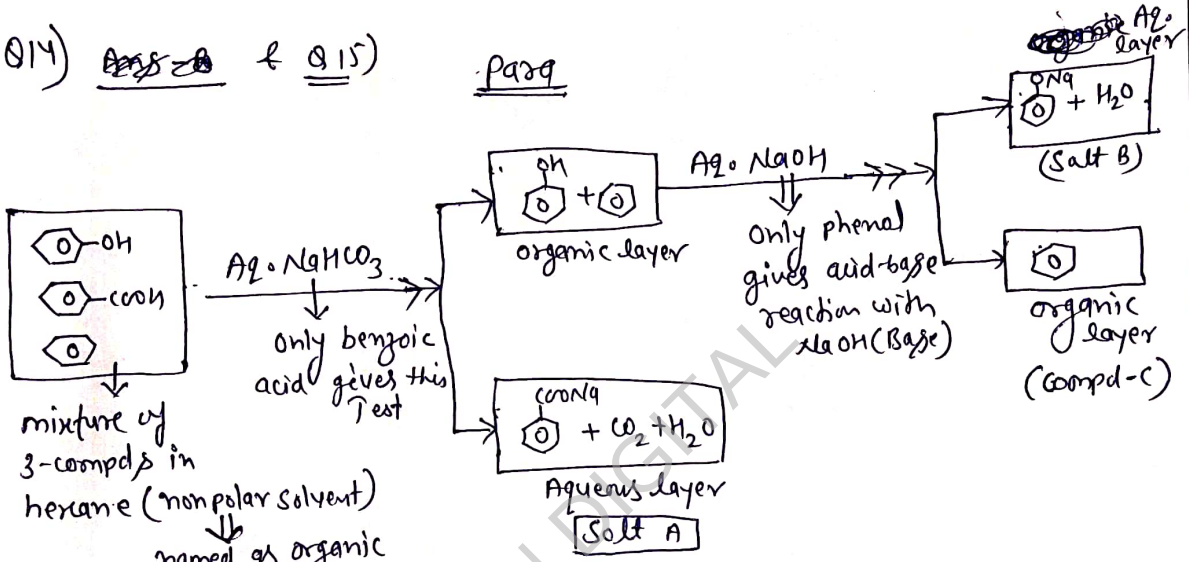
(D) $H-C\equiv C-H + NaOH \rightleftharpoons HC\equiv CNa + H_2O$
Weak acid, weak base, strong Base, strong Acid

* reaction goes to backward direction b/z reaction occur from strong to weak

Q13) Ans – A, B, C, D



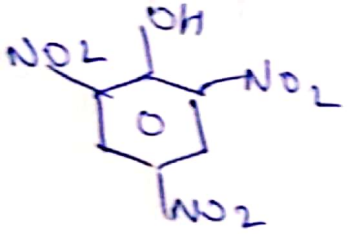

Q14) ~~Ans – B~~ & Q15) para




Q14) Ans – B

Q15) Ans – C

# Ex - JM (Acid & base) Sheet

(1) 

∴ It is picric Acid

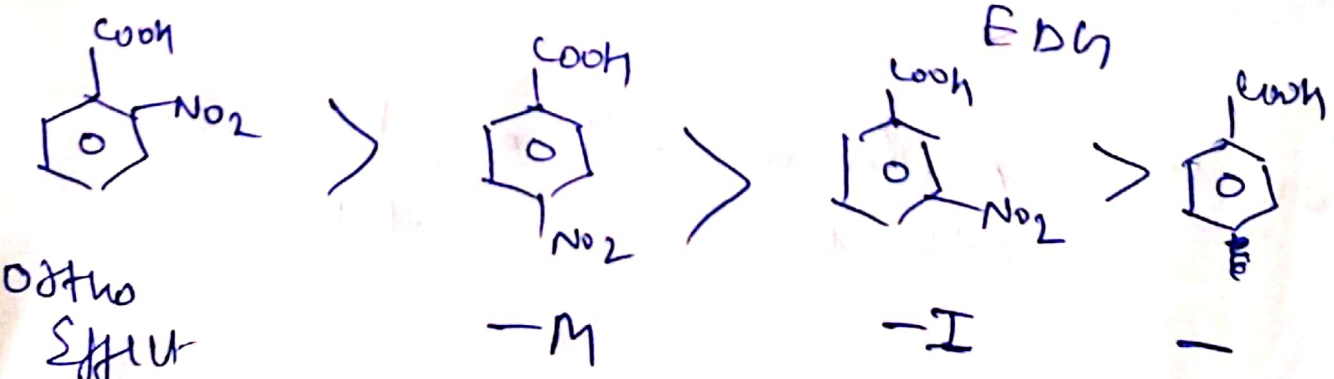
(2) ∴ $OH^{\ominus}$ & $HSO_4^{\ominus}$ can accept and donate $H^{\oplus}$, so they

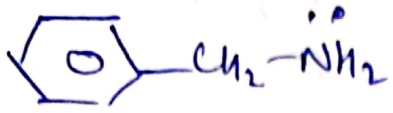
$NH_3$ & $OH^{\ominus}$ can accept as well as donate $H^{\oplus}$, while $HSO_4^{\ominus}$ can only accept $H^{\oplus}$.

(3) ∴ R = Me

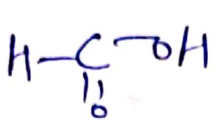
$2^{\circ} > 1^{\circ} > 3^{\circ} > 0^{\circ}$

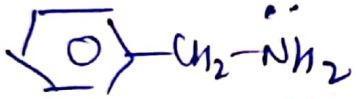
(4) Acidic Strength ∝ EWG ∝ $\frac{1}{\text{EDG}}$



(5) ∴  localised lone pair

(6) Acidic Strength ↑ Pka ↓

 due to No +I group

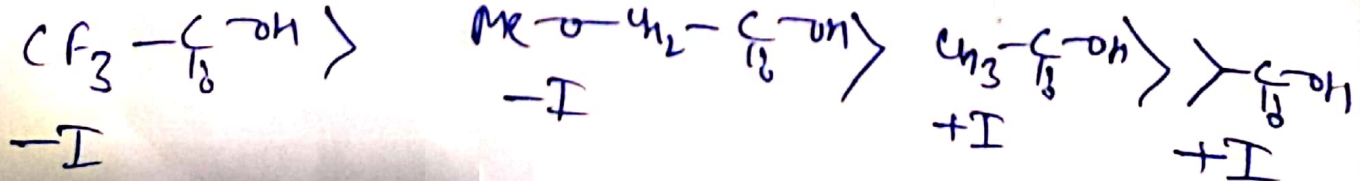
(7)  benzyl Amine (localised l.p.)

(8) $OH^{\ominus} \xrightarrow{H^{\oplus}} O^{-2}$

conjugate base

Ques 9 Same as Q. 6

Ques 10 Acidic strength $\propto \frac{-I}{+I}$



(d) $C_6H_5SO_3H$

Q no 11

$\therefore$ Aniline is least basic

R $\Rightarrow$ Me (Methyl)

$2^{\circ} > 1^{\circ} > 3^{\circ} > 0^{\circ}$

(12) Basic Nature $\propto \frac{1}{\%\ S\ character}$

$R^{\ominus} > NH_2^{\ominus} > HC\equiv C^{\ominus} > R-\overset{\overset{O}{\|}}{C}-O^{\ominus}$

$\longrightarrow$

E.N. $\uparrow$ tendency to hold $e^{\ominus}$ increases

Basic Stength $\downarrow$

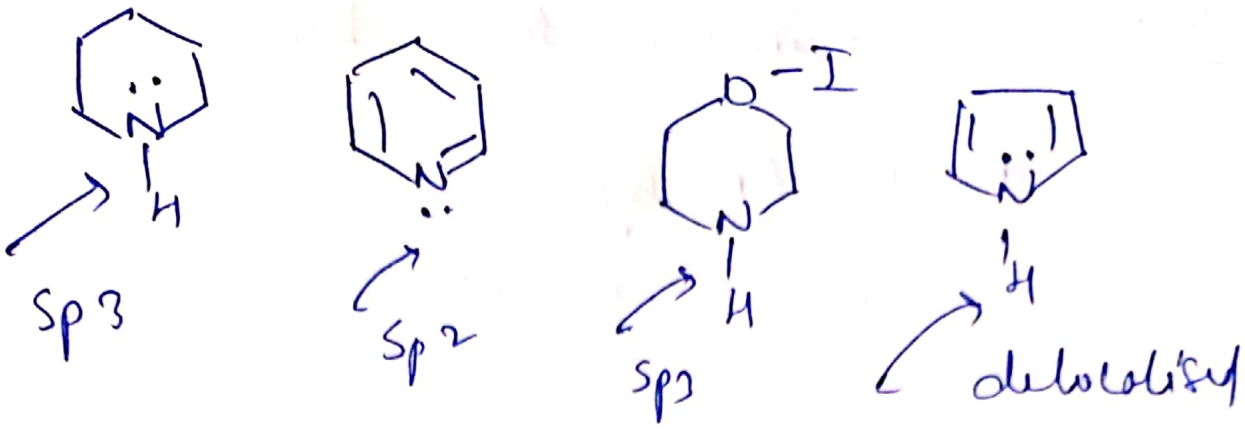
(13) $CH_3-CH_2-\underset{Cl}{CH}-\overset{\overset{O}{\|}}{C}-OH$

Max $-I$ of Chlorine

[A.S $\propto -I \propto \frac{1}{+I}$]

(14) [A.S $\propto -M, -I \propto \frac{1}{+M, +H, +I}$]

Ques 15




I > III > II > IV

Ques 16 same as Q.7

Ques 17 Gaseous phase (depends only on +I group)

$$\left[\text{B.S.} \propto +I \propto \frac{1}{-I}\right]$$

$3^{\circ} > 2^{\circ} > 1^{\circ} > \ddot{N}H_3$

Ques 18 $\left[\text{A.S.} \propto -M, -I \propto \frac{1}{+M, +H, +I}\right]$

$-Cl \Rightarrow -I$

$-NO_2 \Rightarrow -M$

$-CH_3 \Rightarrow +H$

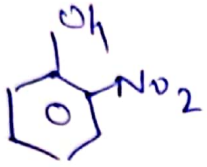
$-OCH_3 \Rightarrow +M$

Ques 19

$N_3H$ Acid $\xrightarrow{-H^{\oplus}}$ $N_3^{\ominus}$

Conjugate base

Ques 20



∴ because it is Acidic than $H_2CO_3$

Ques 21

Basic strength $\propto K_b \propto \frac{1}{pK_b}$

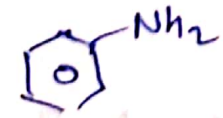
R ⇒ Me $2^{\circ} > 1^{\circ} > 3^{\circ}$ (Aqueous medium)

$(CH_3)_2NH > CH_3-\ddot{N}H_2 > (CH_3)_3\ddot{N}$

Ques 22

[A.S. $\propto$ Stability of anion (C.B.) $\propto$ Equivalent R.S.]

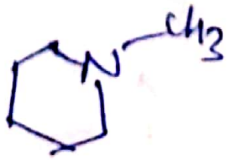
Ques 23



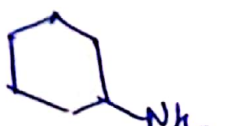
delocalised

3 > 4 > 1 > 2

delocalised



localised +I ↑



localised +I

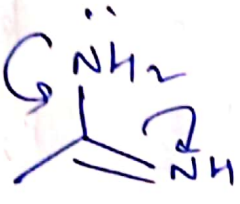
Ques 24

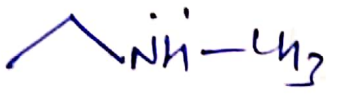
(a)  localised

↑ $sp^3$

(b)  localised

↑ $sp^2$

(c)  ↑↑ Guanidine type

(D)  +I

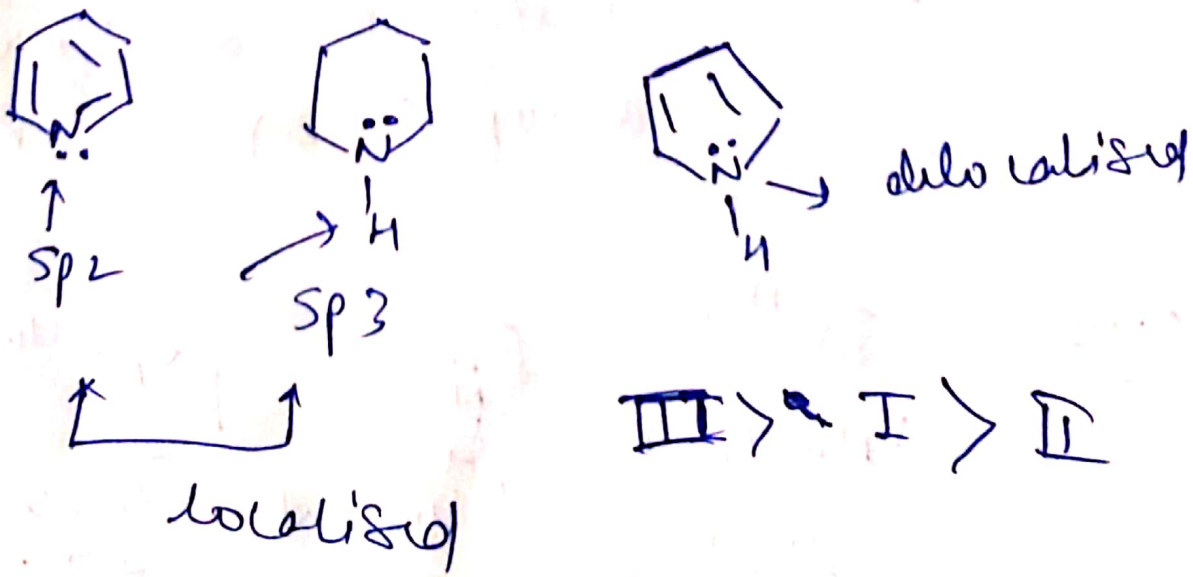
↑ $sp^3$

c > D > a > b

Ques 25

Acidic strength $\propto -I \propto \frac{1}{+I}$

Ques 26



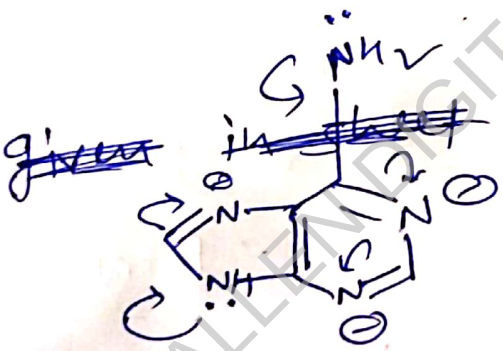

III > I > II

Ques27 B.S. $\propto$ localised lone pair $\propto \frac{1}{\text{delocalised lone pair}}$

$$B.S. \propto +I \propto \frac{1}{-I}$$

Ques28 $\left[\begin{array}{l} A.S. \propto -M, -I \propto \frac{1}{+M, +H, +I} \\ (\text{Acidic Strength}) \end{array}\right]$

Ques29



~~given~~ ~~Solution~~.

Negative reaches at b, c, d

Ques30 $CH\equiv C^{\ominus}$ sp

$CH_3-C\equiv C^{\ominus}$ +I sp

$CH_2=CH^{\ominus}$ $sp^2$

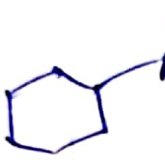
$\left[A.S. \propto E.N. \propto 1/s\right]$

Negative charge is more stable on more E.N. atom

I > II > III

Ques 31. ∴ Given in sheet (Answer key)

Ques 32 ∴  delocalised  → $sp^2$ localised

 → $sp^3$ localised  most delocalised

IV > II > I > V

Ques 33 B.S. $\propto \frac{1}{\%S} \propto \frac{1}{E.N.}$

i > IV > ii > iii > v

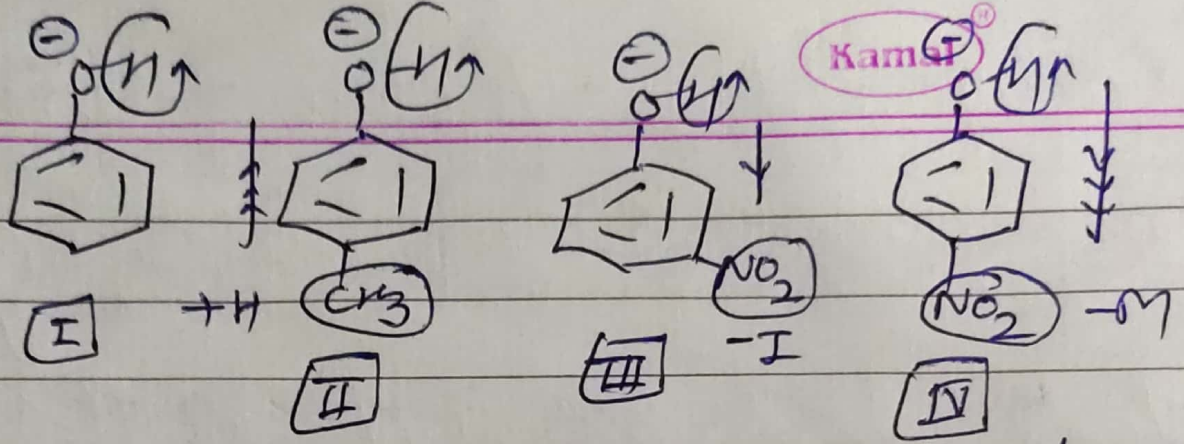
E.N. ↑ tendency to hold $e^{\ominus}$ ↑

Basic strength ↓

# Acidic and Basic Strength

Q. (1)

Sol.ⁿ




A.S ∝ Stability of anion or Conjugate Base

Stability of anion ∝ EWG (-M > -H > -I)

$$\propto \frac{1}{\text{ERG } (+M > +H > +I)}$$

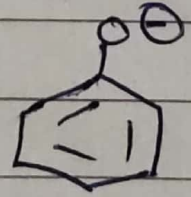
A.S. order ⇒ IV > III > I > II

Ans (D)

Q. (2)

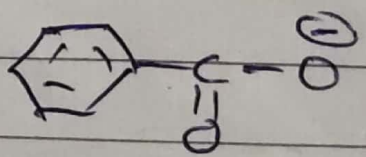
Sol.ⁿ

Phenoxide Ion



(5 R.S)

Benzoate Ion



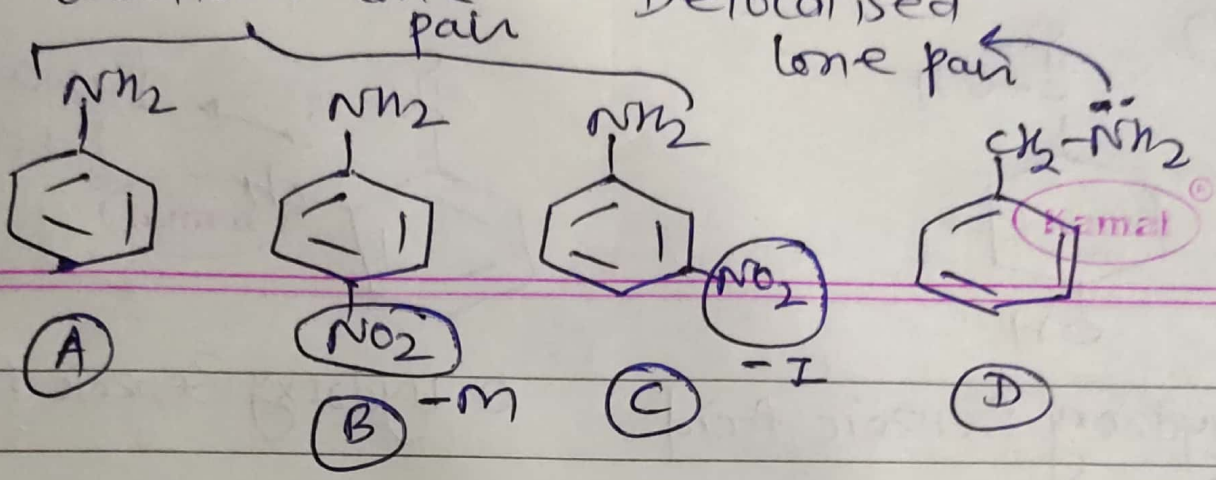
(2 R.S)

more Stable Due to Equivalent Reso.

A.S. order → Benzoic Acid > Phenol ← Reason

Q. (3)

Sol.



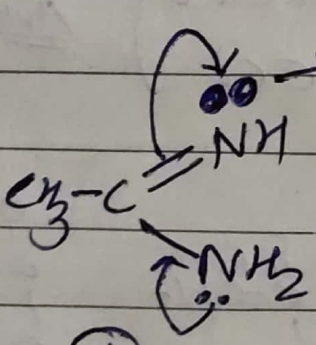

B.S. $\propto$ e⁻ donation tendency

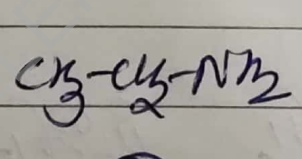
Most Basic → (D)

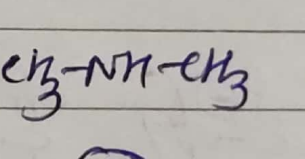
B.S. order → D > A > C > B

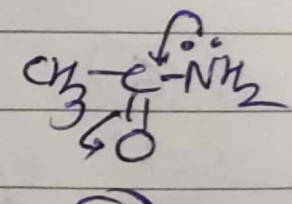
Q. (4)

Sol.




B.S. order : 2

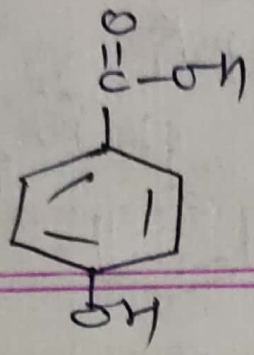
(1) > (3) > (2) > (4)

Ans. (B)

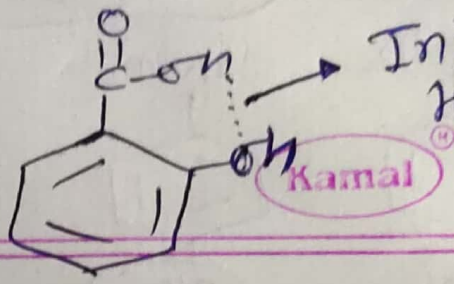
Q. (5)

Sol:

Q. (1)



p-Hydroxy Benzoic Acid




O-Hydroxy Benzoic Acid



B.P order → p-Hydroxy Benzoic Acid > o-Hydroxy Benzoic Acid

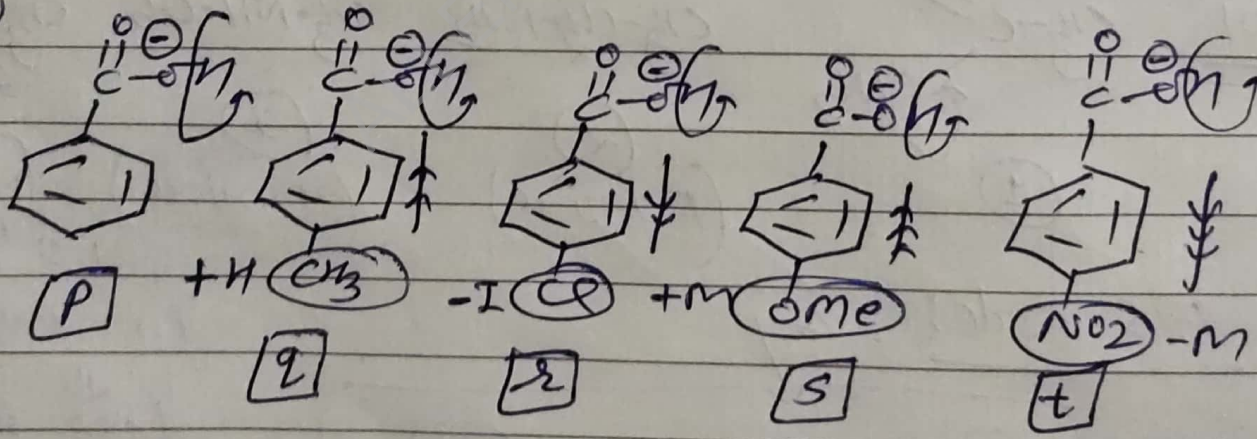
(High BP Due to inter molecular H-bond)

Statement (1) ⇒ Incorrect
Statement (2) ⇒ correct

Ans (4)

Q. (6)

Sol:




[A.S. ∝ St. of anion ∝ $\frac{1}{\text{strength}}$ ∝ $\frac{1}{K_a}$]

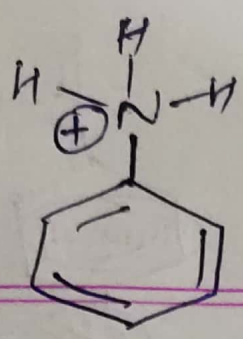
A.S. order → t > r > P > Q > S

Ka order ⇒ t > r > P > Q > S

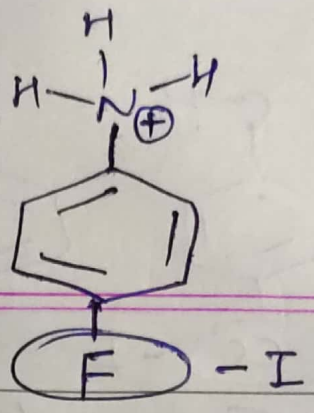
E D C B A

Q. (7)

Sol.:



I




II

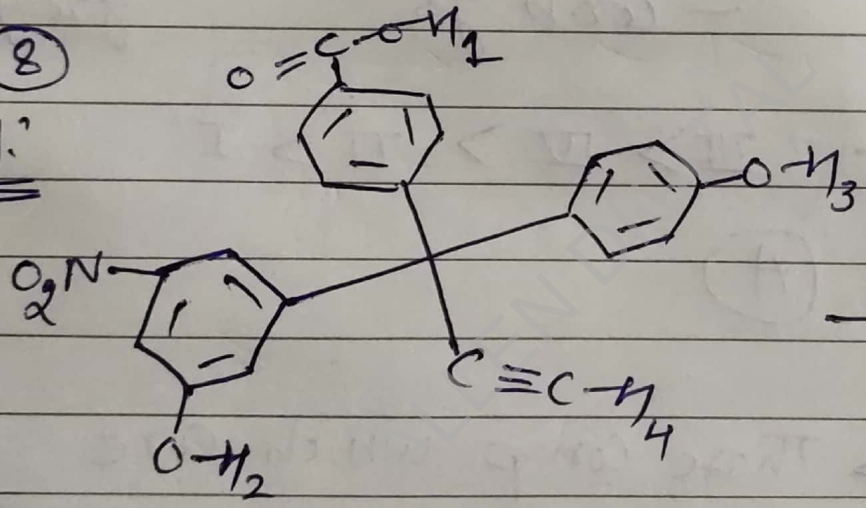
Kamal

II nd is most acidic due to -I Effect of F

A.S. order ⇒ II > I

Q. (8)

Sol.:




2 moles of $NaNH_2$ (Base) → (A)

2 moles of Base react with 2 most Acidic H-atom in given comp.

Note A.S order of H-atom ⇒ $-\overset{\overset{O}{\|}}{C}-H_1 > -H_2 > -H_3 > \equiv C-H_4$

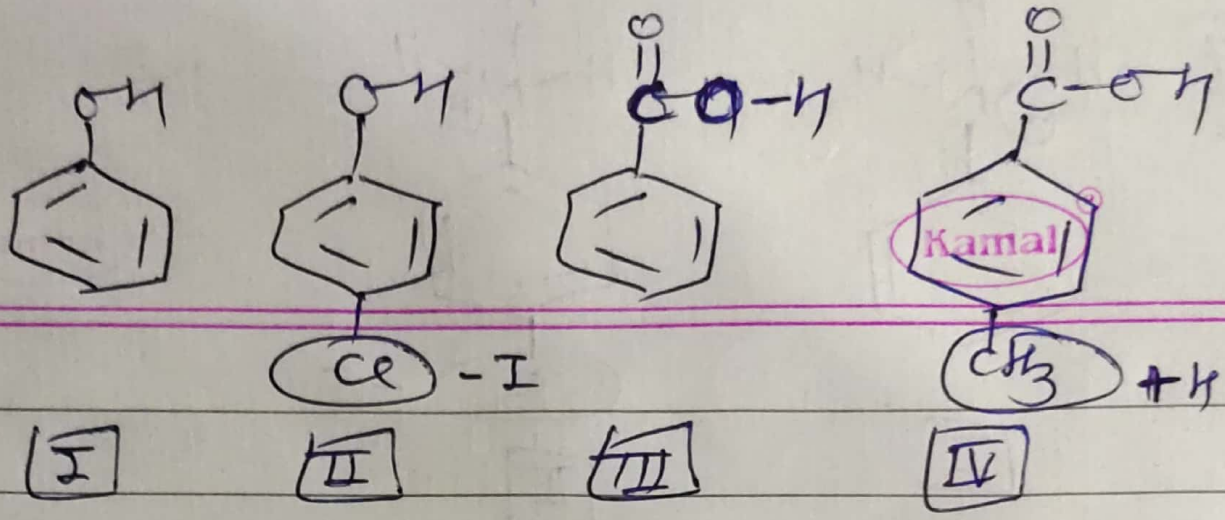
($-H_2$: those where $-NO_2$ is present)

Remove $-H_1$ and $-H_2$ by (2) moles of $NaNH_2$

Ans - (c)

Q. (9)

Sol:




A.S. order → III & IV > I & II

Due to —COOH gr

Here —OH group

A.S order → III > IV > II > I

Ans (A)

Q. (10)

Sol: Concept :→ Those comp. which are stronger Acid then $H_2O$ are soluble in NaOH.

A.S. order → $-COOH > \underset{OH}{\bigcirc} > CH_3OH > H_2O > R\text{-}OH$

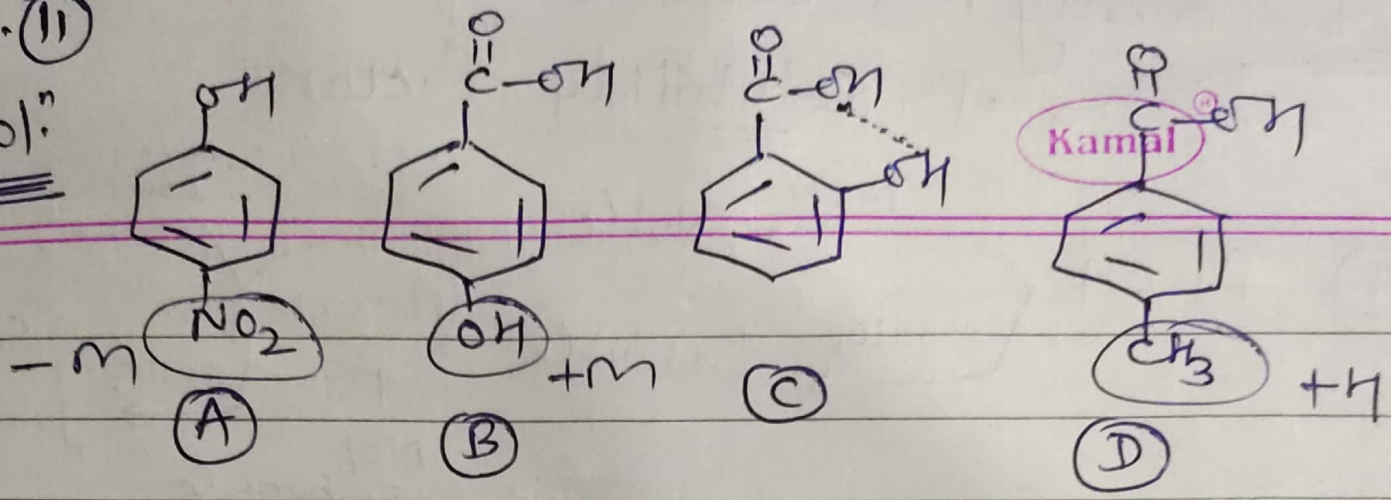
[A.S. of comp] > $[A.S]_{H_2O}$

total (4) comp. are more Acidic then $H_2O$ hence they are soluble in NaOH

Ans - (4) → (II, IV, VI, VIII)

Q. (11)

Sol:




A.S. order → $-\overset{O}{\overset{\|}{C}}-OH > -OH$

B, C, D > A

C > D > B > A

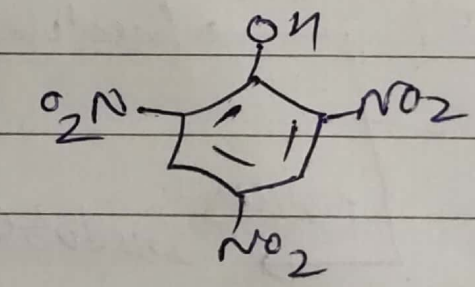
Most Acidic is (C)

Ans - (C)

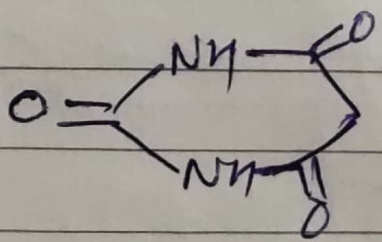
Q. (12)

Sol:

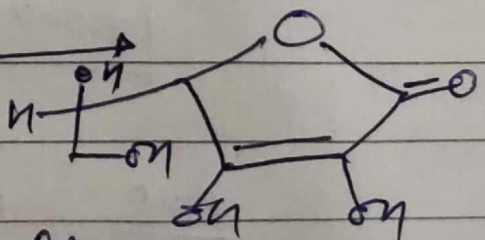
(A) Picric Acid



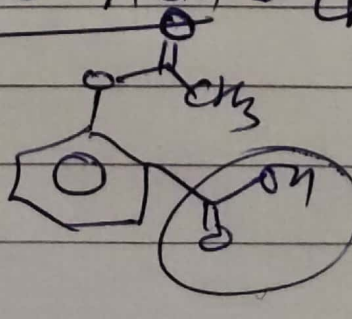
(B) Barbituric Acid



(C) Ascorbic Acid



(D) Aspirin



Carboxylic group

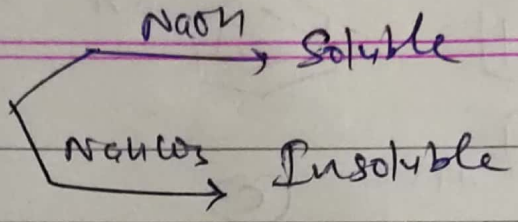
Ans - (D)

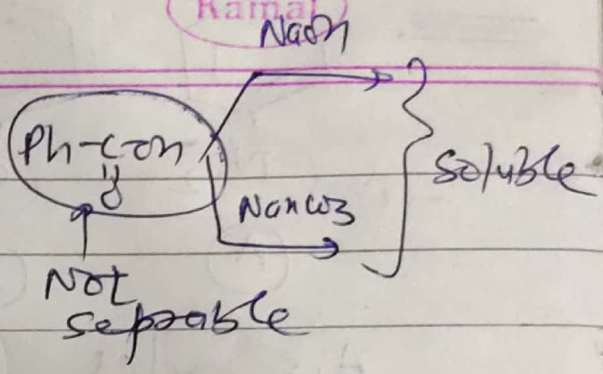
Q.(13)

Sol: Binary mix. can be separated on the basis of Solubility factor.

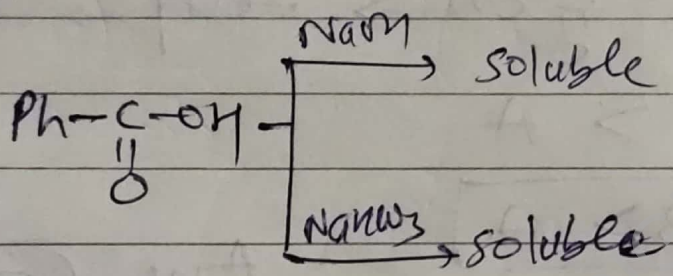


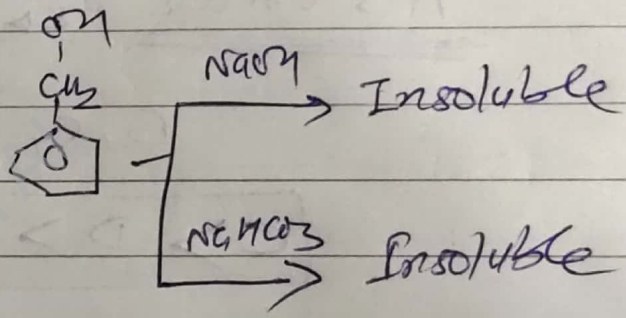
(A) Ph-OH



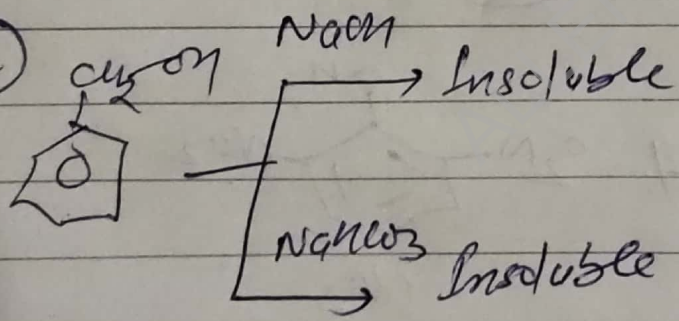



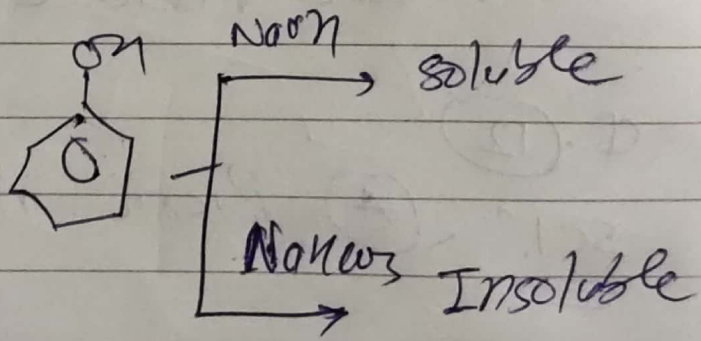

(B)



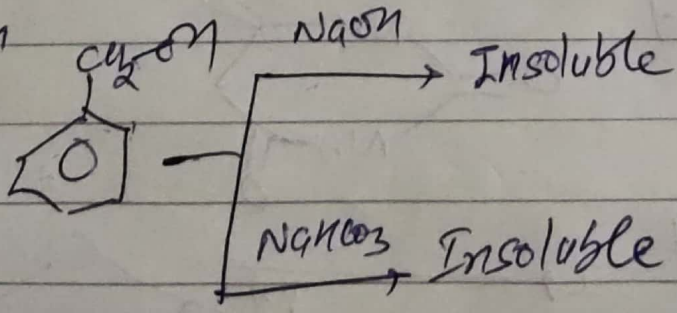



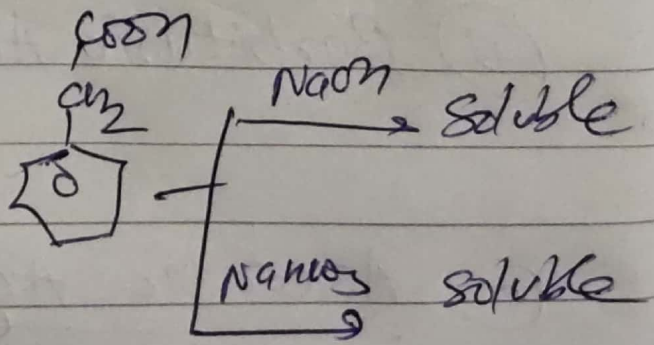

(C)




(D)



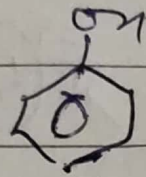

Ans B, D

Q. (14)

Sol." Those which are weaker then Carbonic Acid ($H_2CO_3$) are not able to release $CO_2$ with $NaHCO_3$.

Kamal

(A, B, C) → stronger then $H_2CO_3$ ⇒ Release $CO_2$ ↑

(D)  weaker than $H_2CO_3$ ⇒ Not release $CO_2$ ↑

Phenol

Ans – (D)

Q. (15)

Sol." Subjective based on theory

Ans A, B, D

Q. (16)

Sol." Basic Strength & $e^-$ donation tendency

B.S. order (IV) > (I) > (II) > (III)

Imidazole

↓

L.P involve in Reso.

↑

Guanidine

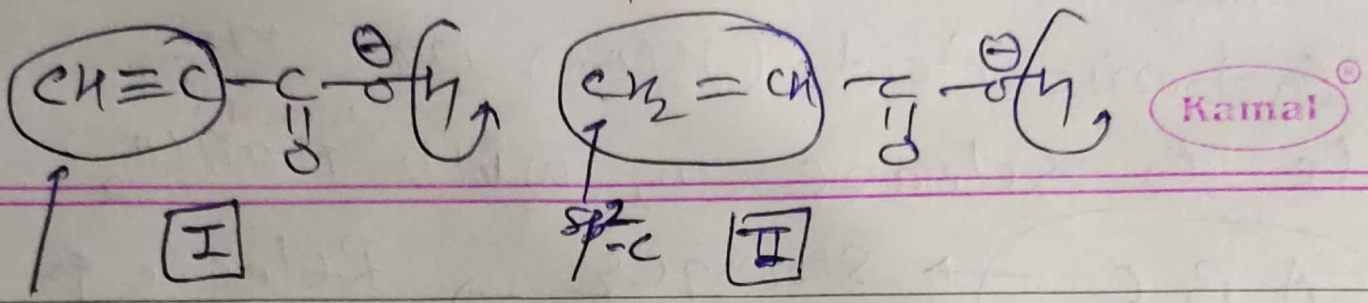
↑

(Strongest organic Base)

Ans. (D)

Q. (17)

less - I



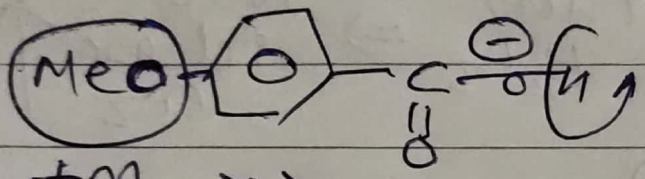

I

$sp$-C

more ⊖ I

II

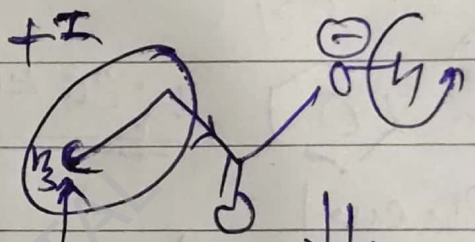
$sp^2$-C



+M

III

pKa ≃ 4.37



$sp^3$ C

IV

pKa = 4.87

St. order of anion ⇒ I > II > III > IV

A.S ∝ $\frac{1}{pKa}$

A.S. order I > II > III > IV

Ans- (D)