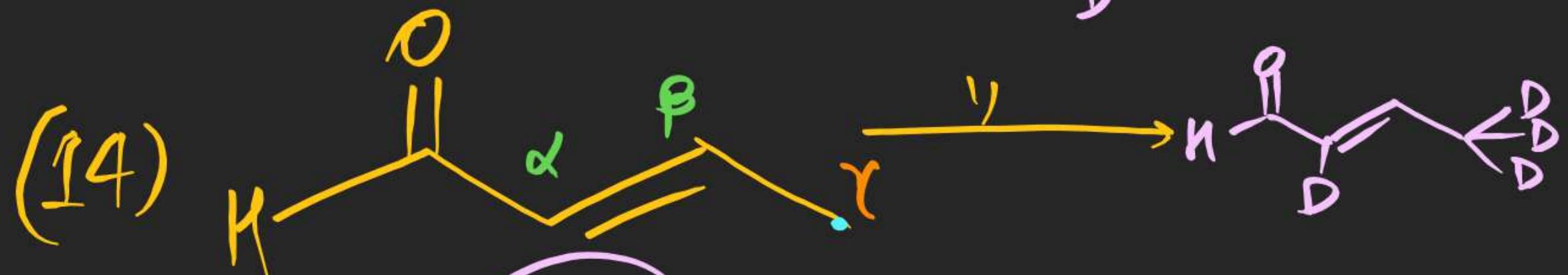
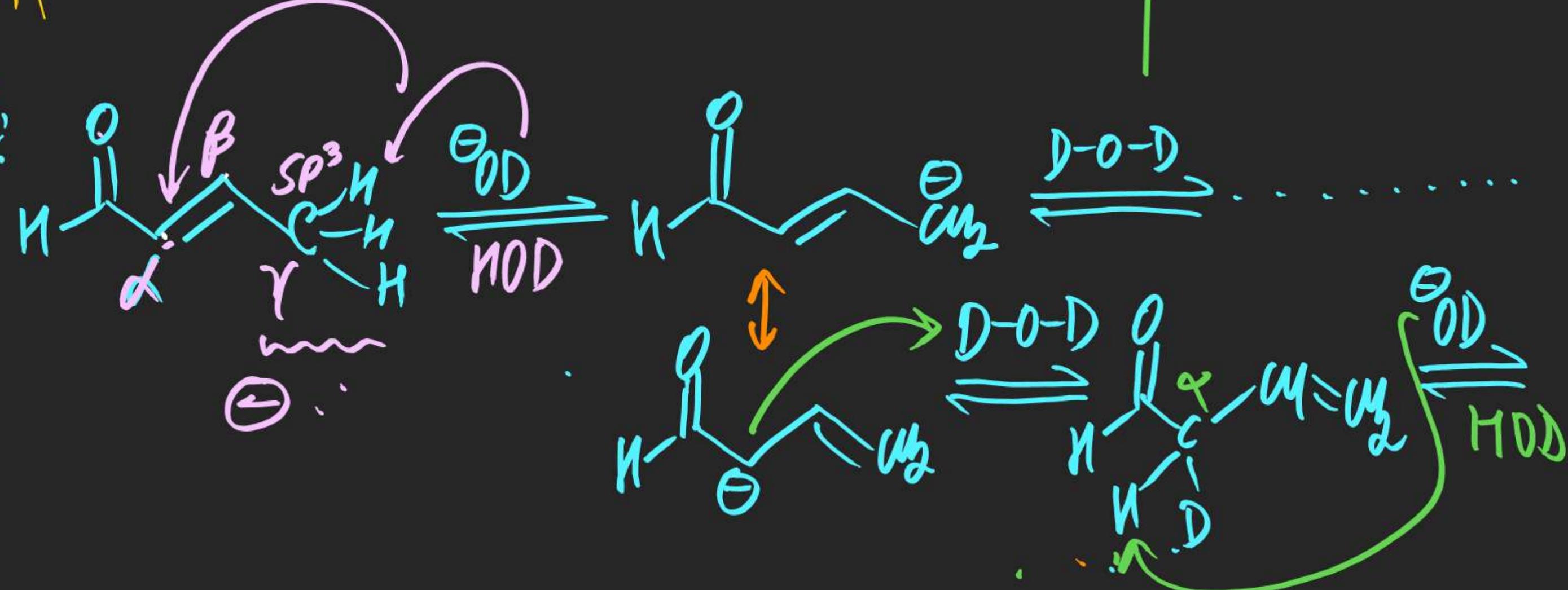
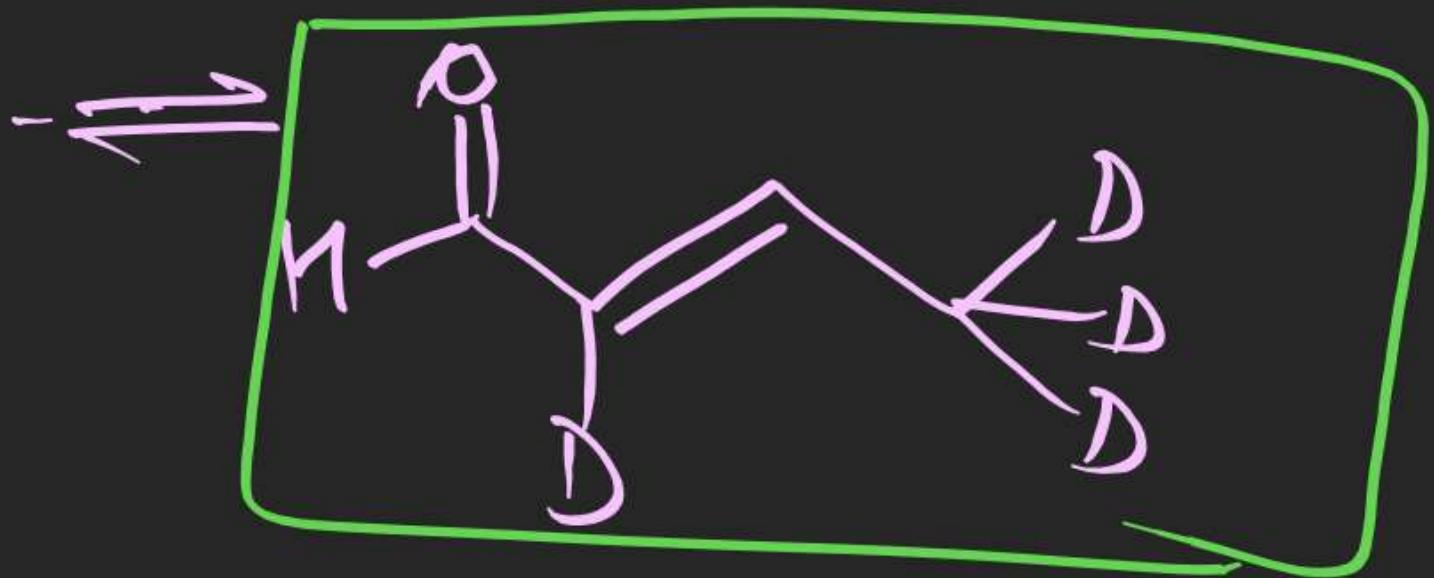
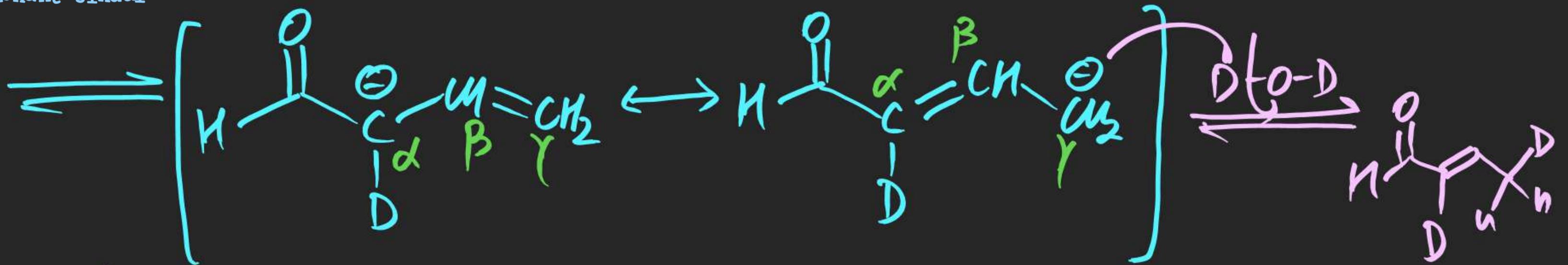
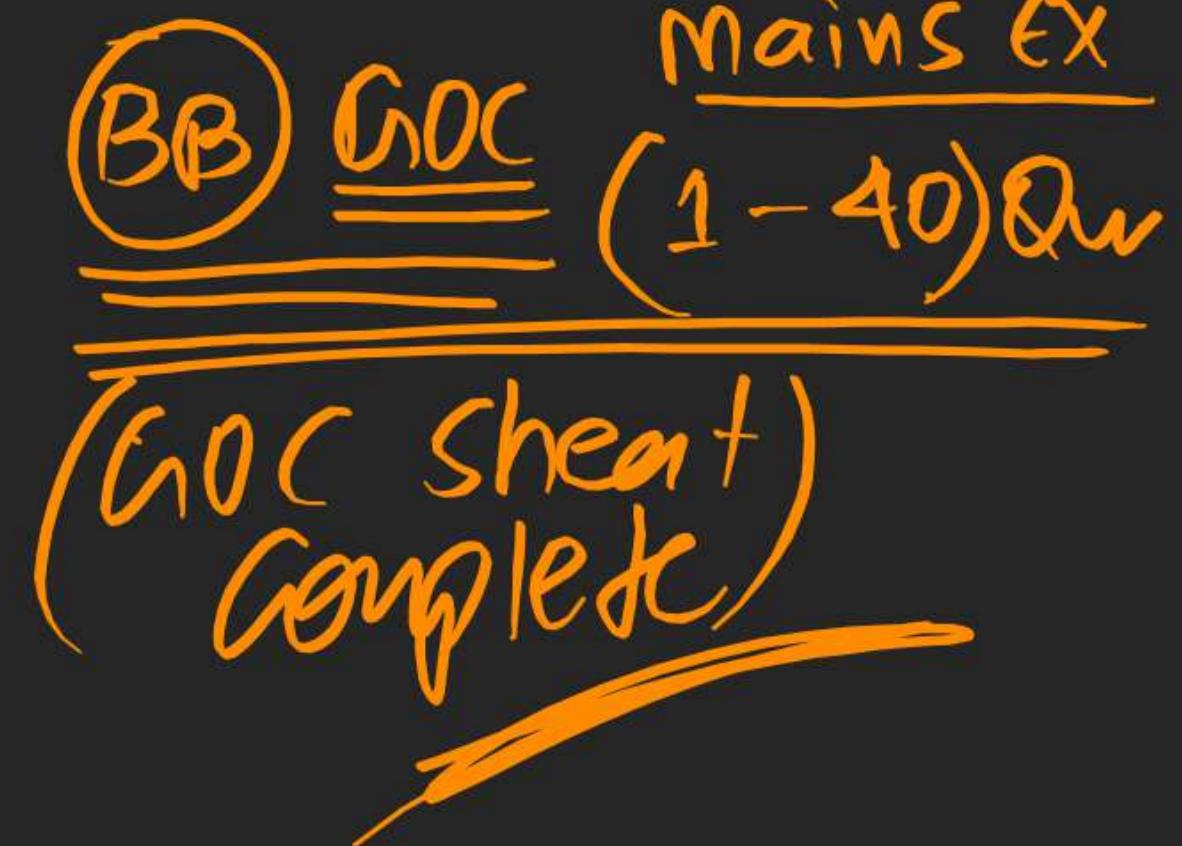
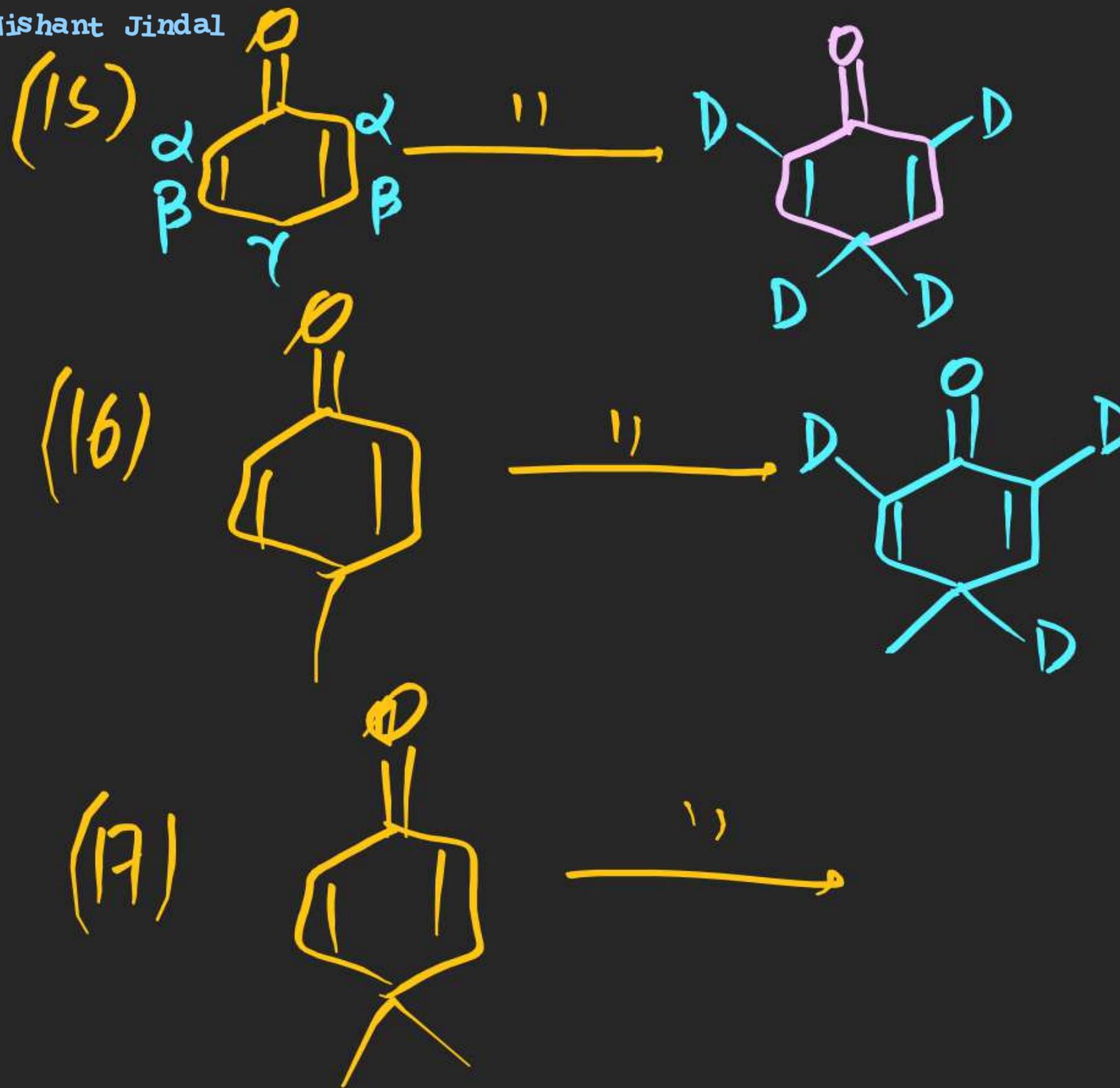




Telegram.

skm-Nucleusedu  
academymech?



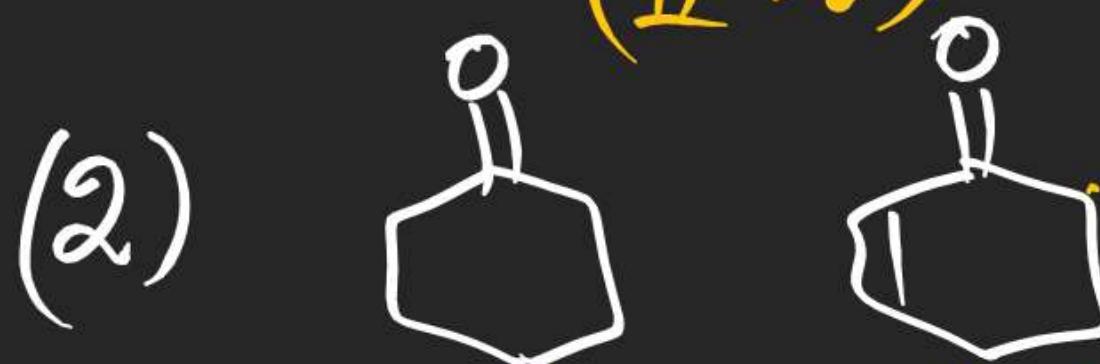


Ex: Anhyd following in ↓ order of % Enol.



qn  $\pi_L$

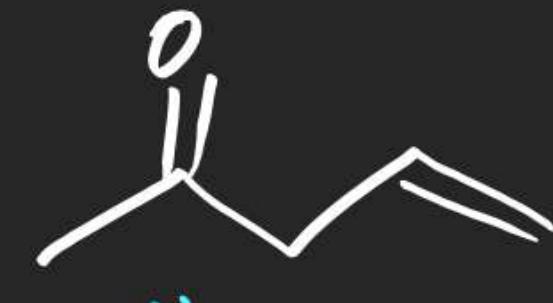
(II > I)



$\pi_{C_6}$

$\pi_{C_6H_8}$

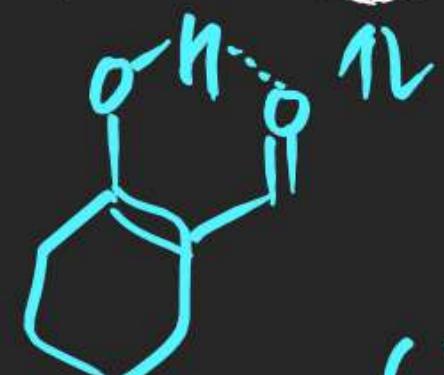
(III > II > I)



qn  $\pi_R$

more stable due to  
extended reson

(3)



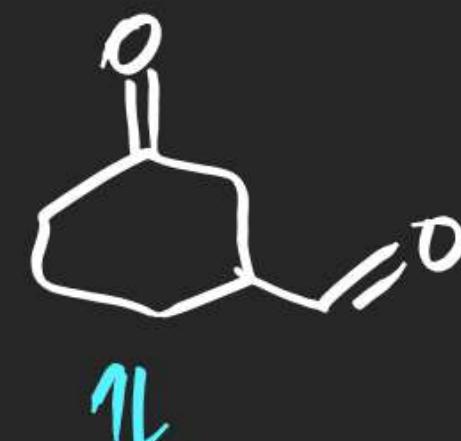
(4)

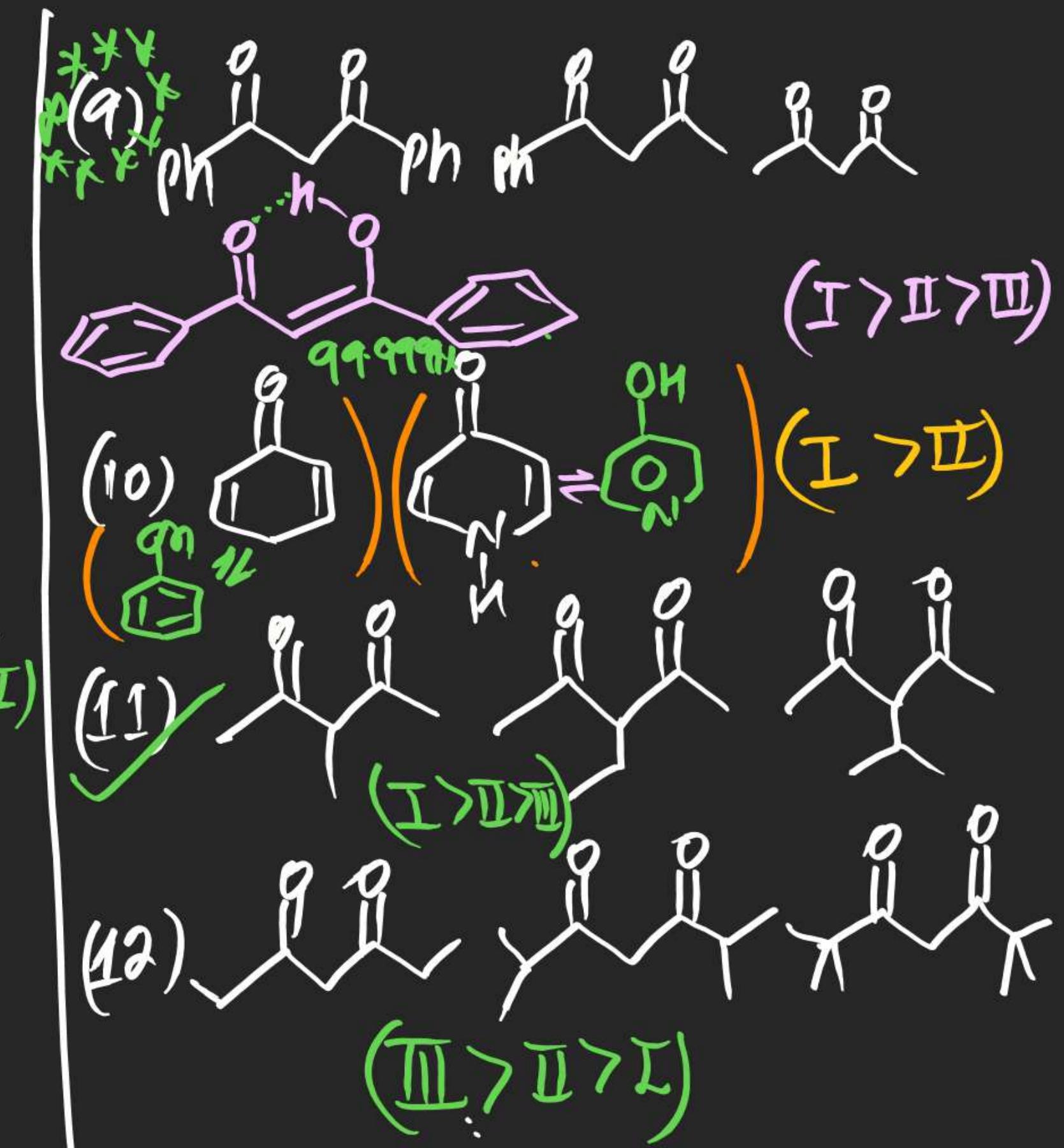
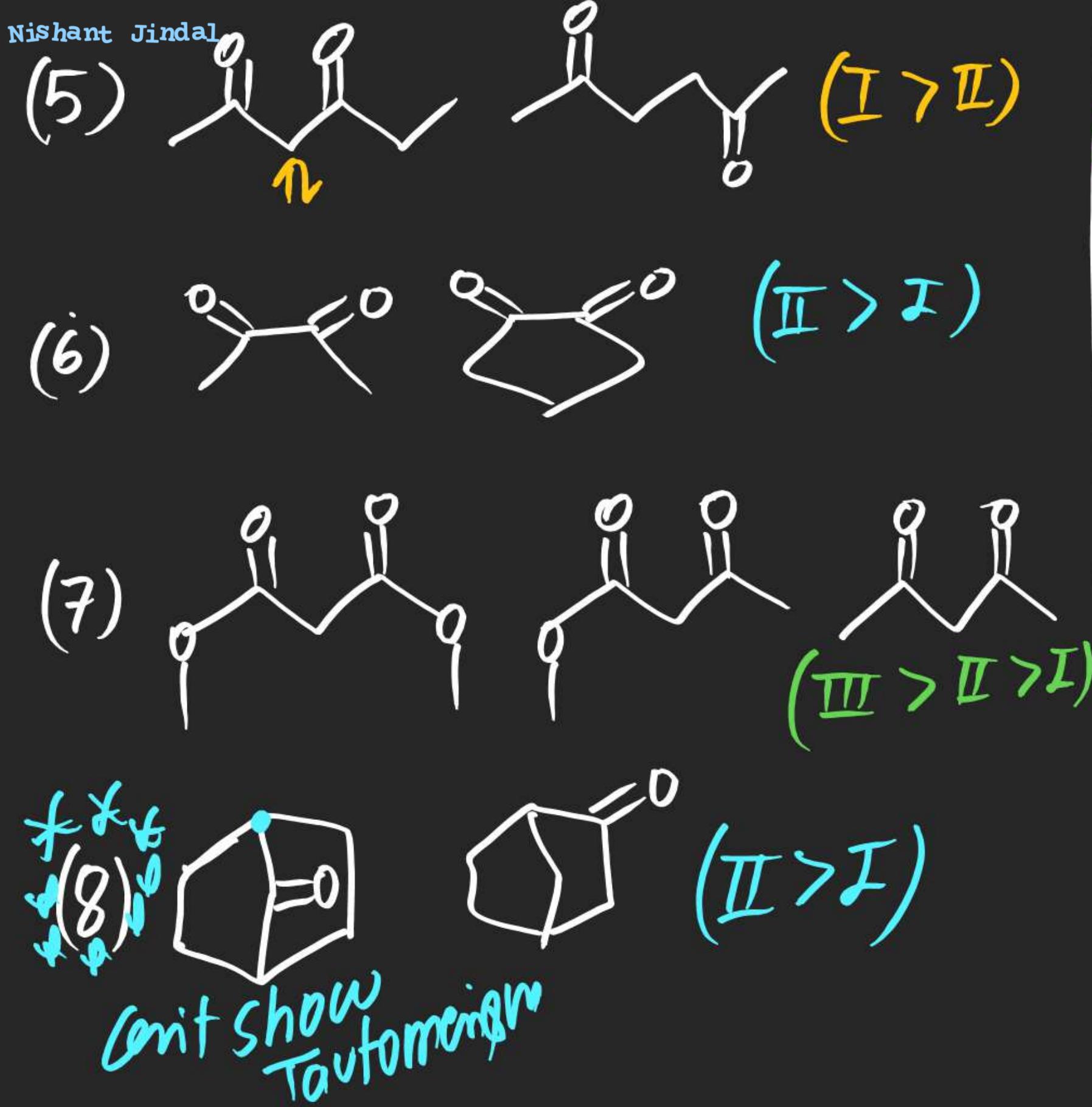


no  $\pi_L$  no  $\pi_L$

Non Aromatic

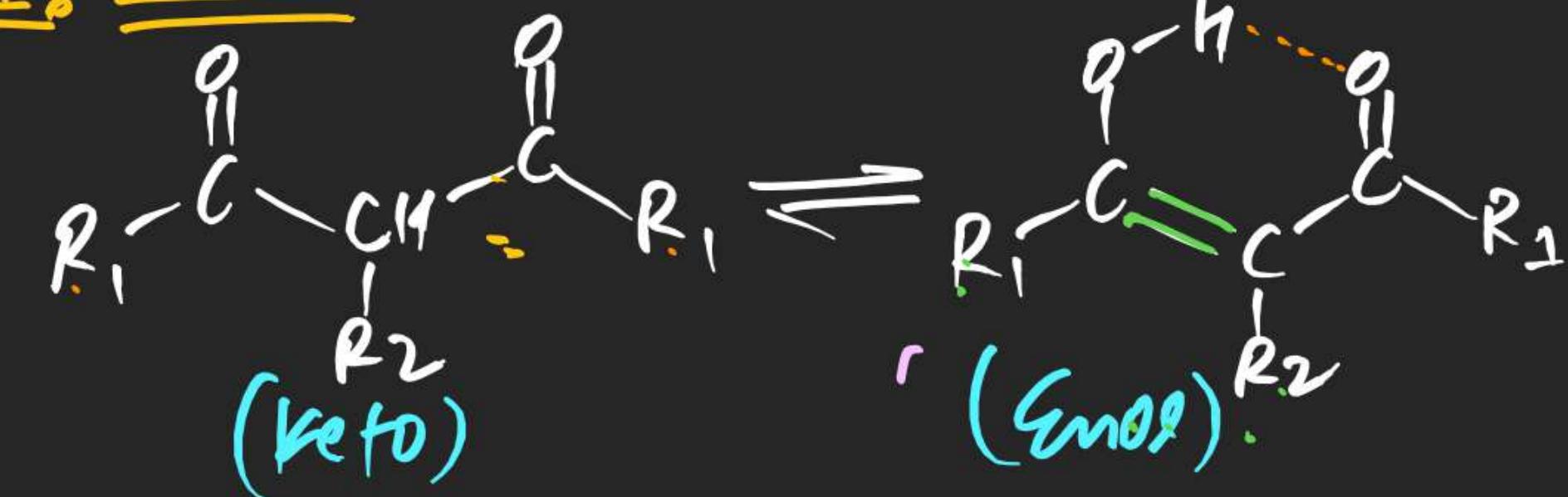
Anti-Aromatic Aromatic  
II > I > III





## (#) Factors affecting % Enrol :

### (i) Structure of keto :

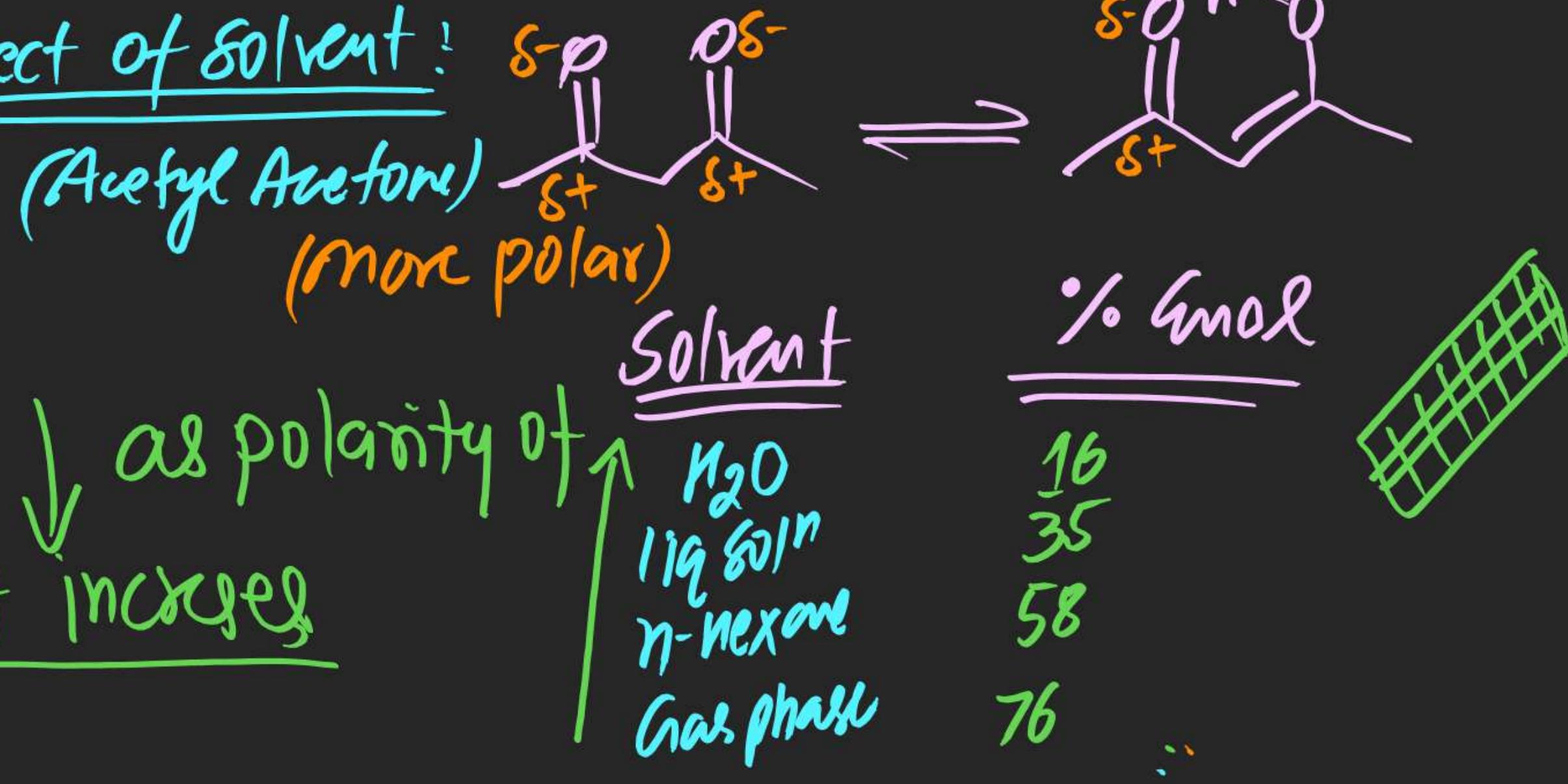


$\Rightarrow$  If size of  $R_2$  increases  $\Rightarrow$  steric crowding would increase in  $\text{Enol}$  & hence % Enol decreases.

$\Rightarrow$  If size of  $R_1$  increases  $\Rightarrow$  wd cause stronger chelation b/w O &  $\ell = 0$  hence increases % Engol.

(##) effect of Temp!

On increasing Temperature % Enol decreases  
bcz chelation gets destroyed.

(##) effect of solvent!

(11) Aromatic

(13) Aromatic

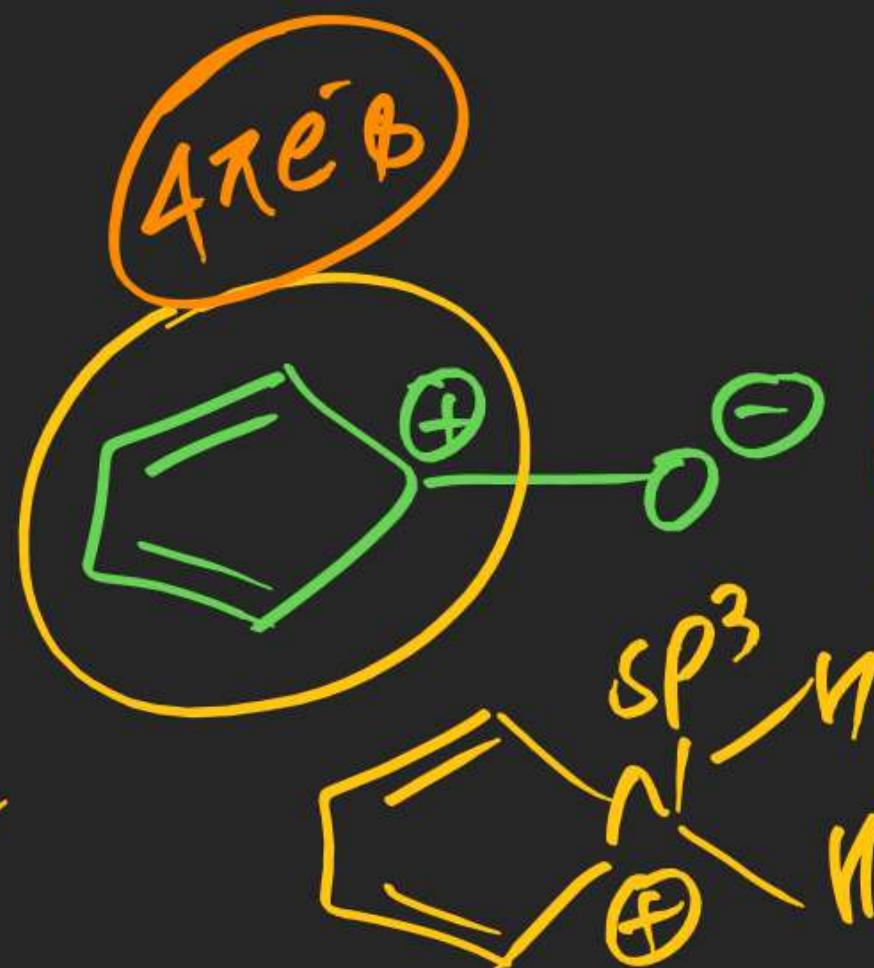
(14) "

(15) Anti Aromatic

(16) Non Aromatic

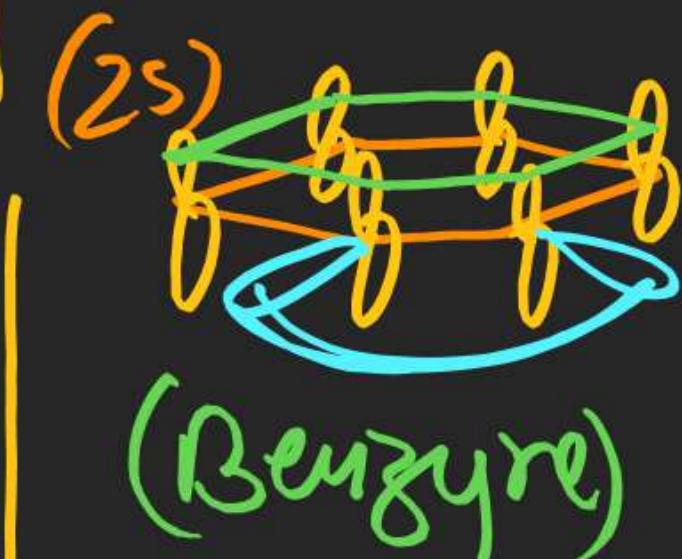
(17) Aromatic

(18) - (20) (Non Aromatic)

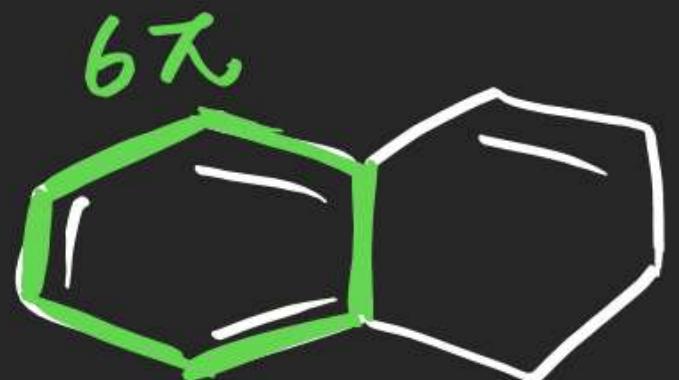


(21) - (30) Aromatic

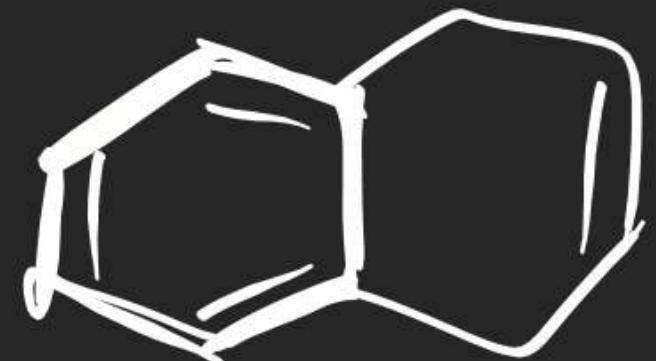
(22)



(28)

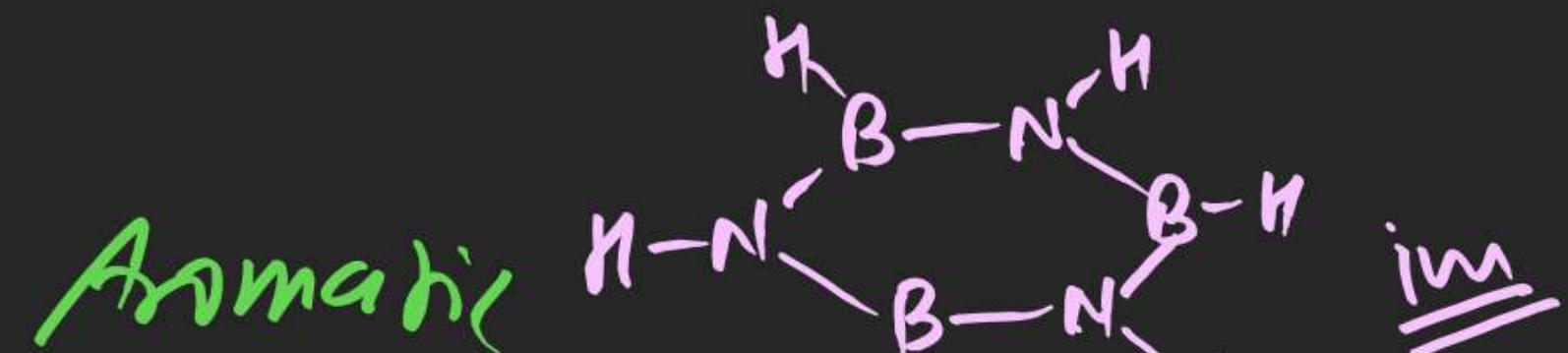


(29)



(31) And. Aromatic

(32) Aromatic



(33) - (39) Aromatic

(40) Non Aromatic

(41) & (42) Aromatic

(43) Non Aromatic



(44) - (45) Aromatic (Tub shaped)

(46) Non Aromatic

(47) Aromatic

(48) N-Aromatic

(49) Aromatic

(50) Nl-Aromatic

(51) Aromatic

(52) Aromatic

Sheat Excessus

SKM - Nucleus  
advancing



# General Organic Chemistry

## EXERCISE - III

**Q.1** Cyclopentadienyl anion is much more stable than allyl anion because

- (A) Cyclic anion is more stable than acyclic anion
- (B) Delocalised anion is more stable than localised anion
- (C) Cyclopentadienyl anion is aromatic in nature
- (D) None of these



Q.2 Select correct statement regarding given compounds :

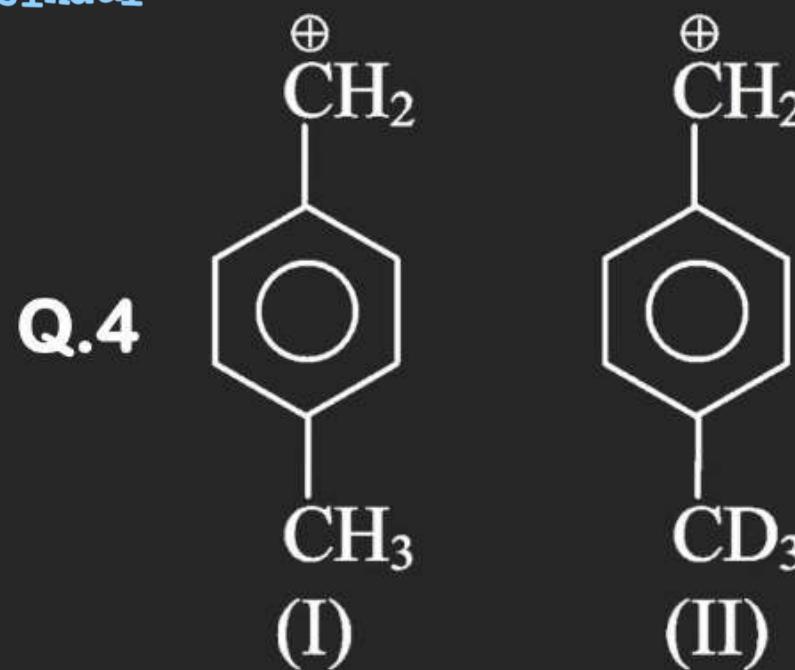


- (A) Boiling point of II is higher than I
- (B) Boiling point of II is lower than I
- (C) Compound I forms intramolecular H-bonding
- (D) Compound II forms intermolecular H-bonding

I      II      III      IV

**Q.3 In the compound,  $\text{CH}_3\text{--CH=CH--C}\equiv\text{N}$ , the most electronegative carbon is :**

- (A) Boiling point of II is higher than I**
- (B) Boiling point of II is lower than I**
- (C) Compound I forms intramolecular H-bonding**
- (D) Compound II forms intermolecular H-bonding**

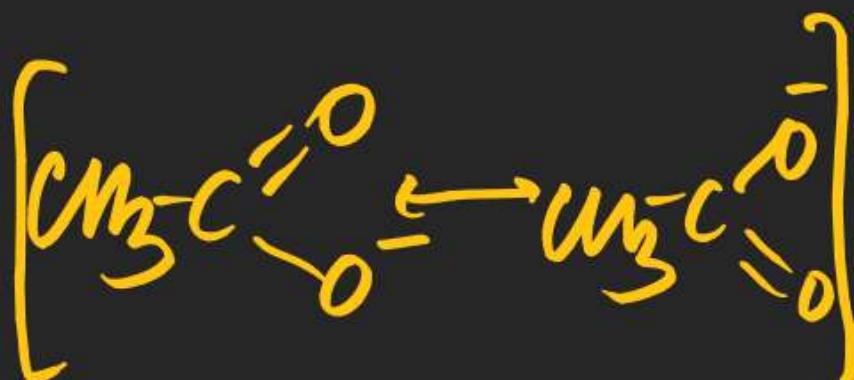


**Carbocation (I) is more stable than carbocation (II), because :**

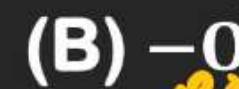
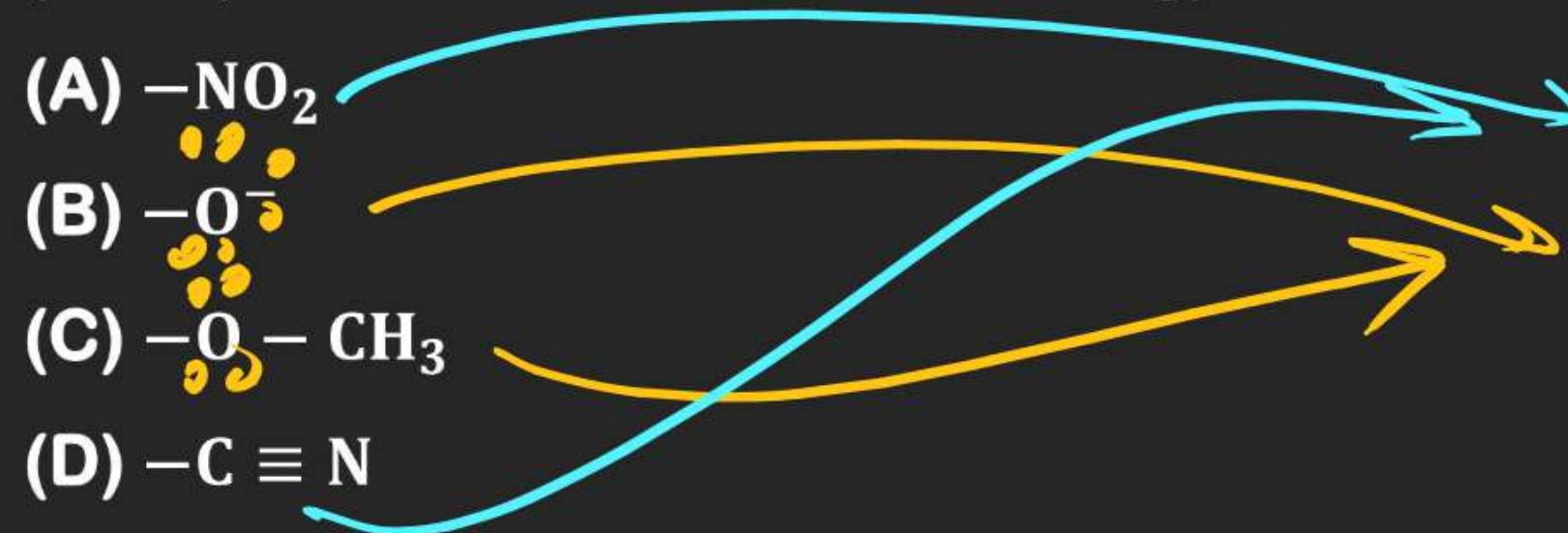
- (A)  $-CD_3$  has more +I effect than  $-CH_3$**
- (B)  $-CH_3$  has more +I effect than  $-CD_3$**
- (C)  $-CH_3$  has more +H effect than  $-CD_3$**
- (D)  $-CD_3$  has more +H effect than  $-CH_3$**

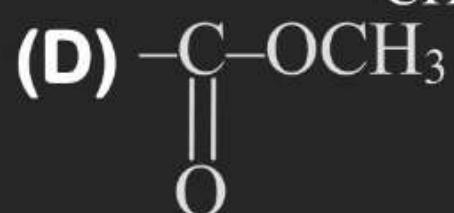
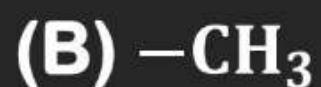
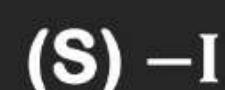
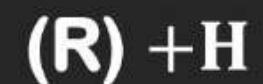
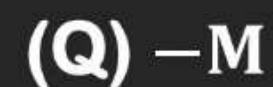
Q.5 Select correct statement :

- (A) Carbon-oxygen bonds are of equal length in acetate ion
- (B) Resonating structures of acetate ion are equivalent
- (C) Carbon-oxygen bonds are of unequal length in formate ion
- (D) Resonating structures of formate ion are equivalent



Q.6

**Column-I****(Group attached with benzene ring)****Column-II****(Effect shown by the group)**(P) **-R effect**(Q) **+R effect**(R) **+I effect**(S) **-I effect**

**Q.7      Column- I****(Groups attached to phenyl ring)****Column- II****(Effect shown)**

**Q.8 Match the column :****Column-I**

**(A) Group donate  $e^-$  inductively but does not donate/withdraw by resonance**

**(B) Group withdraw  $e^-$  inductively but does not donate/withdraw by resonance**

**(C) Group withdraw  $e^-$  inductively & donate  $e^-$  by resonance**

**(D) Group withdraw  $e^-$  inductively & withdraw  $e^-$  by resonance**

**Column-II**

**(P)  $-OH$**

**(Q)  $-NO_2$**

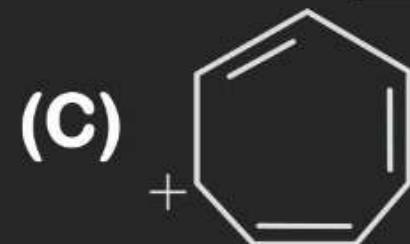
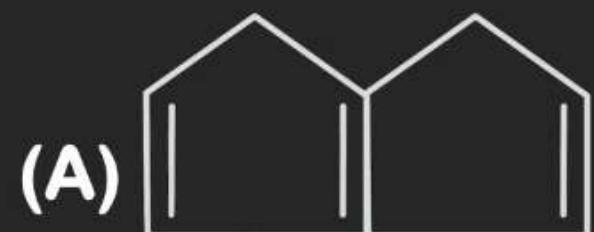
**(R)  $-CH_2 - CH_3$**

**(S)  $^+ -NH_3$**

**(T)  $-NH_2$**

**Q.9 Match the column I with column II.**

**Column-I**



**Column-II**

(P) Aromatic

(Q) Non-aromatic

(R) Anti-aromatic

(S) Cyclic structure



Because

Statement-II: More is the double bond character less is the bond length.

- (A) Statement-I is true, statement-II is true and statement-II is correct explanation for statement-I.
- (B) Statement-I is true, statement-II is true and statement-II is NOT the correct explanation for statement-I.
- (C) Statement-I is true, statement-II is false.
- (D) Statement-I is false, statement-II is true.

**Q.11 Statement-I:**  $\text{Me}_3\overset{+}{\text{C}}$  is more stable than  $\text{Me}_2\overset{+}{\text{CH}}$  and  $\text{Me}_2\overset{+}{\text{CH}}$  is more stable than the  $\text{Me}^+\text{H}_2$ .

**Because**

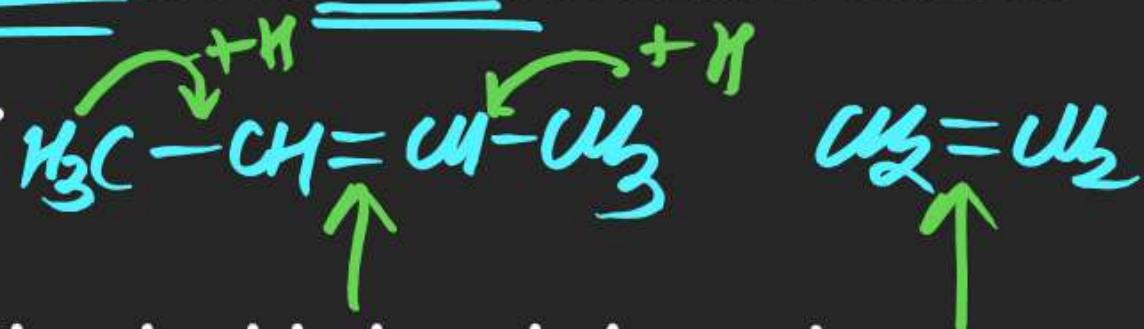
**Statement-II:** Greater the number of hyperconjugative structures, more is the stability of carbocation.

- (A) Statement-I is true, statement-II is true and statement-II is correct explanation for statement-I .
- (B) Statement-I is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-I .
- (C) Statement-I is true, statement-II is false.
- (D) Statement-I is false, statement-II is true.

**Q.12 Statement-I :** The potential energy barrier for rotation about C=C bond in 2-butene is much higher than that in ethylene.

Because

**Statement-II :** Hyperconjugation effect decreases the double bond character.



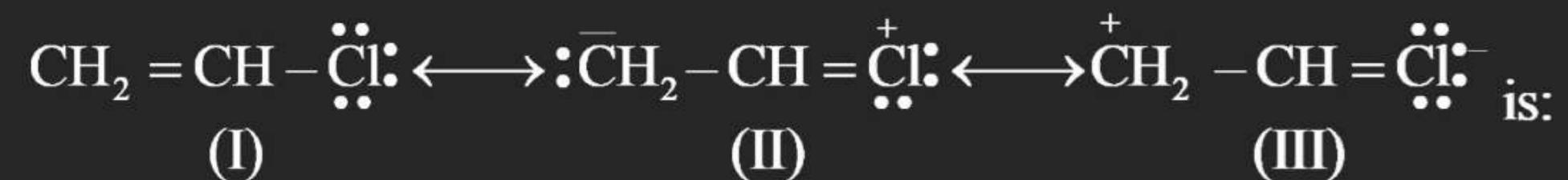
- (A) Statement-I is true, statement-II is true and statement-II is correct explanation for statement-I.
- (B) Statement-I is true, statement-II is true and statement-II is NOT the correct explanation for statement-I
- (C) Statement-I is true, statement-II is false
- (D) Statement-I is false, statement-II is true.

## Paragraph for Question 13 to 15

**The intramolecular delocalisation of n and non-bonding electrons without any change in the position of atoms is called resonance. Delocalisation may occur in conjugated system involving carbon atom and atom other than carbon.**

**Delocalisation makes system stable. More is the number of resonating structures, more is the stability of the system. A resonating structure is less stable when a higher electronegative atom has positive charge and when identical charges are present on adjacent atoms.**

- 13. The decreasing order of stability of the following resonating structures.**

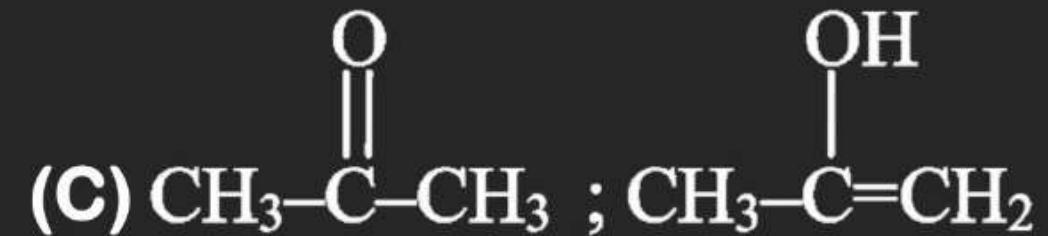


- (A) I > II > III      (B) II > III > I      (C) III > II > I      (D) I > III > II

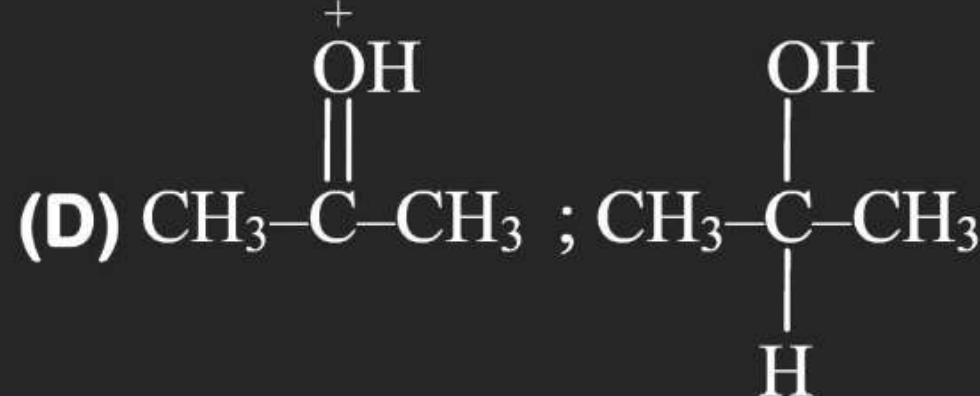
14. If A is  $\text{PhCH}_2$  and B is  $\text{CH}_2 = \text{CH} - \overset{+}{\text{CH}}_2$ , the greater number of resonating structure is of-
- (A) A      (B) B      (C) both A and B      (D) None of these

**15. Which of the following pairs represent resonance?**

(A)  $\text{CH}_2 = \text{CHOH}$ ;  $\text{CH}_3\text{CHO}$

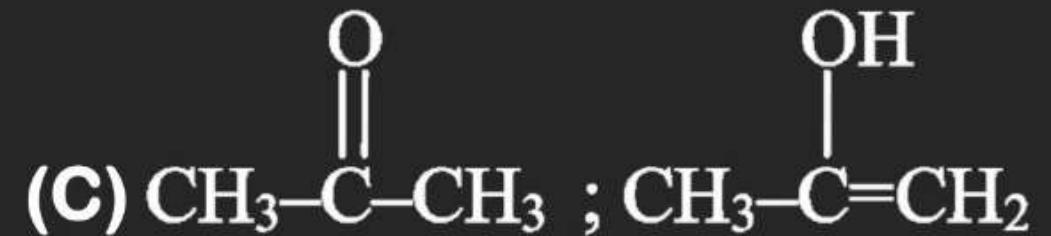


(B)  $\text{CH}_2 - \text{CHO}^\ominus$ ;  $\text{H}_2\text{C} = \text{CH} - \text{O}^\ominus$

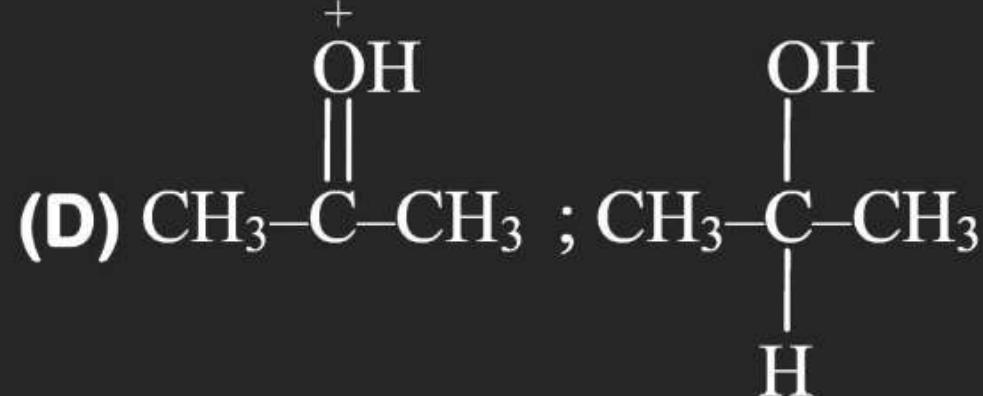


**15. Which of the following pairs represent resonance?**

(A)  $\text{CH}_2 = \text{CHOH}$ ;  $\text{CH}_3\text{CHO}$



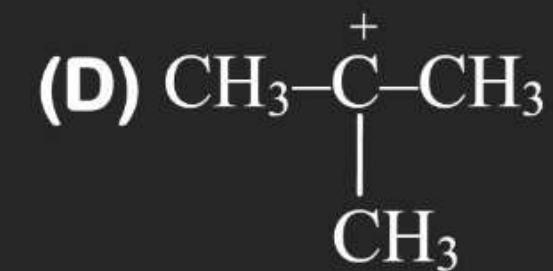
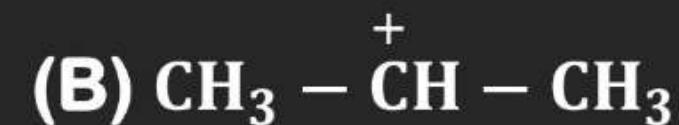
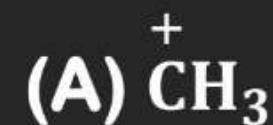
(B)  $\text{CH}_2 - \text{CHO}^\ominus$ ;  $\text{H}_2\text{C} = \text{CH} - \text{O}^\ominus$



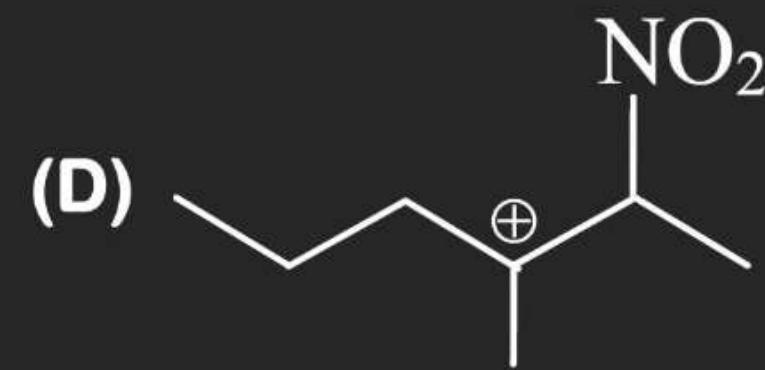
### Paragraph for Question 16 to 18

Carbocation is a species with positively charged carbon atom having six electrons in the valence shell after sharing. Carbocations are formed in the heterolysis of a bond and are planar species. Stability of carbocation is determined by inductive effect, hyperconjugation and resonance effect. Greater the number of contributing structures, more is the stability of a Carbocation. Electron releasing groups (+I effect) increases the stability of a carbocation whereas the electron withdrawing groups (-I effect) have an opposite effect.

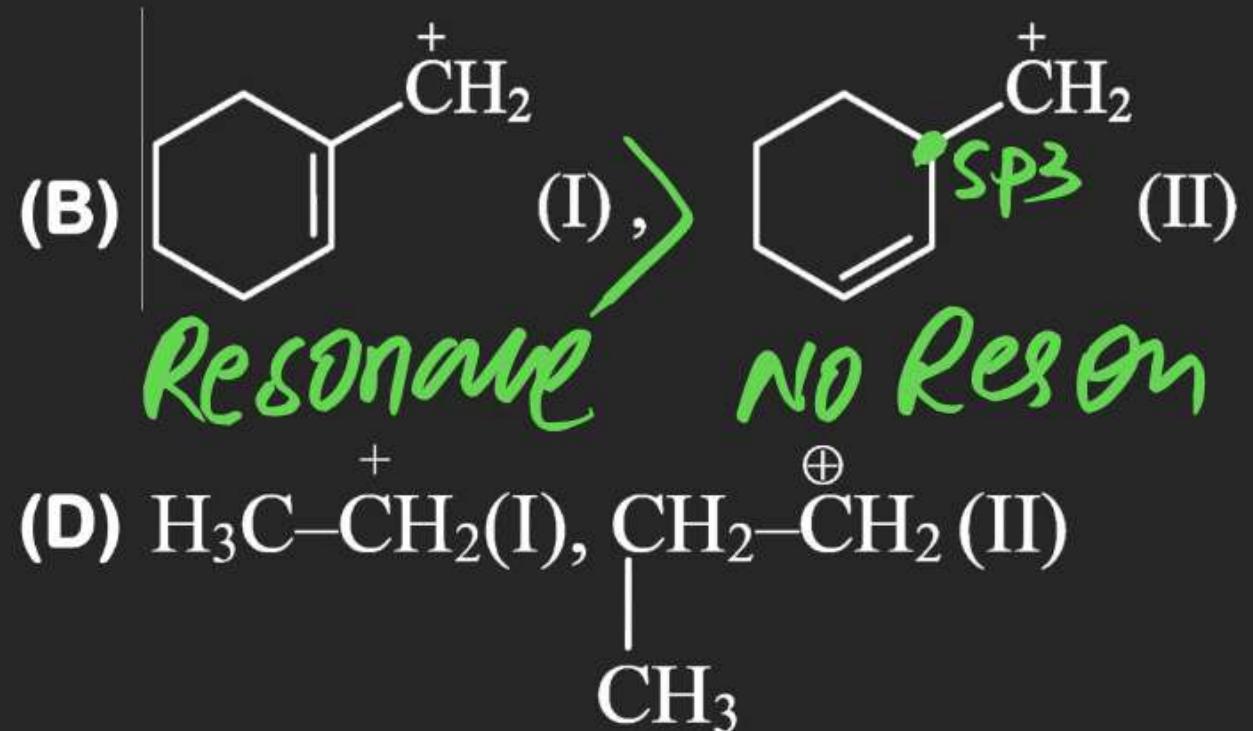
16. Which of the following is most stable carbocation?



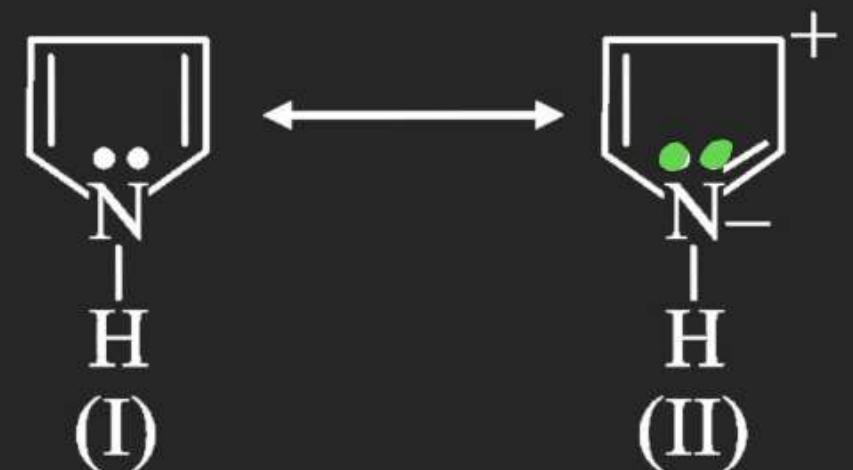
17. The most stable carbocation among the following :



19. In which of the following cases, the carbocation (I) is less stable than the carbocation (II)?



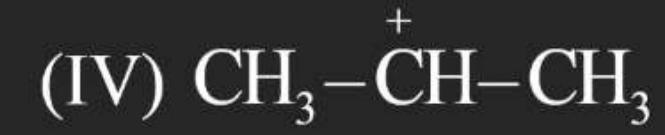
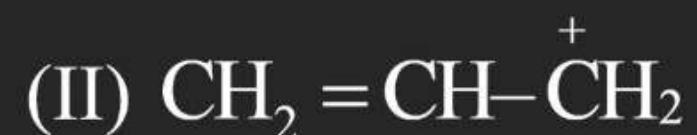
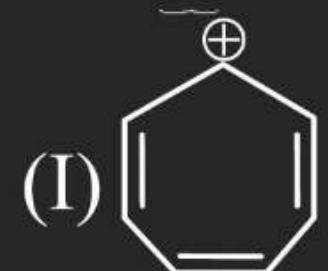
**20. Examine the following two structures for pyrrole and choose the correct statement given below**



- (A) II is not an acceptable resonating structure because carbonium ions is less stable than nitride ion
  - (B) II is not an acceptable resonating structure because there is charge separation
  - (C) II is not an acceptable resonating structure because nitrogen has ten valence electrons
  - (D) II is an acceptable resonating structure

21. **Delocalization of electrons increases molecular stability because :**
- (A) Potential energy of the molecule decreases**
  - (B) Electron-electron repulsion decreases**
  - (C) Both (A) and (B)**
  - (D) Electron-electron repulsion increases**

22. The most stable and the least stable carbocation among



are respectively:

(A) II, I

(B) III, IV

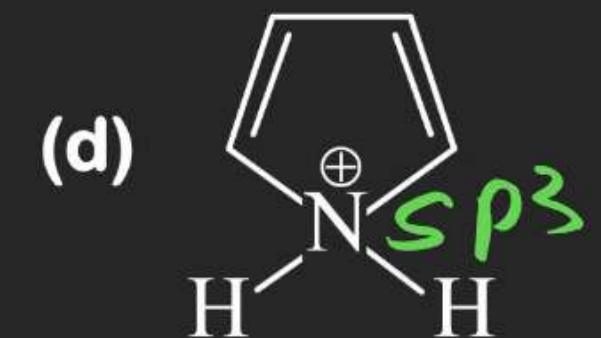
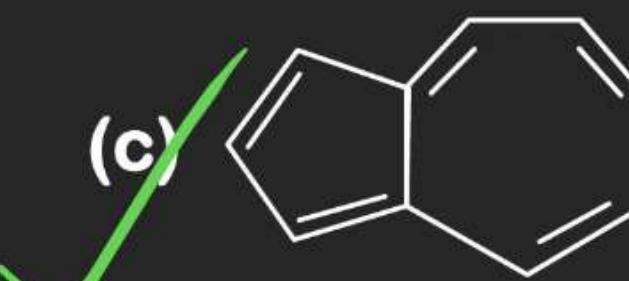
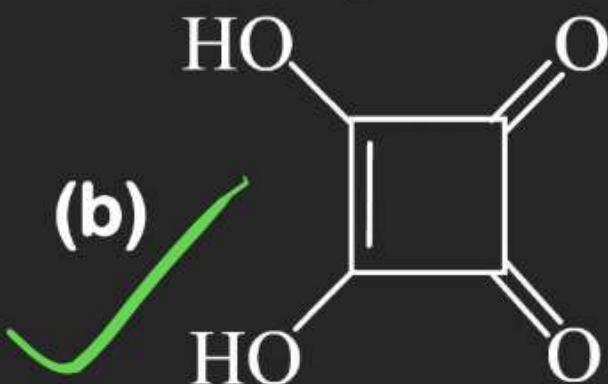
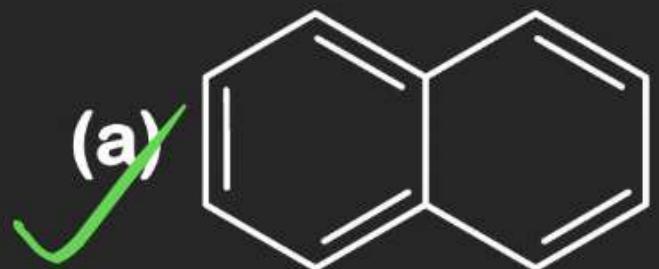
(C) I, II

(D) I, IV

23. **Most stable carbocation is formed by the heterolysis of:**

- (A)  $(\text{CH}_3)_3\text{CBr}$       (B)  $(\text{C}_6\text{H}_5)_3\text{CBr}$       (C)  $(\text{C}_6\text{H}_5)_2\text{CHBr}$       (D)  $\text{C}_6\text{H}_5\text{CH}_2\text{Br}$

## 24. Total number of aromatic compounds



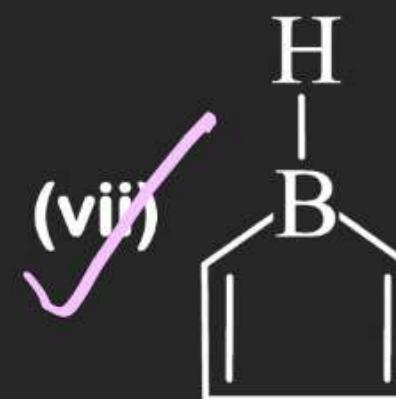
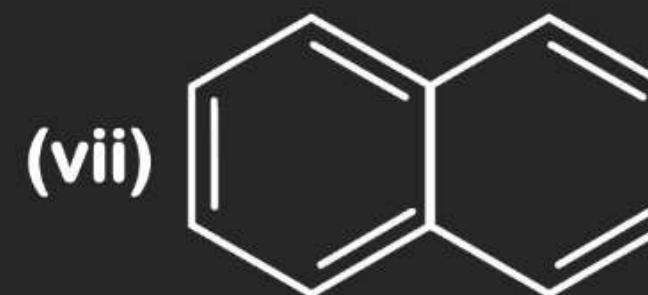
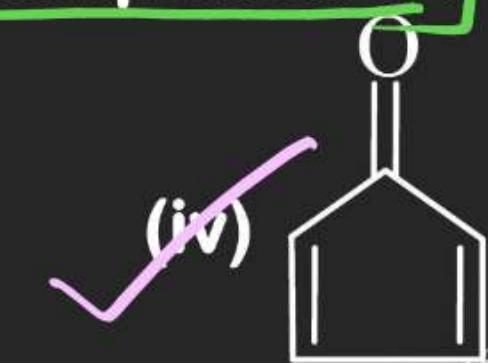
Non Aromatic



Non Aromatic

AntiAromatic

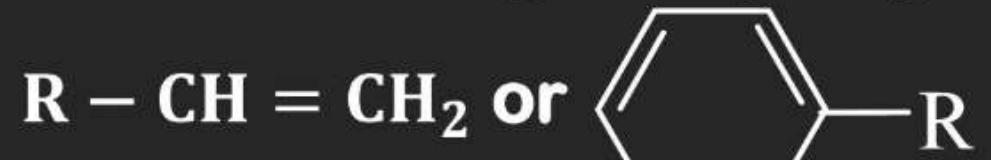
25. Identify total number of compounds which are unstable at room temperature ?



**General Organic Chemistry**  
**EXERCISE - IV (JEE MAINS)**

**Q.1 In the following benzyl/allyl system**

**[AIEEE-2002]**



**(R is alkyl group)**

**decreasing order of inductive effect is-**

- (1)  $(CH_3)_3C^- > (CH_3)_2CH^- > CH_3CH_2^-$**
- (2)  $CH_3 - CH_2^- > (CH_3)_2CH^- > (CH_3)C^-$**
- (3)  $(CH_3)_2CH^- > CH_3CH_2^- > (CH_3)_3C^-$**
- (4) None of these**

**Q.2 In the anion  $\text{HCOO}^-$  the two carbon-oxygen bonds are found to be of equal length.**

**What is the reason for it-**

**[AIEEE-2003]**

- (1) Electronic orbits of carbon atoms are hybridised**
- (2) The  $\text{C} = \text{O}$  bond is weaker than the  $\text{C} - \text{O}$  bond**
- (3) The anion  $\text{HCOO}^-$  has two resonating structure**
- (4) The anion is obtained by removal of a proton from the acid molecule**

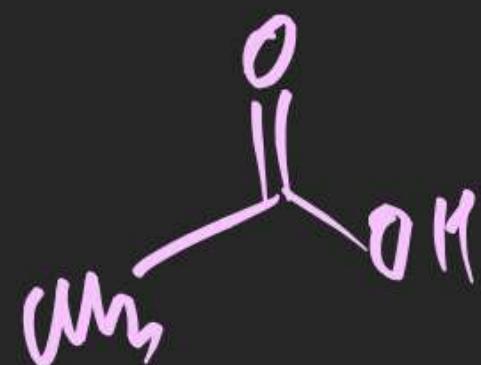
Q.3 Which one of the following does not have  $sp^2$  hybridised carbon

[AIEEE-2004]

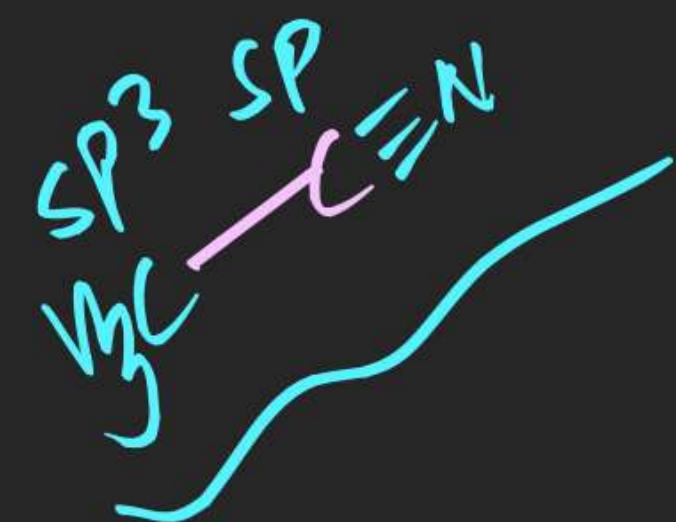
(1) Acetamide



(2) Acetic acid



(3) Acetonitrile



(4) Acetone



Q.4 Due to the presence of an unpaired electron, free radicals are -

[AIEEE-2005]

- (1) Chemically inactive
- (2) Chemically reactive
- (3) Cations
- (4) Anions

**Q.5 The increasing order of stability of the following free radicals is**

**[AIEEE-2006]**

- (1)  $(C_6H_5)_3\dot{C} < (C_6H_5)_2\dot{C}H < (CH_3)_3\dot{C} < (CH_3)_2\dot{C}H$
- (2)  $(C_6H_5)_2\dot{C}H < (C_6H_5)_3\dot{C} < (CH_3)_3\dot{C} < (CH_3)_2\dot{C}H$
- (3)  $(CH_3)_2\dot{C}H < (CH_3)_3\dot{C} < (C_6H_5)_3\dot{C} < (C_6H_5)_2\dot{C}H$
- (4)  $(CH_3)_2\dot{C}H < (CH_3)_3\dot{C} < (C_6H_5)_3\dot{C}H < (C_6H_5)_3\dot{C}$

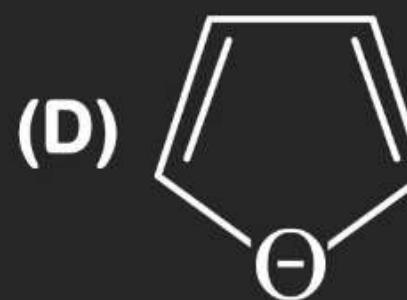
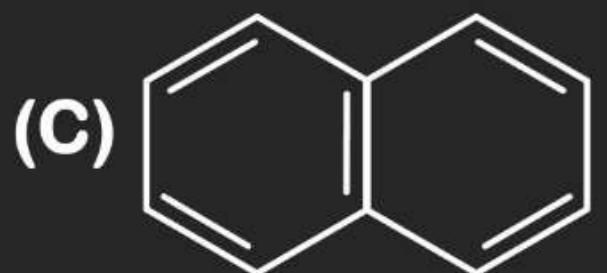
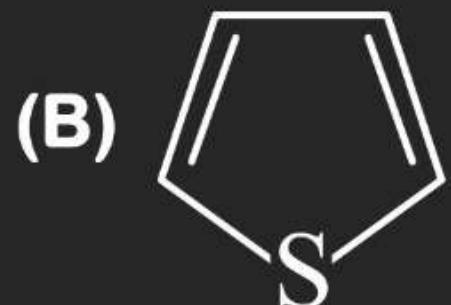
**Q.6 Arrange the carbanions,  $(\text{CH}_3)_3\bar{\text{C}}$ ,  $\bar{\text{C}}\text{Cl}_3$ ,  $(\text{CH}_3)_2\bar{\text{C}}\text{H}$ ,  $\text{C}_6\text{H}_5\bar{\text{C}}\text{H}_2$  in order of their decreasing stability**

**[AIEEE-2009]**

- (1)  $\bar{\text{C}}\text{Cl}_3 > \text{C}_6\text{H}_5\bar{\text{C}}\text{H}_2 > (\text{CH}_3)_2\bar{\text{C}}\text{H} > (\text{CH}_2)_3\bar{\text{C}}$
- (2)  $(\text{CH}_3)_3\bar{\text{C}} > (\text{CH}_3)_2\bar{\text{C}}\text{H} > \text{C}_6\text{H}_5\bar{\text{C}}\text{H}_2 > \bar{\text{C}}\text{Cl}_3$
- (3)  $\text{C}_6\text{H}_5\bar{\text{C}}\text{H}_2 > \bar{\text{C}}\text{Cl}_3 > (\text{CH}_3)_3\bar{\text{C}} > (\text{CH}_3)_2\bar{\text{C}}\text{H}$
- (4)  $(\text{CH}_3)_2\bar{\text{C}}\text{H} > \bar{\text{C}}\text{Cl}_3 > \text{C}_6\text{H}_5\bar{\text{C}}\text{H}_2 > (\text{CH}_3)_3\bar{\text{C}}$

**Q.7 The non aromatic compound among the following" is :-**

**[AIEEE-2011]**



*Para*

Q.8 ortho-Nitrophenol is less soluble in water than *o*-and *m* - Nitrophenols because :

[AIEEE-2012]

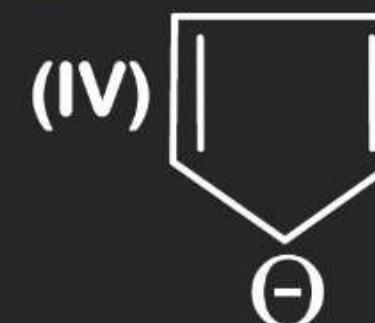
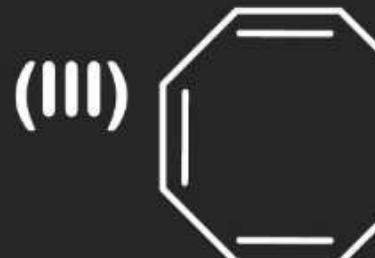
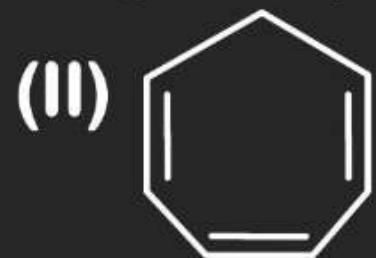
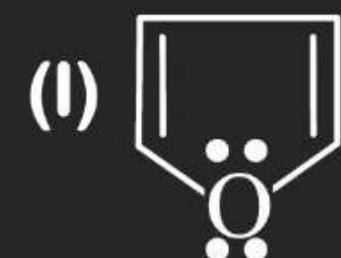
- (1) Melting point of o-Nitrophenol is lower than those of m - and p-isomers
- (2) o- Nitrophenol is more volatile in steam than those of m - and p-isomers
- (3) o-Nitrophenol shows Intramolecular H-bonding
- (4) o-Nitrophenol shows Intermolecular H-bonding

Q8



**Q.9 Which of the following compounds are antiaromatic :-**

**[AIEEE-2012(Online)]**



**(1) (III) and (VI)**

**(2) (II) and (V)**

**(3) (I) and (V)**

**(4) (V) and (VI)**

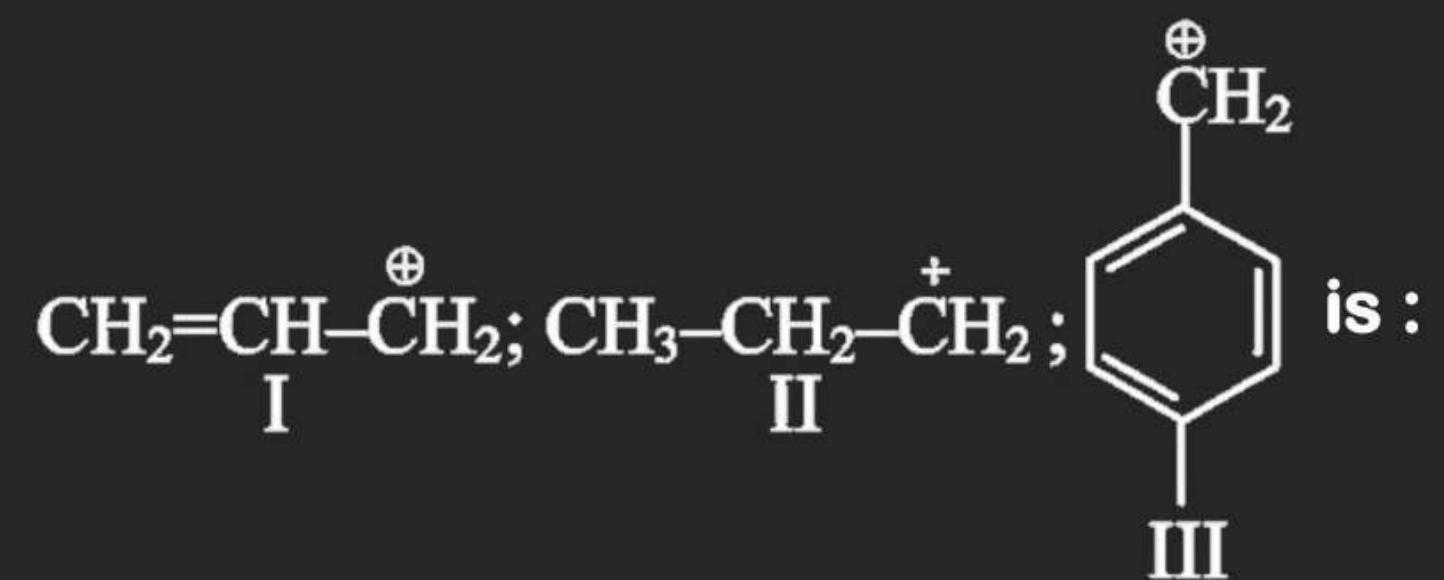
**Q.10 Among the following the molecule with the lowest dipole moment is :-**

**[AIEEE-2012(Online)]**

- (1)  $\text{CHCl}_3$
- (2)  $\text{CH}_2\text{Cl}_2$
- (3)  $\text{CCl}_4$
- (4)  $\text{CH}_3\text{Cl}$

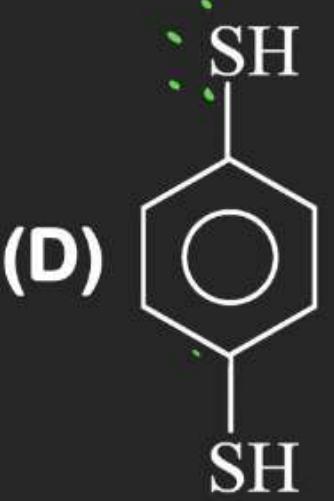
**Q.11 The order of stability of the following carbocations**

**[JEE-MAIN-2013]**



Q.12 For which of the following molecule significant  $\mu \neq 0$

[JEE-MAIN-2014]

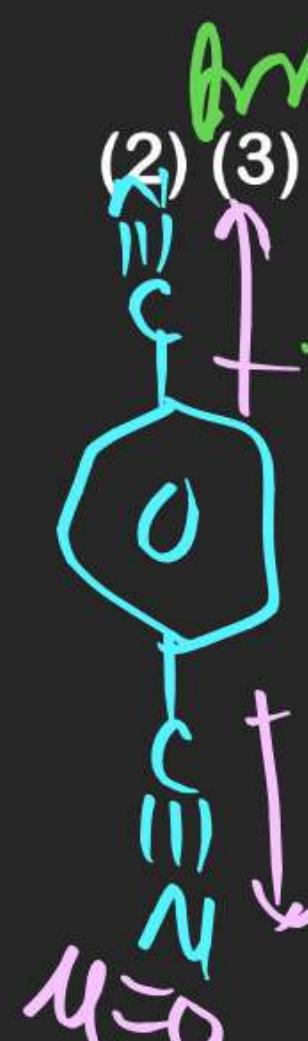


(1) Only (3)



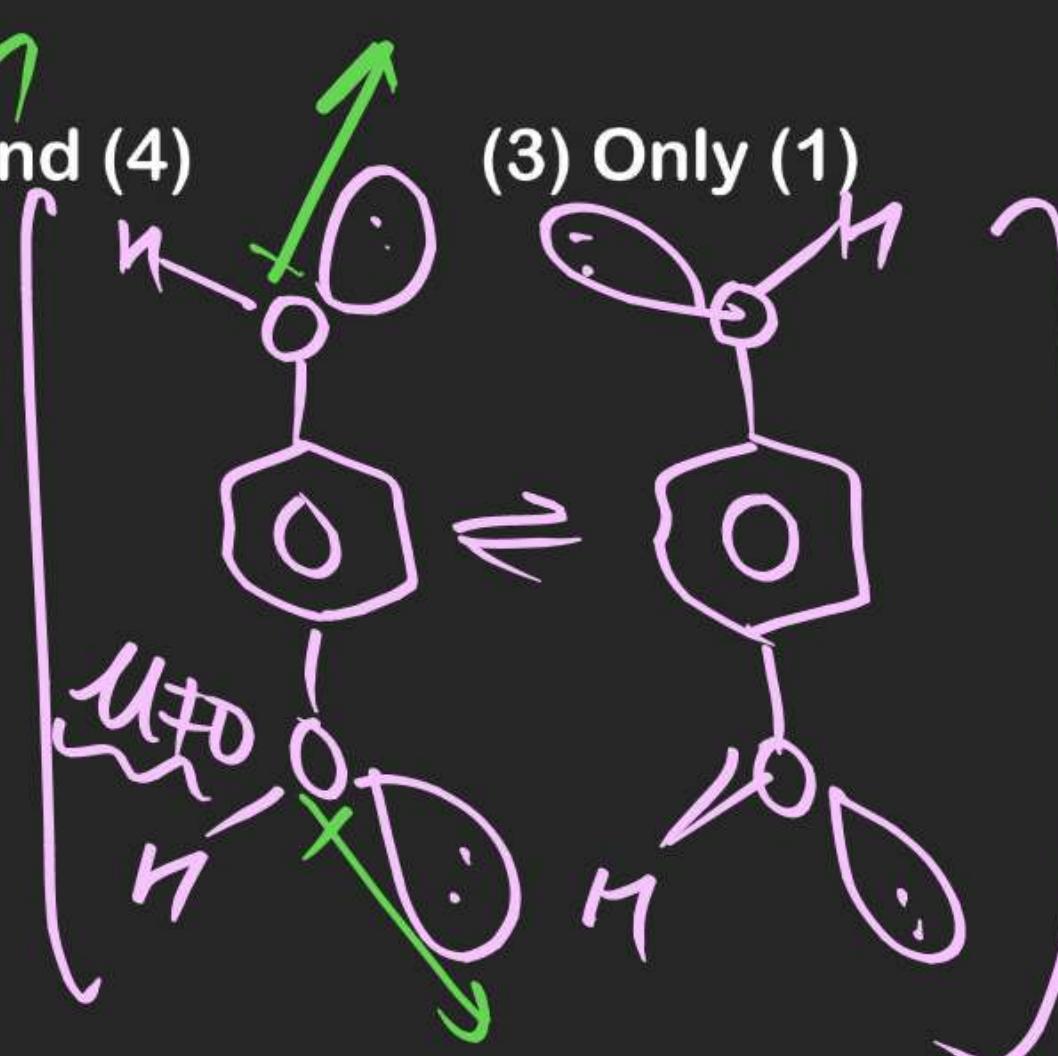
$$\mu > 0$$

(2) (3) and (4)



$$\mu = 0$$

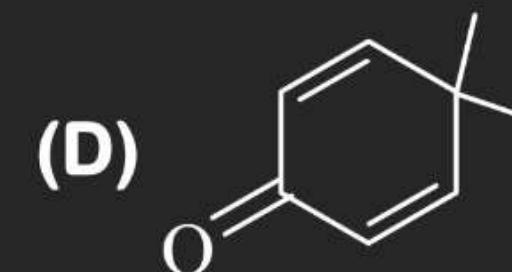
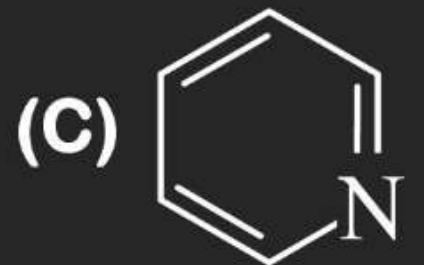
(3) Only (1)



$$\mu > 0$$

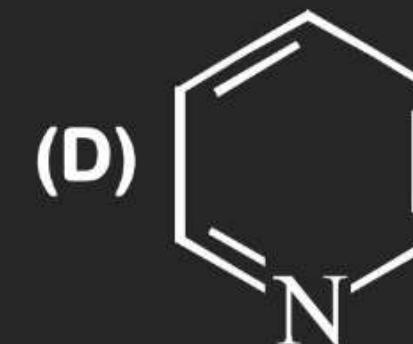
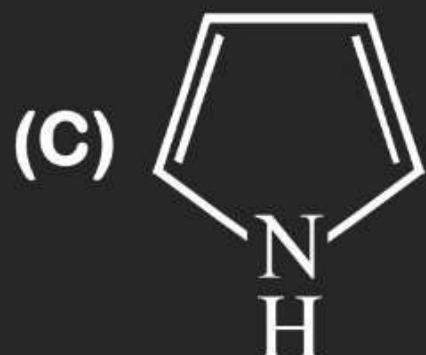
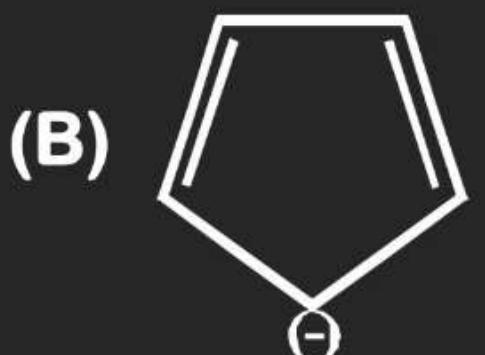
(4) (1) and (2)

Q.13 Which of the following molecules is least resonance stabilized ?



**Q.14 Which of the following compounds is not aromatic?**

**[JEE MAIN-2019]**



**Q.15 Which compound(s) out of the following is/are not aromatic ?**

**[JEE MAIN-2019]**



(A)



(B)



(C)



(D)

**(1) (A) and (C)**

**(2) (B), (C) and (D)**

**(3) (C) and**

**(D) (4) (B)**

**General Organic Chemistry**  
**EXERCISE - V (JEE MAINS)**

**Q.1 Which one of the following has the smallest heat of hydrogenation per mole of H<sub>2</sub> ?**

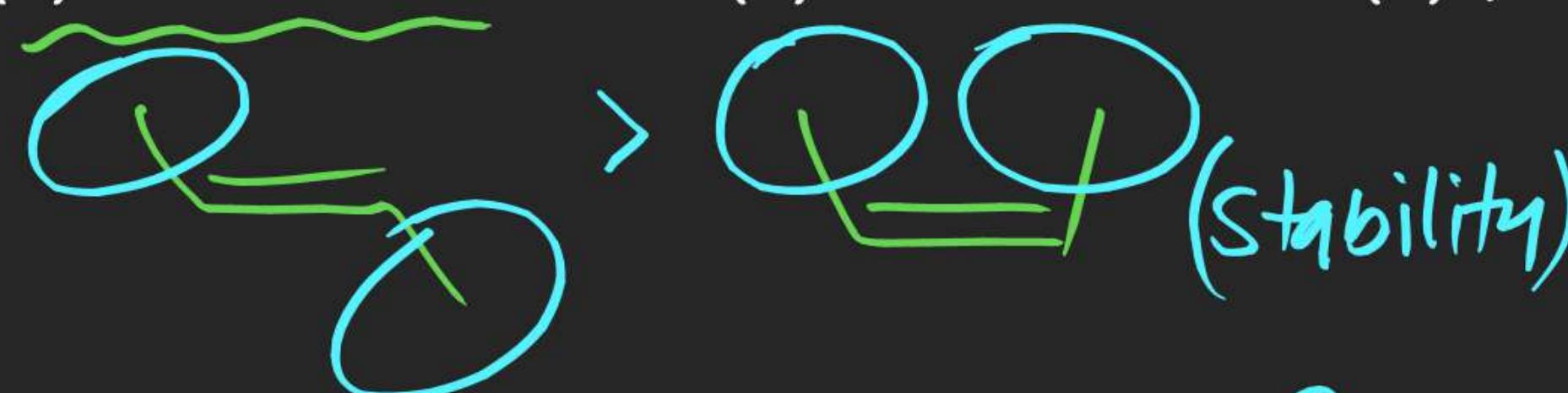
**[IIT-93]**

**(A) 1-Butene**

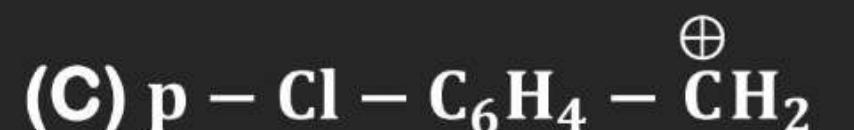
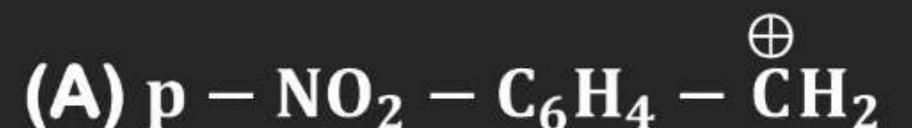
**(B) trans-2-Butene**

**(C) cis-2-Butene**

**(D) 1, 3-Butadiene**



non  $\alpha$  total no. of  $\alpha$ -Bond  
d  $\frac{1}{\text{Stability}}$

**Q.2 Most stable carbonium ion is****[IIT-95]**

**Q.3 Arrange the following compounds in order of increasing dipole moment : [IIT-96]**

toluene (I)

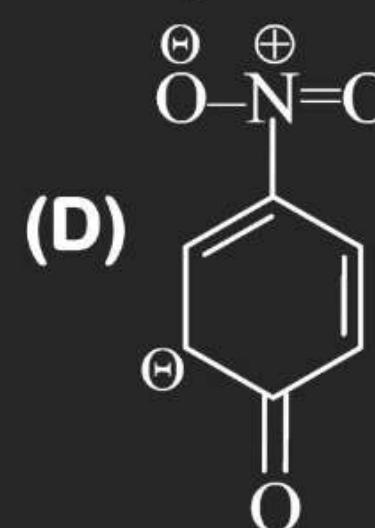
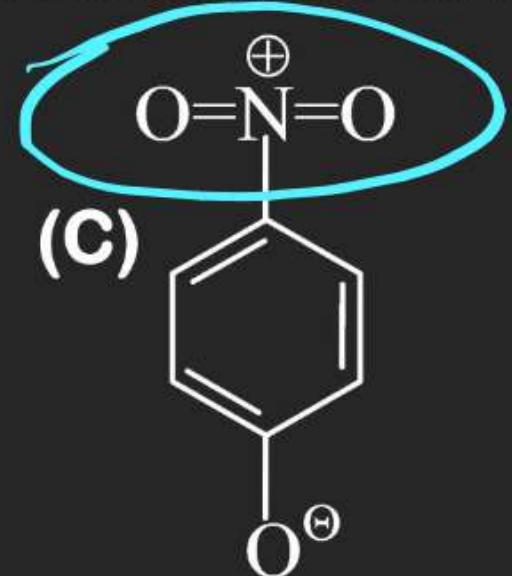
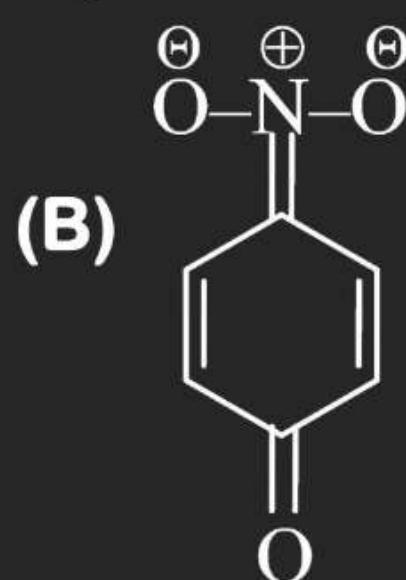
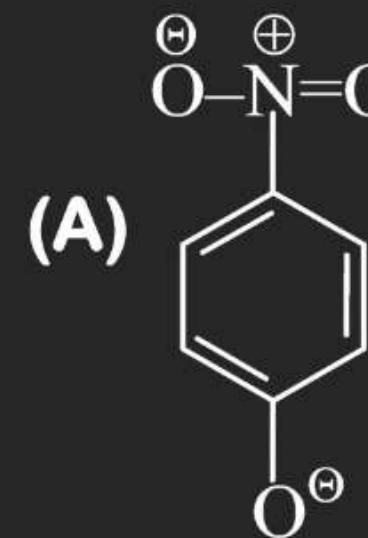
m-dichlorobenzene (II)

o-dichlorobenzene (III)

p-dichlorobenzene (IV)

- (A) I < IV < II < III      (B) IV < I < II < III      (C) IV < I < III < II      (D) IV < II < I < III

**Q.4 The most unlikely representation of resonance structure of p-nitrophenoxide ion is -**



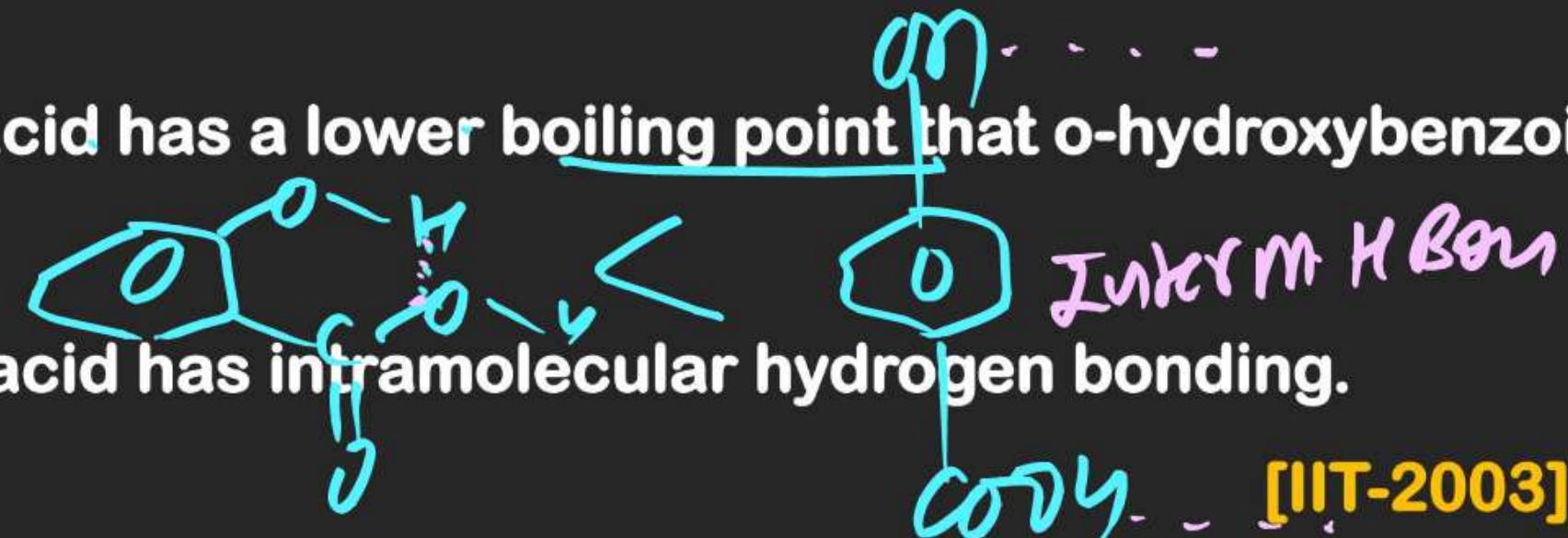
[IIT-99]

**Q.5 An aromatic molecule will not**

**[IIT-99]**

- (A) have  $4n\pi$  electrons
- (B) have  $(4n + 2)\pi$  electrons
- (C) be planar
- (D) be cyclic

Q.6 Statement-I: p-Hydroxybenzoic acid has a lower boiling point than o-hydroxybenzoic acid. Because



- (A) Statement-I is True, Statement-II is True ; Statement-II is a correct explanation for Statement-I
- (B) Statement-I is True, Statement-II is True ; Statement-II is NOT a correct explanation for Statement-I
- (C) Statement-I is True, Statement-II is False.
- (D) Statement-I is False, Statement-II is True.

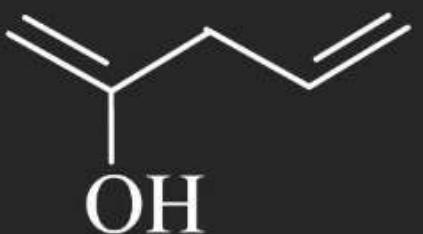
**Q.7 Among the following, the molecule with the highest dipole moment is [IIT-2003]**



$$(\mu = 0)$$

**Q.8 Give resonating structures of following compound.**

**[IIT-2003]**



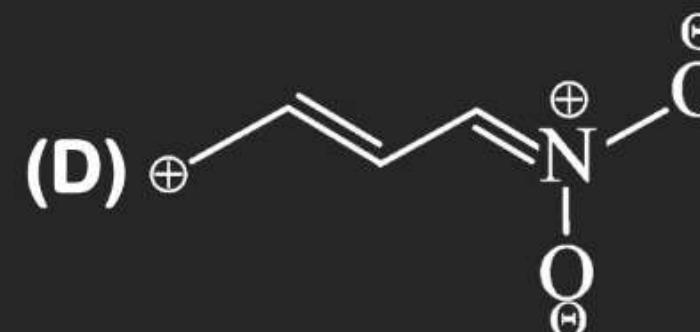
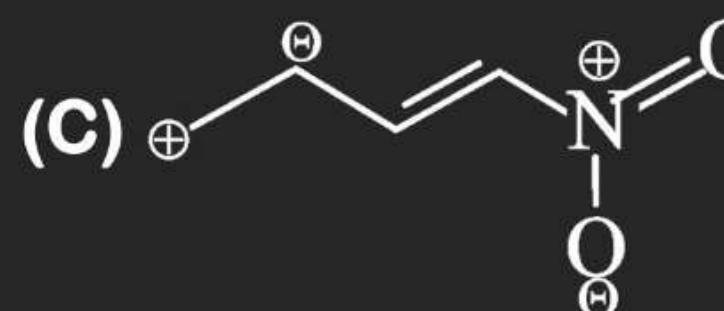
**Q.9 Which of the following is least stable :**

**[IIT-2005]**



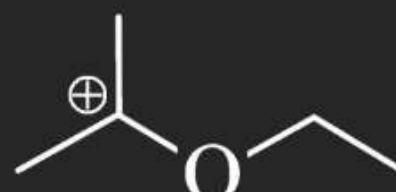
**Q.10 Among the following, the least stable resonance structure is -**

**[IIT-2007]**



**Q.11 The correct stability order for the following species is :**

**[IIT-2008]**



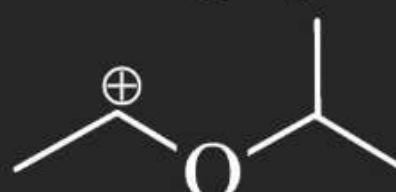
(I)

- (A) **II > IV > I > III**



(II)

- (B) **I > II > III > IV**



(III)

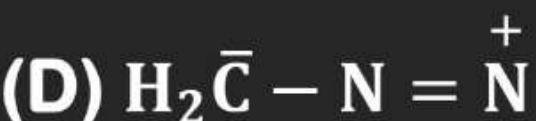
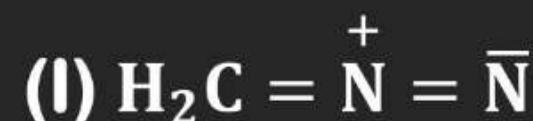
- (C) **II > I > IV > III**



(IV)

- (D) **I > III > II > IV**

**Q.12 The correct stability order of the following resonance structures is [IIT-2009]**



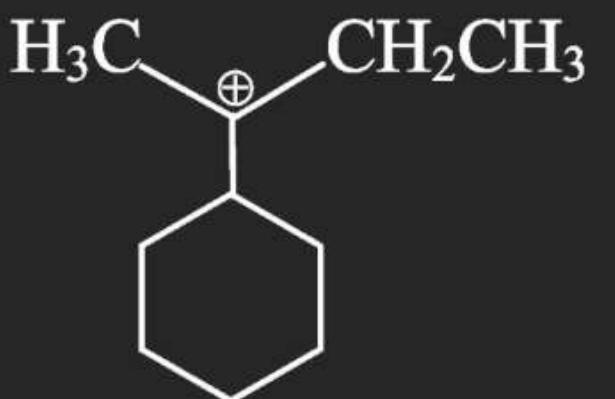
(A) (I) > (II) > (IV) > (III)

(B) (I) > (III) > (II) > (IV)

(C) (II) > (I) > (III) > (IV)

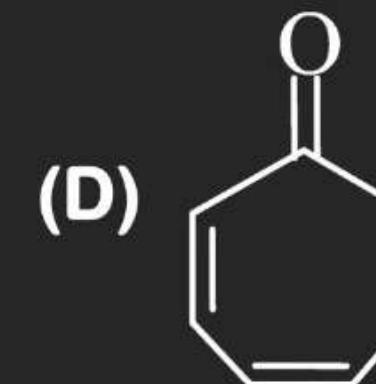
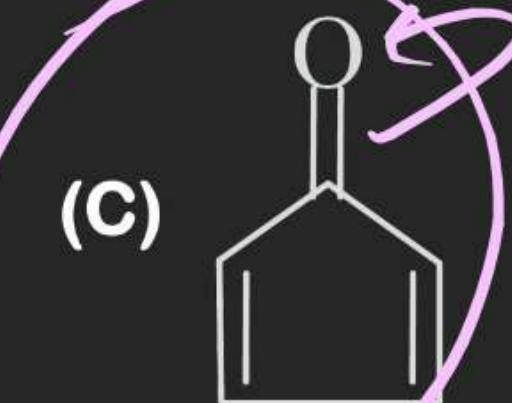
(D) (III) > (I) > (IV) > (II)

**Q.13** The total number of contributing structures showing hyperconjugation (involving C-H bonds) for the following carbocation is. [IIT-2011]



Q.14 Which of the following molecules, in pure form, is (are) unstable at room temperature?

[IIT-2012]

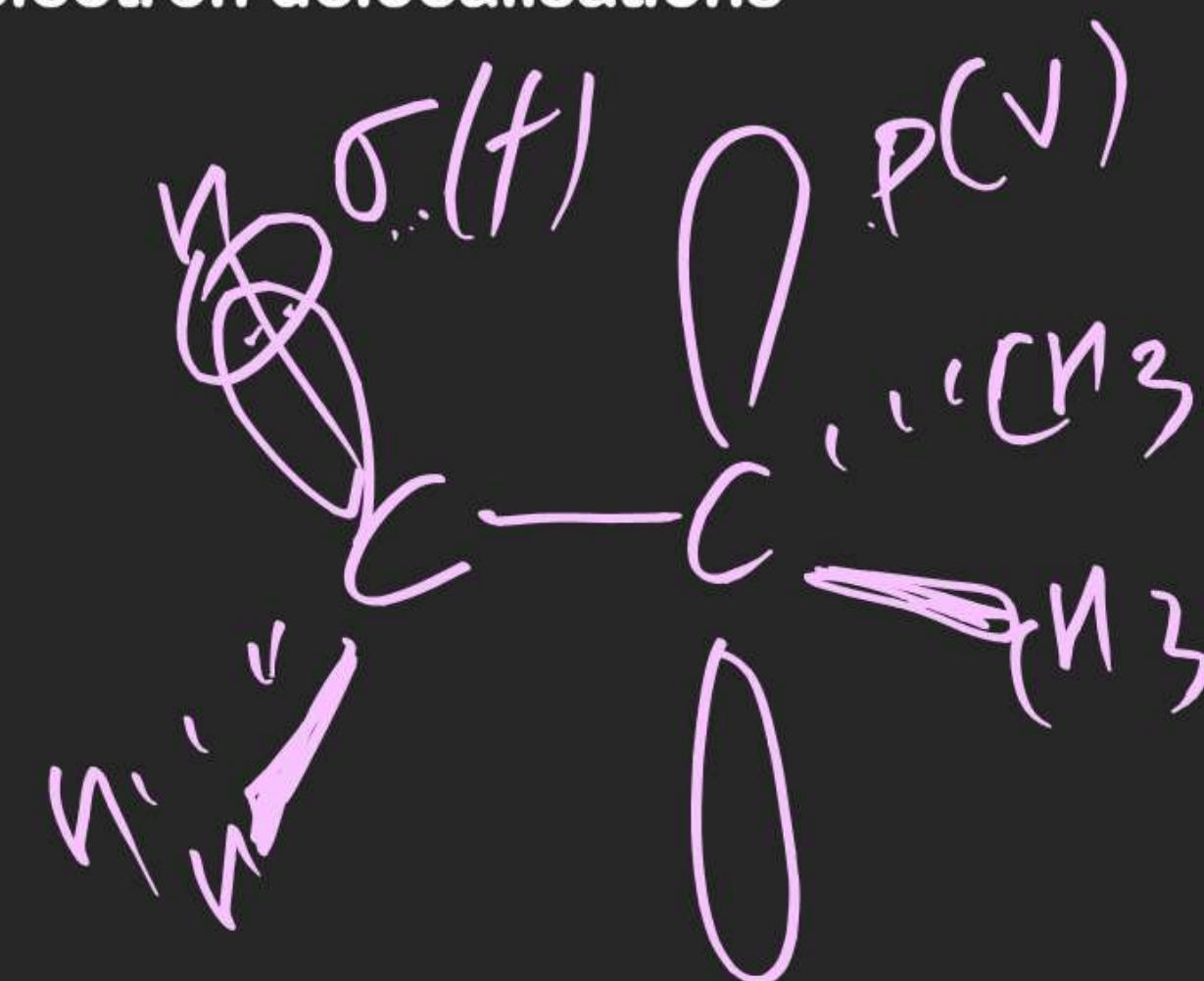


Mark aromatic  
(B)  
(C)



Q.15 The hyperconjugative stabilities of tert-butyl cation and 2-butene, respectively, are due to [IIT-2013]

- (A)  $\sigma \rightarrow p$  (empty) and  $\sigma \rightarrow \pi$  electron delocalisations
- (B)  $\sigma \rightarrow \sigma$  and  $\sigma \rightarrow \pi$  electron delocalisations
- (C)  $\sigma \rightarrow p$  (filled) and  $\sigma \rightarrow \pi$  electron delocalisations
- (D)  $p$  (filled)  $\rightarrow \sigma$  and  $\sigma \rightarrow \pi$  electron delocalisations

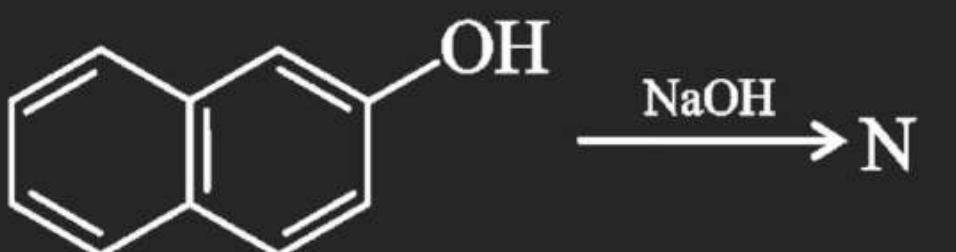


**Q.16 The total number of lone-pairs of electrons in melamine is**

**[IIT-2013]**

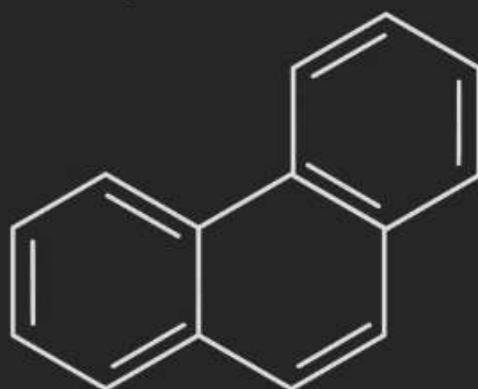
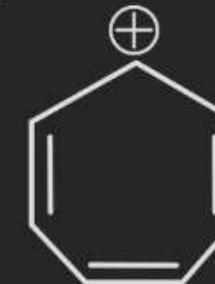
**Q.17 The number of resonance structures for N is :**

**[IIT-2015]**



**Q.18 Among the following the number of aromatic compound(s) is**

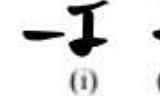
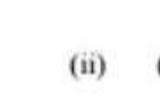
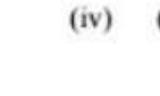
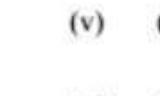
**[JEE ADV. 2017]**





## EXERCISE # I

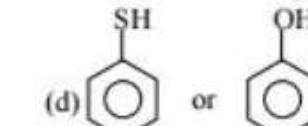
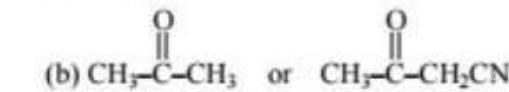
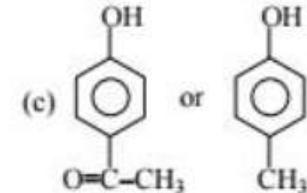
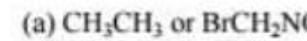
I. Write correct order of acidic strength of following compounds:

- (i)  (a)  $\text{NO}_2\text{-CH}_2\text{-C}(=\text{O})\text{-OH}$
- (ii)  (c)  $\text{Ph}\text{-CH}_2\text{-C}(=\text{O})\text{-OH}$
- (iii)  (a)  $\text{CH}_3\text{-CH}_2\text{-CH(F)-C}(=\text{O})\text{-OH}$
- (iv)  (c)  $\text{Cl}-\text{CH}_2-\text{C}(\text{Cl})(\text{Cl})-\text{C}(=\text{O})\text{-OH}$
- (v)  (a)  $\text{Cyclopropane-COOH}$
- (vi)  (a)  $\begin{matrix} \text{COOH} \\ | \\ \text{CH}_2 \\ | \\ \text{COOH} \end{matrix}$
- (vii)  (a)  $\text{H-F}$       (b)  $\text{H-Cl}$       (c)  $\text{H-Br}$       (d)  $\text{H-I}$
- (viii)  (a)  $\text{CH}_4$       (b)  $\text{NH}_3$       (c)  $\text{H}_2\text{O}$       (d)  $\text{HF}$
- (ix)  (a)  $\text{F-CH}_2\text{-CH}_2\text{-O-H}$       (b)  $\text{NO}_2\text{-CH}_2\text{-CH}_2\text{-O-H}$   
 (c)  $\text{Br-CH}_2\text{-CH}_2\text{-O-H}$       (d)  $\text{NH}_3^+-\text{CH}_2\text{-CH}_2\text{-O-H}$
- (x)  (a)  $\text{CH}_3\text{COOH}$       (b)  $\text{CH}_3\text{CH}_2\text{OH}$       (c)  $\text{C}_6\text{H}_5\text{OH}$       (d)  $\text{C}_6\text{H}_5\text{SO}_3\text{H}$

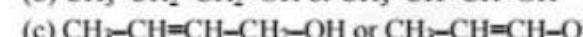
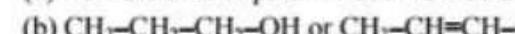
$a > b > c > d$

## (Organic Chemistry) GENERAL ORGANIC CHEMISTRY A

2. Among the following pairs, which compound is stronger acid?

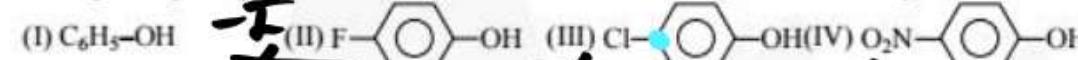


3. Which of the following would you predict to be the stronger acid?



-I > Br > Cl > F

4. Arrange the given phenol & its derivative in their decreasing order of acidity:

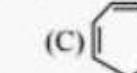
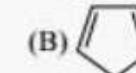
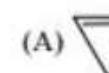


Select the correct answer from the given code:

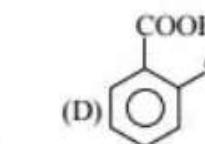
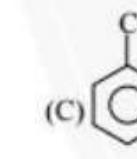
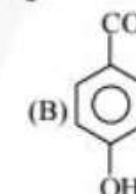
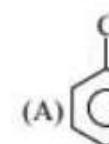
- (A) IV > III > I > II    (B) IV > II > III > I    (C) IV > III > II > I    (D) IV > I > III > II

IV > III > II > I

5. Which one of the following is the most acidic?

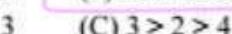
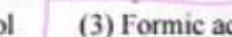


6. Which of the following is weakest acid?



[H<sup>+</sup>] 3 > 4 > 1 > 2

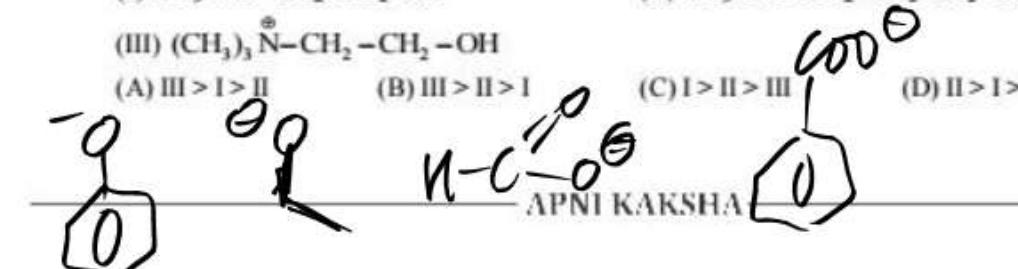
7. Arrange pH of the given compounds in decreasing order:



8. Arrange acidity of given compounds in decreasing order:

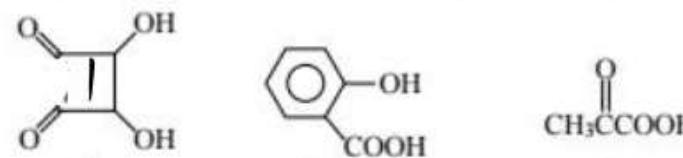


2 > 1 > 4 > 3



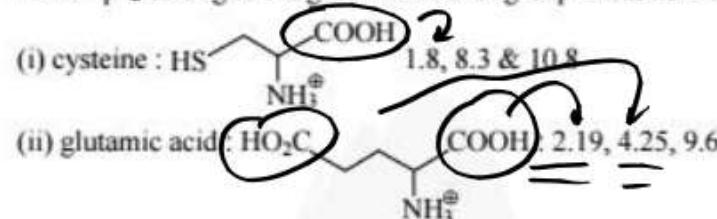
## (Organic Chemistry) GENERAL ORGANIC CHEMISTRY

9. Which of the following compounds on reaction with  $\text{NaHCO}_3$  gives  $\text{CO}_2$  gas?

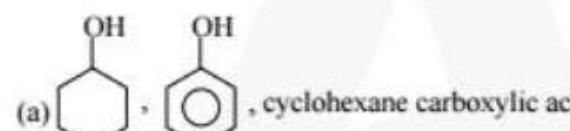


- (A) I, II and III      (B) I and III      (C) II and III      (D) I and II

10. Which  $pK_a$  belong to the given functional group in case of following amino acids :

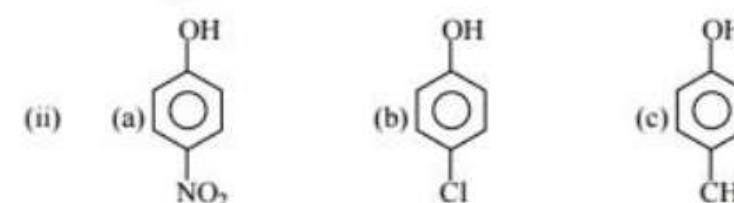
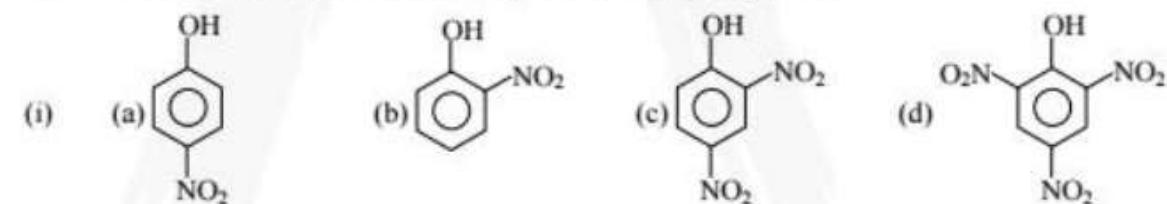


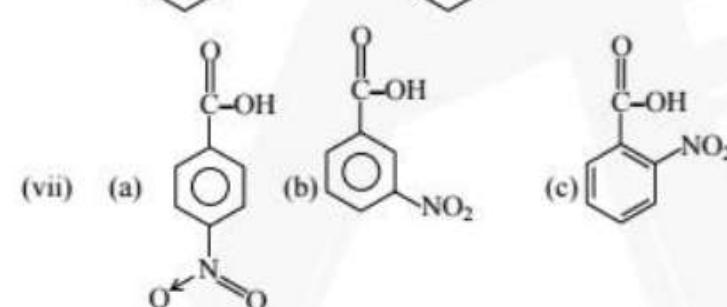
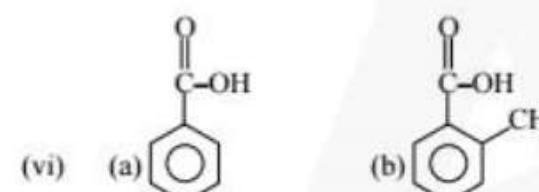
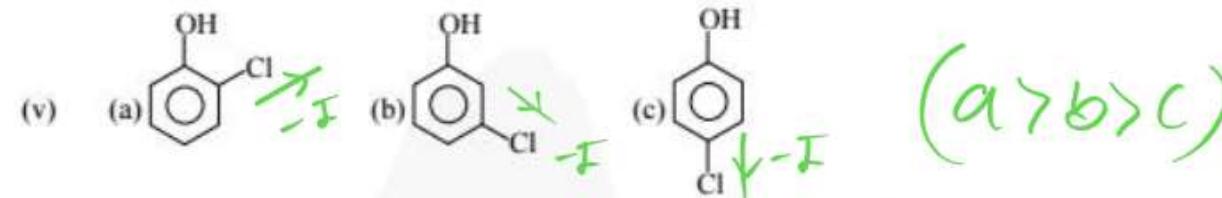
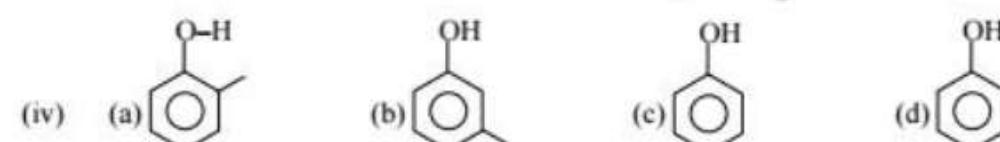
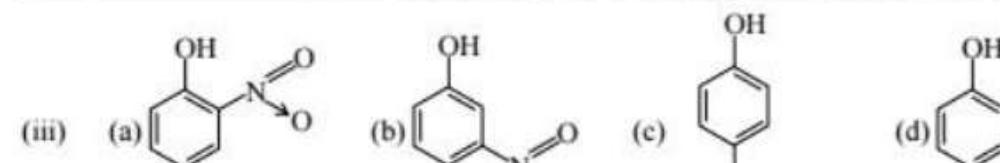
11. Arrange the following sets of compounds according to increasing  $pK_a$  ( $= -\log K_a$ )



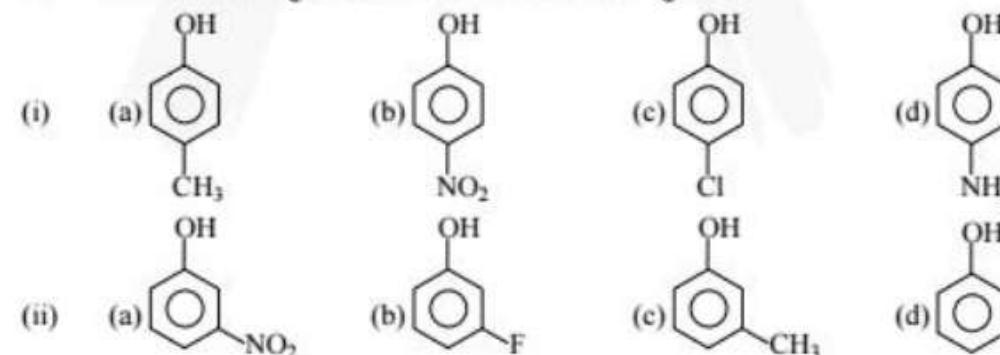
- (b) 1-butyne, 1-butene, butane  
 (c) Propanoic acid, 3-bromopropanoic acid, 2-nitropropanoic acid  
 (d) Phenol, o-nitrophenol, o-cresol  
 (e) Hexylamine, aniline, methylamine

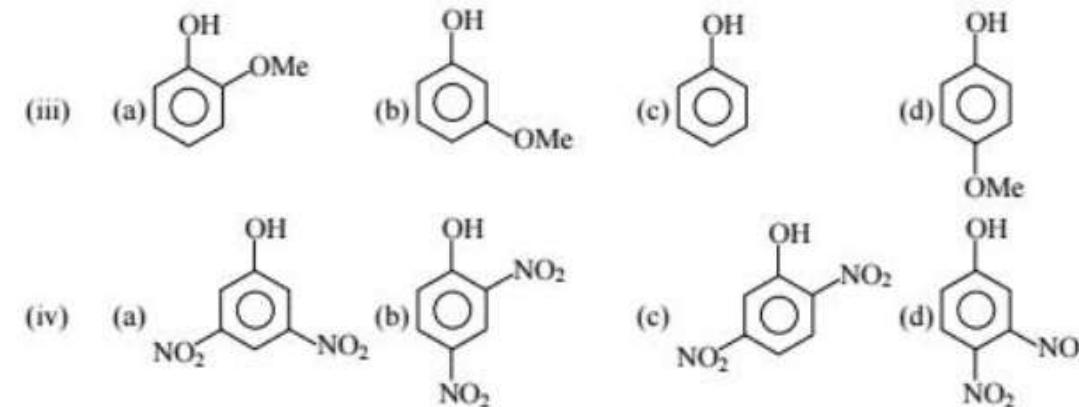
12. Write correct order of acidic strength of following compounds:





13. Select the strongest acid in each of the following sets :





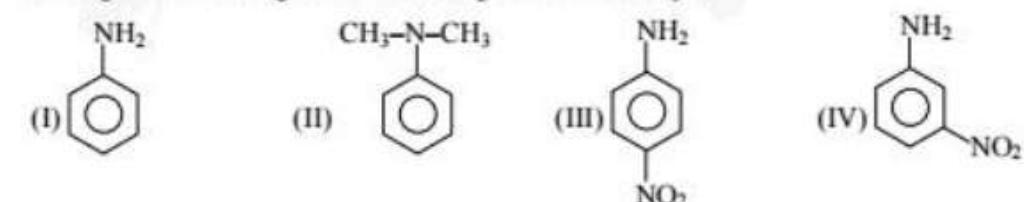
14. The strongest acid is:  
 (A) HF                    (B) CH<sub>3</sub>CO<sub>2</sub>H                    (C) HF + SbF<sub>5</sub>                    (D) H<sub>2</sub>S
15. The weakest acid (does not show acidic character) is:  
 (A) HC = CH                    (B) CH<sub>2</sub> = CH<sub>2</sub>                    (C) Me<sub>3</sub>CH                    (D) Ph<sub>3</sub>CH
16. Select correct order regarding acidic strength of given compounds :  
 (1) o-methylbenzoic acid                    (2) m-methylbenzoic acid  
 (3) p-methylbenzoic acid                    (4) benzoic acid  
 (A) I > 2 > 3 > 4                    (B) 4 > 3 > 2 > 1                    (C) 1 > 4 > 2 > 3                    (D) 3 > 2 > 4 > 1

**Paragraph for Question 17 to 18**

The most important condition for resonance to occur is that the involved atoms in resonating structure must be coplanar or nearly coplanar for maximum delocalisation. If this condition does not fulfil, involved orbitals cannot be parallel- to each other and as a consequence delocalisation cannot occur. Bulky groups present on adjacent atoms inhibit the planarity of atoms involved in resonance. This phenomenon is known as steric inhibition of resonance. Steric inhibition of resonance has profound effect on

(1) Physical properties                    (2) Acidity and basicity (3) Reactivity of organic compounds

17. Arrange the following in the increasing order of basicity :

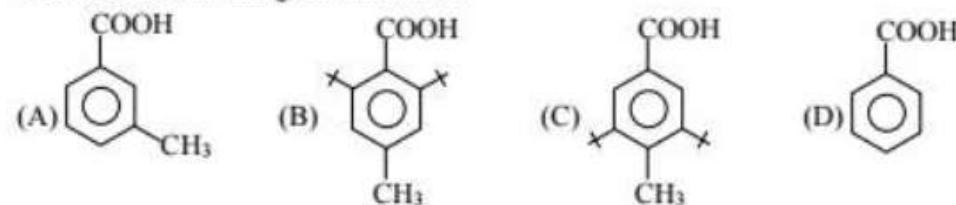


- (A) I > II > III > IV                    (B) IV > III > II > I                    (C) II > I > IV > III                    (D) I > IV > III > II

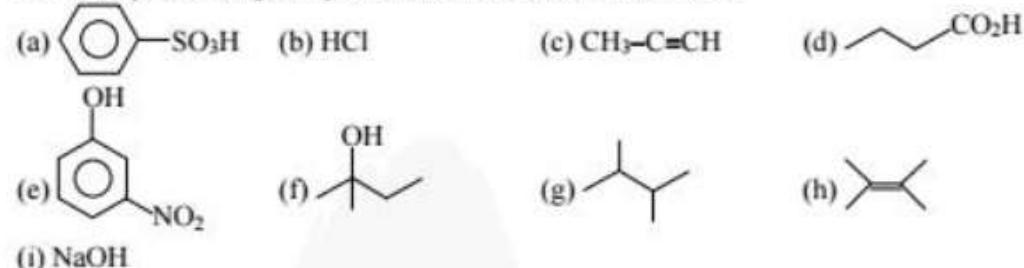
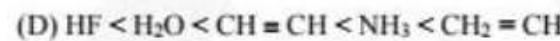
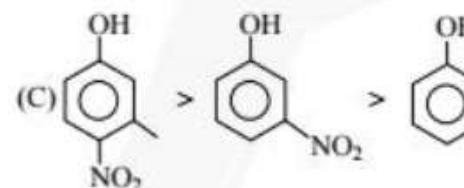
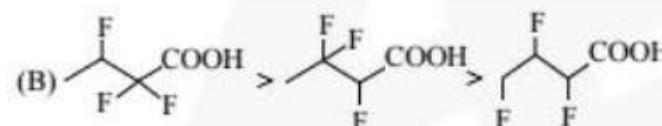
## (Organic Chemistry) GENERAL ORGANIC CHEMISTRY

A

18. Which of the following is most acidic :



19. How many following compounds are more acidic than water ?

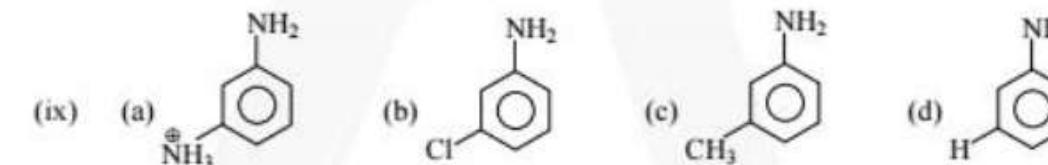
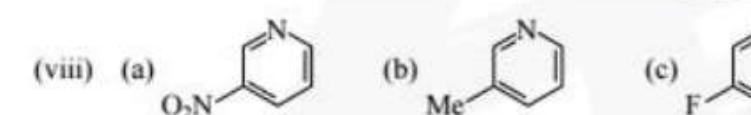
20. How many of the following are incorrect order of  $\text{pK}_a$ .



## EXERCISE # II

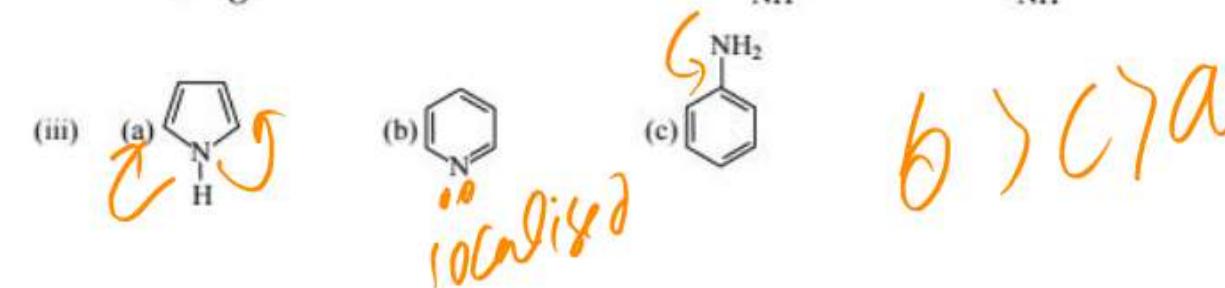
1. Write increasing order of basic strength of following compounds/species :

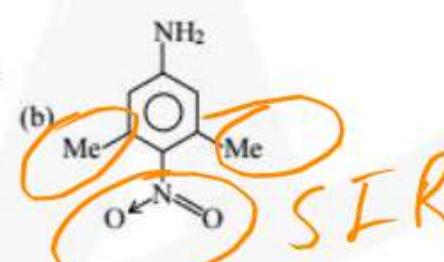
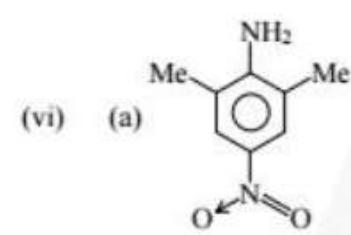
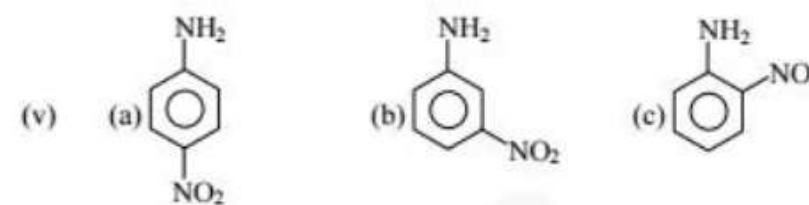
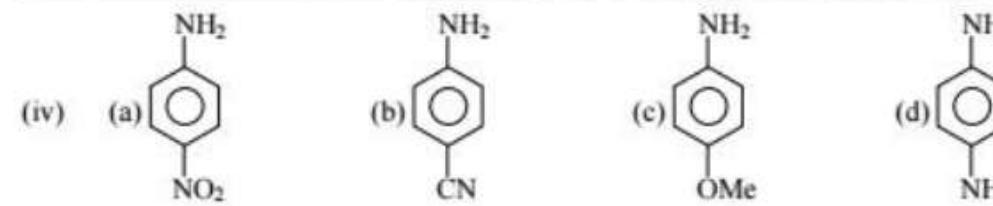
- (i) (a)  $\text{CH}_3^-$       (b)  $\text{NH}_2^-$       (c)  $\text{OH}^-$       (d)  $\text{F}^-$
- (ii) (a)  $\text{F}^-$       (b)  $\text{Cl}^-$       (c)  $\text{Br}^-$       (d)  $\text{I}^-$
- (iii) (a)  $\text{NH}_3$       (b)  $\text{MeNH}_2$       (c)  $\text{Me}_2\text{NH}$       (d)  $\text{Me}_3\text{N}$  (in  $\text{H}_2\text{O}$ )
- (iv) (a)  $\text{NH}_3$       (b)  $\text{MeNH}_2$       (c)  $\text{Me}_2\text{NH}$       (d)  $\text{Me}_3\text{N}$  (Gas phase)
- (v) (a)  $\text{R}-\text{NH}_2$       (b)  $\text{Ph}-\text{NH}_2$       (c)  $\text{R}-\overset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{NH}_2$



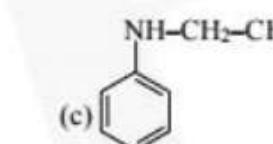
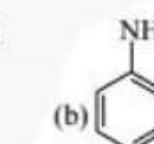
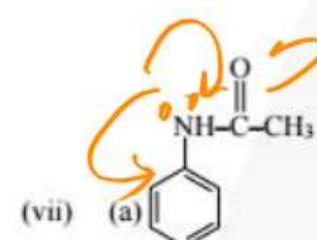
2. Write increasing order of basic strength of following:

- (i) (a)  $\text{CH}_3-\text{CH}_2-\text{NH}_2$       (b)  $\text{CH}_3-\text{CH}_2=\text{NH}$       (c)  $\text{CH}_3-\text{C}\equiv\text{N}$
- (ii) (a)  $\text{CH}_3-\overset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{NH}_2$       (b)  $\text{CH}_3-\text{CH}_2-\text{NH}_2$       (c)  $\text{CH}_3-\overset{\text{NH}}{\underset{\parallel}{\text{C}}}-\text{NH}_2$       (d)  $\text{NH}_2-\overset{\text{NH}}{\underset{\parallel}{\text{C}}}-\text{NH}_2$

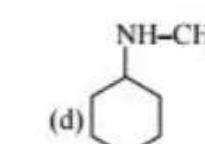
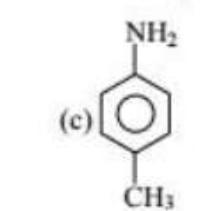
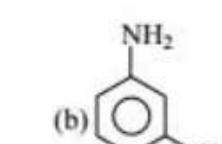
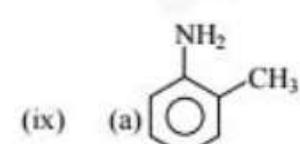
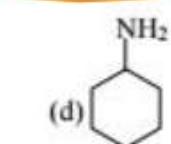
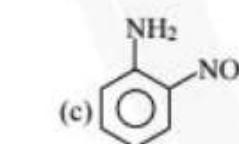
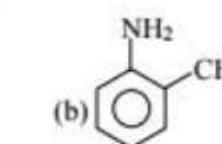
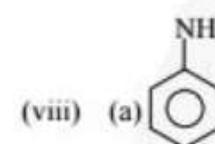




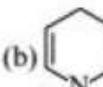
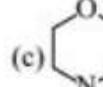
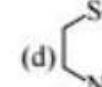
$b > a$



$c > b > a$



3. Select the strongest base in following compound

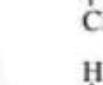
- (i) (a)  (b)  (c)  (d) 

(ii) (a)  (b)  (c)  (d) 

*• • locum*

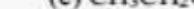
(iii) (a)  (b)  (c)  (d) 

*Aliphatic locum*

(iv) (a)  (b)  (c)  (d) 

4. Arrange the following compound in decreasing order of their basicity

- (i) (a)  $\text{H}_2\text{C} \equiv \text{CHNa}$  (b)  $\text{CH}_3\text{CH}_2\text{Na}$  (c)  $\text{CH}_3\text{CH}_2\text{ONa}$  (d)  $\text{HC} \equiv \text{CNa}$

(ii) (a)  (b)  (c)  (d) 

(iii) (a)  $\text{HO}^-$  (b)  $\text{NH}_3$  (c)  $\text{H}_2\text{O}$  (d)  $\text{HSO}_4^-$

5. Consider the following bases

- (I) o-nitroaniline      (II) m-nitroaniline      (III) p-nitroaniline

### The decreasing order of basicity

- (A) II > III > I      (B) II > I > III      (C) I > II > III      (D) I > III > II

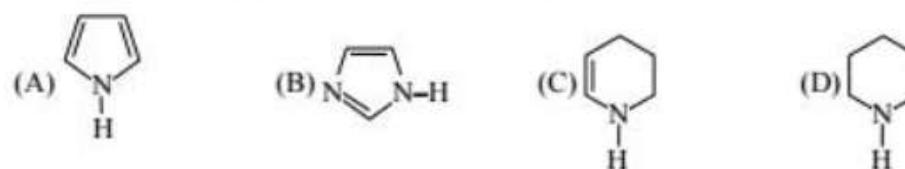
6. Consider the basicity of the following aromatic amines

- (I) aniline                  (II) p-nitroaniline                  (III) p-methoxyaniline (IV) p-methylaniline

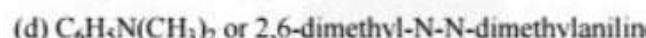
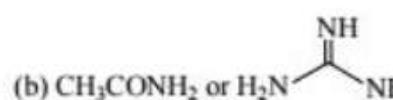
The correct order of decreasing basicity is

- (A) III > IV > I > II   (B) III > IV > II > I   (C) I > II > III > IV   (D) IV > III > II >

7. Which one of the following is least basic in character?



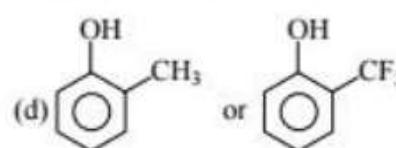
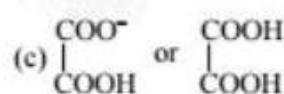
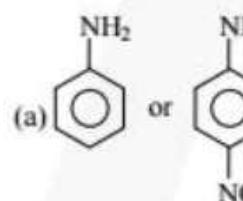
8. In each of the following pair of compounds, which is more basic?



9. Choose the member of each of the following pairs of compounds that is likely to be the weaker base.



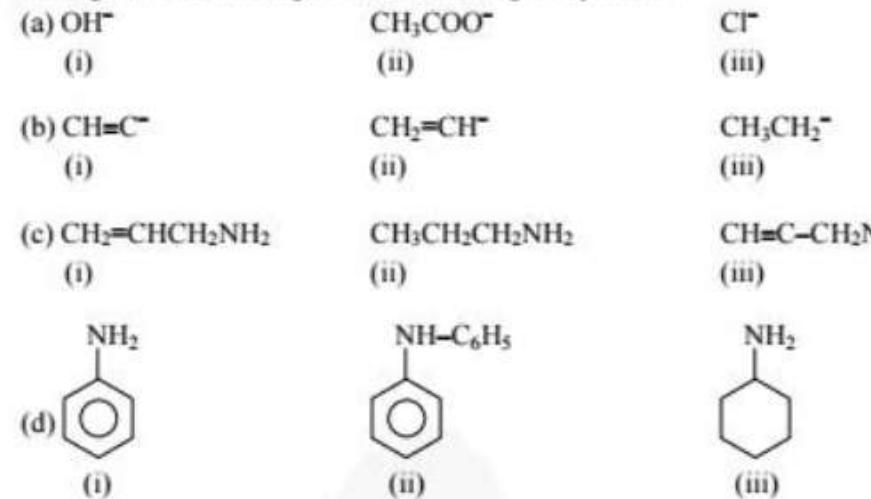
10. Which compound in given pair is the weaker base?



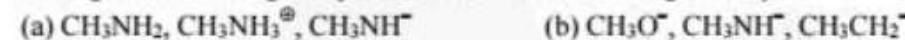
## (Organic Chemistry) GENERAL ORGANIC CHEMISTRY

A

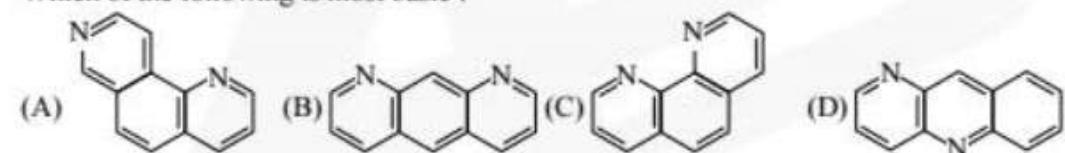
11. Arrange the basic strength of the following compounds.



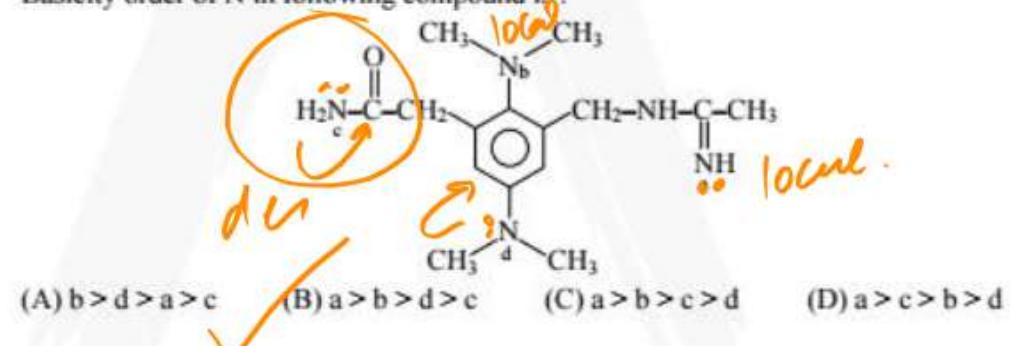
12. Arrange the following compounds in order of increasing basicity.



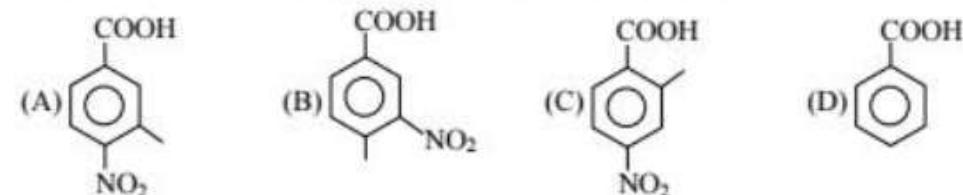
13. Which of the following is most basic :



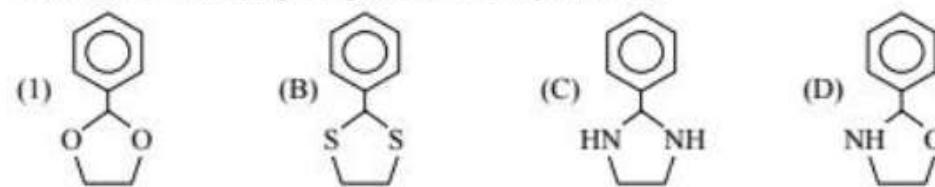
14. Basicity order of N in following compound is :



15. Which of the following possess highest basic conjugate base?



16. Which of the following compound has least  $pK_b$  value :



17. Which of the following order(s) is(are) correct.

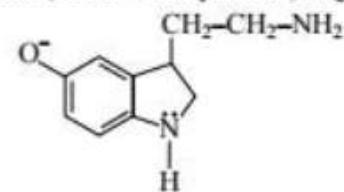
- (A) > > - Stability
- (B) > > - Basic Strength
- (C) < < < - Stability
- (D)  $\text{NaNH}_2 > \text{NaOH} > \text{NaSH}$  - Basic Strength

18. Which one of the following option is correct regarding basic strength:

- (A) > > >
- (B) > > > >
- (C) > > >
- (D) < < <

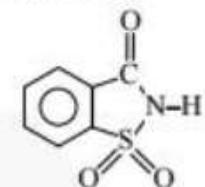
## (Organic Chemistry) GENERAL ORGANIC CHEMISTRY

19. The conjugate base of serotonin (used as tranquilisers) is given as follows:

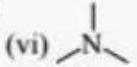
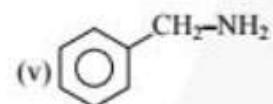
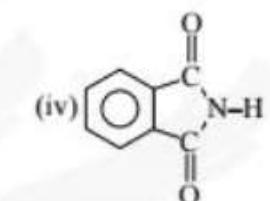
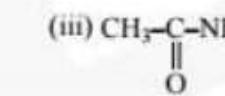
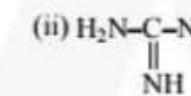
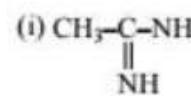


How many basic groups present in given compound?

20. The structure of saccharin is given as follows :



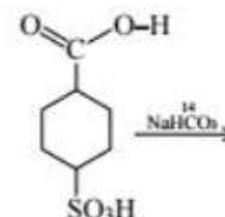
How many following compounds are more basic than saccharin ?





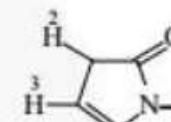
## EXERCISE # III

1. In given reaction Gas liberated is/are



- (A)  $\text{CO}_2$  &  $\text{SO}_3$       (B)  $\text{SO}_3$  &  $^{14}\text{CO}_2$       (C)  $^{14}\text{CO}_2$  only      (D)  $\text{SO}_2$  only

2. Arrange marked atom in decreasing order of acidic strength :



- (A) 1 > 2 > 3      (B) 3 > 2 > 1      (C) 2 > 1 > 3      (D) 2 > 3 > 1

3.

## Column-I

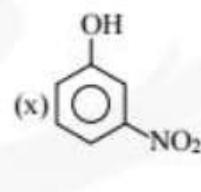
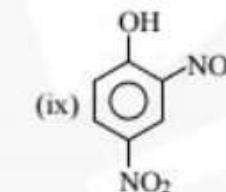
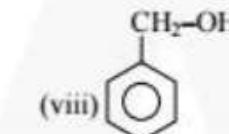
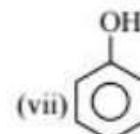
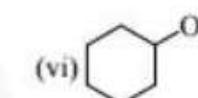
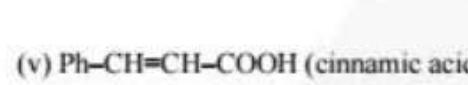
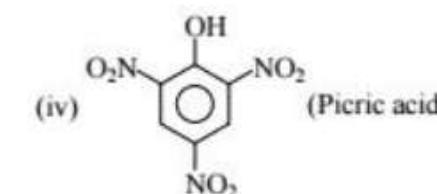
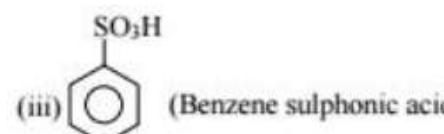
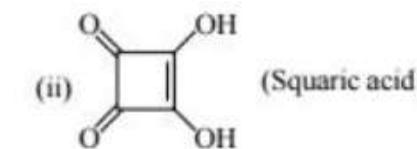
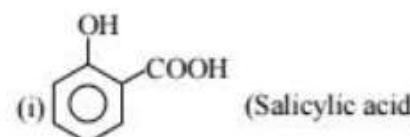
- (A)
- (B)
- (C)
- (D)

## Column-II

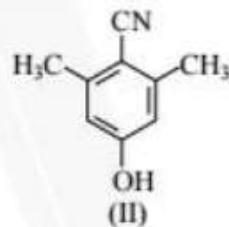
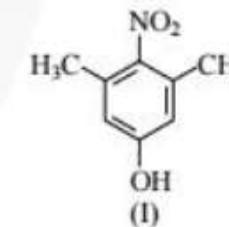
- (P) React with  $\text{NaOH}$
- (Q) React with  $\text{NaHCO}_3$
- (R) React with  $\text{NaH}$
- (S) React with  $\text{Na}$
- (T) React with  $\text{NaNH}_2$

## (Organic Chemistry) GENERAL ORGANIC CHEMISTRY

4. Compounds which can give effervescences with  $\text{NaHCO}_3$  are :



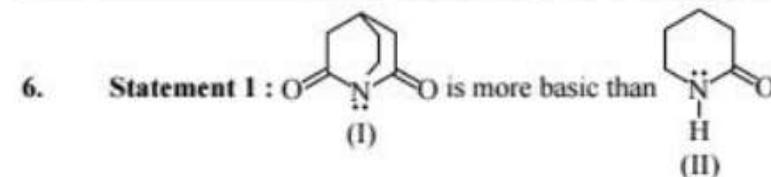
5. Statement-1 : For the given two compounds-I is more acidic than compounds-II.



and

Statement-2 : Due to presence of  $-\text{CH}_3$  group at ortho positions to  $-\text{NO}_2$  ; the plane of  $-\text{NO}_2$  deviates, w.r.t plane of ring.

- (A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
- (B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1.
- (C) Statement-1 is True, Statement-2 is False.
- (D) Statement-1 is False, Statement-2 is True.

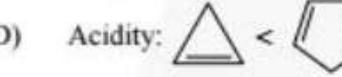


and

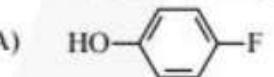
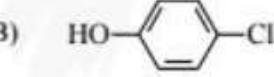
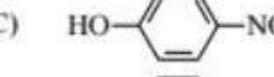
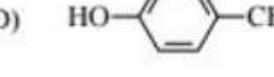
**Statement 2 :** Lone pair electrons on nitrogen in compound (I) does not participate in resonance.

- (A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
- (B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1.
- (C) Statement-1 is True, Statement-2 is False.
- (D) Statement-1 is False, Statement-2 is True.

7. Match Column-I with Column-II.

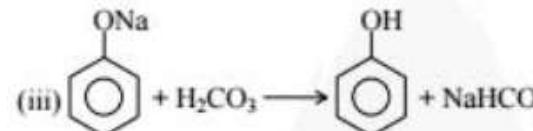
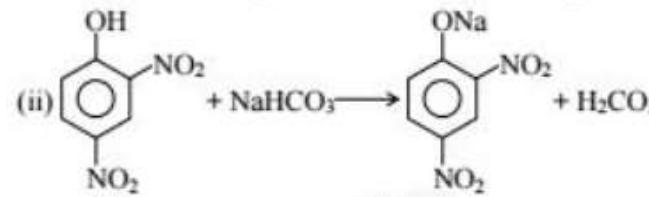
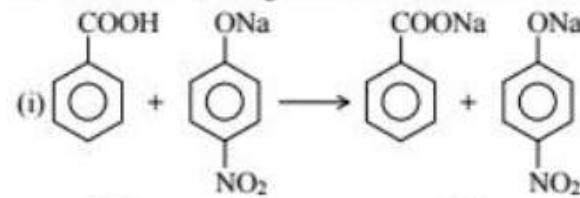
	<b>Column-I (Facts)</b>	<b>Column-II (Reasons)</b>
(A)	Guanidine is proton sponge	(P) 3 equivalent structures of conjugate acid
(B)	Carbanion stability $\overline{\text{CCl}}_3 > \overline{\text{CF}}_3$	(Q) Due to s-character of central atoms
(C)	Alkyne is more acidic than alkene	(R) Due to d-orbital resonance
(D)	Acidity: 	(S) Due to formation of aromatic anion (T) Stability of conjugate base due to more number of equivalent resonating structure

8. Match Column-I with Column-II.

	<b>Column-I (Compounds)</b>	<b>Column-II (<math>\text{pK}_a</math>)</b>
(A)		(P) 7.15
(B)		(Q) 10.14
(C)		(R) 9.98
(D)		(S) 9.38 (T) $\text{pK}_a$ is more than phenol

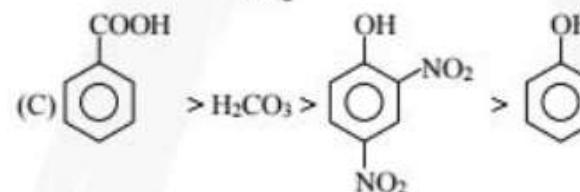
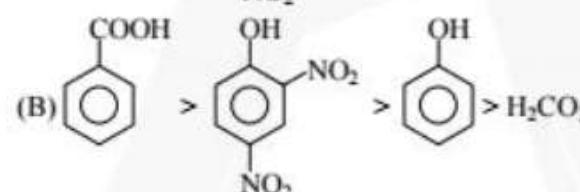
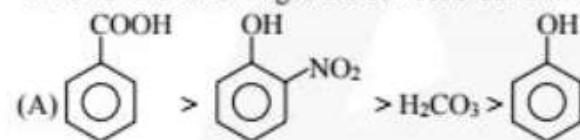
**(Comprehension) (Q.9 to Q.11)**

Observe the following reaction which are feasible:



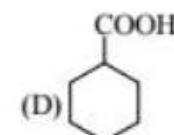
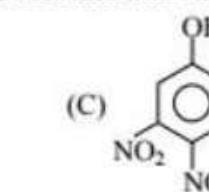
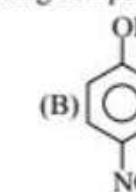
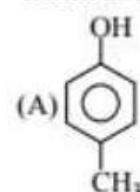
**Answer the following question :**

9. Which of the following is the correct order of acidic strength?



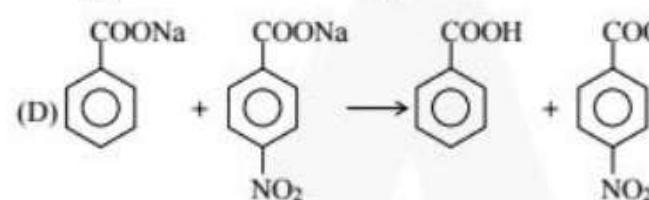
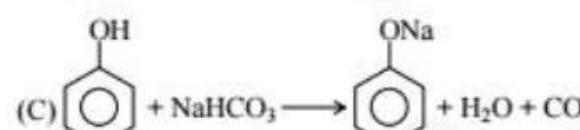
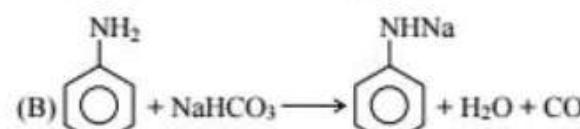
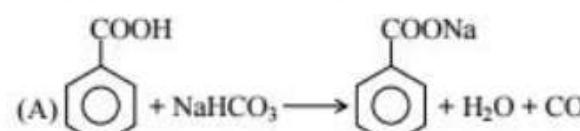
(D) None

10. Which of the following compound does not react with NaHCO<sub>3</sub>

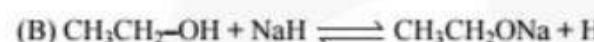
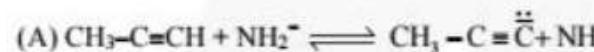


## (Organic Chemistry) GENERAL ORGANIC CHEMISTRY

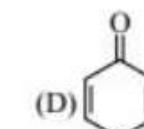
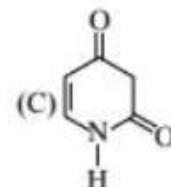
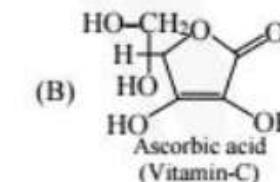
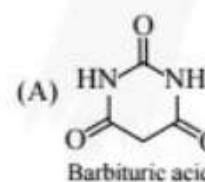
11. Identify the feasible reactions



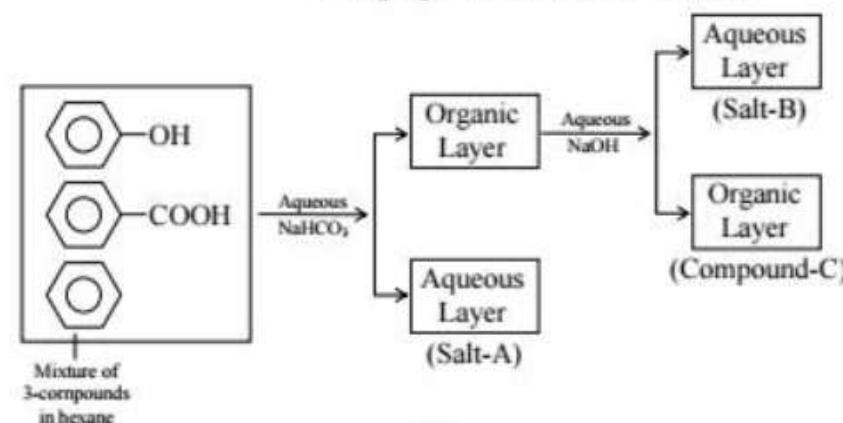
12. Identify the non-feasible reaction



13. Select the number of compounds in which deprotonation gives aromatic anion :



## Paragraph for Questions 14 and 15



14. Identify salt 'A' ?

- (A) (B) (C) (D) All of these

15. Identify compound 'C' ?

- (A) (B) (C) (D)

16. Which of the following reactions is/are feasible in forward direction.

- (A)  $\text{CH} = \text{CH} + \text{Na} \longrightarrow$
- (B) Paracetamol + Caustic soda  $\longrightarrow$
- (C) Carbonic Acid + Carbolic acid  $\longrightarrow$
- (D) Ethyl alcohol + Carbonic acid  $\longrightarrow$

## (Organic Chemistry) GENERAL ORGANIC CHEMISTRY

Answer Q.17, Q.18 and Q.19 by appropriately matching the information given in the three columns of the following table.

Column 1, 2 and 3 contain starting materials, reagents and resonating structure of product involving monoion only.

Column-I	Column-II	Column-II
(I)	(i) Aq. NaOH	(P) 5
(II)	(ii) AlCl3	(Q) 7
(III)	(iii) NaH	(R) 6
(IV)	(iv) SbCl5	(S) 10

17. Which of the following represent CORRECT combination ?

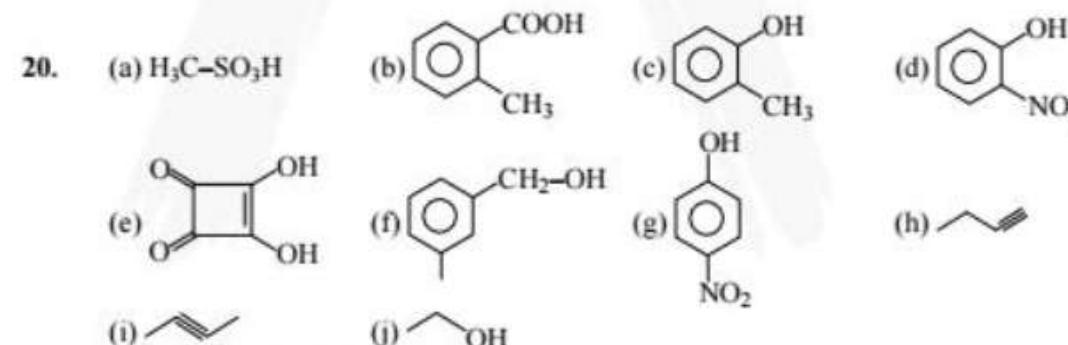
- (A) (III) (iv) (R)    (B) (I) (ii) (P)    (C) (II) (iii) (Q)    (D) (IV) (iii) (S)

18. Which of the following CORRECT combination represent equivalent resonating structures ?

- (A) (I) (ii) (R)    (B) (III) (iv) (Q)    (C) (II) (iii) (P)    (D) (IV) (i) (S)

19. Which of the following represent INCORRECT combination ?

- (A) (I) (iv) (R)    (B) (III) (ii) (Q)    (C) (IV) (i) (S)    (D) (II) (iii) (P)



In above given compounds if

(i) Total number of compounds which gives  $\text{CO}_2(\uparrow)$  on reacting with  $\text{NaHCO}_3 = A$

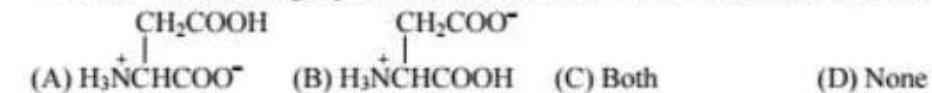
(ii) Total number of compounds which are soluble in aq. NaOH are = B

Then what would be the value of  $B^A$

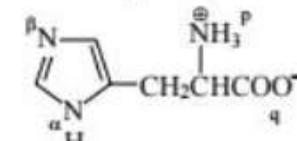


## EXERCISE-IV

1. Which of the following dipolar structure of the amino acid is considered more correct?

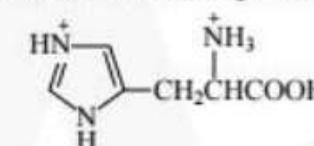


2. Which of the nitrogen of histidine is first protonated?

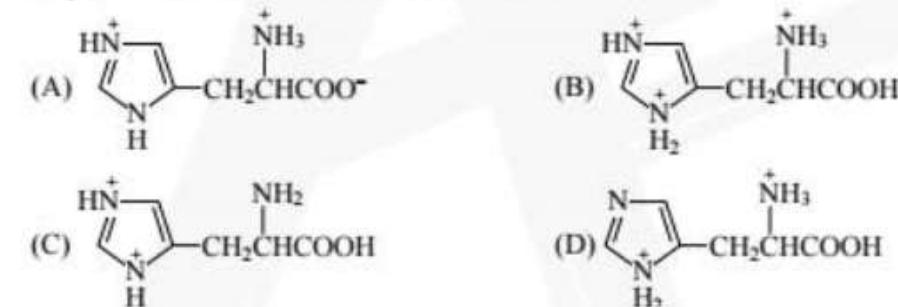


- (A) a    (B) b    (C) p    (D) q

3. Histidine, a heterocyclic amino acid has following structure at pH < 1.82,



At pH > 1.82 it should have which structure?

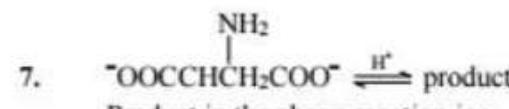


4. Alanine forms Zwitter ion which exists as ( $\text{pK}_a$  for two acids is 4.62 and 9.13) :

- (A)  $\text{CH}_3-\overset{\oplus}{\text{NH}_3}-\text{CHCOO}^-$  in medium of pH = 7  
 (B)  $\text{CH}_3-\overset{\oplus}{\text{NH}_3}-\text{CHCOOH}$  in medium of pH = 4  
 (C)  $\text{CH}_3-\overset{\oplus}{\text{NH}_2}-\text{CH}-\text{COO}^-$  in a medium of pH = 13  
 (D)  $\text{CH}_3-\overset{\oplus}{\text{NH}_3}-\text{CHCOO}^-$  in a medium of pH = 2

## (Organic Chemistry) GENERAL ORGANIC CHEMISTRY

5. In aqueous solution at pH = 7, glycine is present as :  
 (A)  $\text{H}_3\text{N}^+\text{CH}_2\text{COO}^-$  (B)  $\text{H}_3\text{N}^+\text{CH}_2\text{COOH}$  (C)  $\text{H}_2\text{NCH}_2\text{COO}^-$  (D) All of these
6. In aqueous solution, the basic character of amino acids is due to :  
 (A)  $-\text{NH}_2$  group (B)  $-\overset{+}{\text{NH}_3}$  group (C)  $-\text{COOH}$  group (D)  $-\text{COO}^-$  group

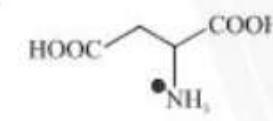
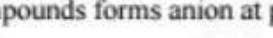


- (A)  $\text{HOOCCHCH}_2\text{COOH}$       (B)  $\text{HOOCCHCH}_2\text{COO}^-$   
 (C)  $-\overset{+}{\text{OOCCHCH}_2\text{COO}^-}$       (D) Any of the three

8. The principle species present in the solution of lysine  $\text{H}_2\text{N}(\text{CH}_2)_4\text{CHCOOH}$  at pH 9 is:  
 (Given  $pK_a$  are 4.2, 8.1, 9.8)

- (A)  $\text{H}_3\overset{+}{\text{N}}(\text{CH}_2)_4\text{CHCOOH}$       (B)  $\text{H}_3\overset{+}{\text{N}}(\text{CH}_2)_4\text{CHCOO}^-$   
 (C)  $\text{H}_2\text{N}(\text{CH}_2)_4\text{CHCOO}^-$       (D)  $\text{H}_3\overset{+}{\text{N}}(\text{CH}_2)_4\text{CHCOO}^-$

9. At, pH = 7, following amino acid predominantly exist as:  
 (Given  $pK_a$  are 2.2, 4.3, 8.9)

- (A)   
 (B)   
 (C)   
 (D) 

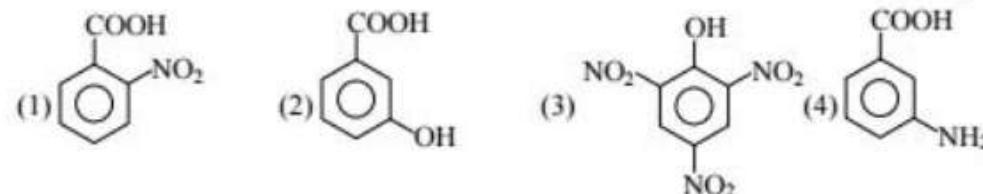
10. Which of the following compounds forms anion at pH=7 dominantly?  
 (A) Benzene sulphonic acid      (B) Carboxylic acid  
 (C) Cinnamic acid      (D) Picric acid



## EXERCISE # V (JEE MAIN)

1. Picric acid is -

[AIEEE-2002]



2. Which of the following species acts both as bronsted acid &amp; base -

[AIEEE-2002]

- (1)  $\text{NH}_3$  (2)  $\text{HO}^-$  (3)  $\text{HSO}_4^{\ominus}$  (4) 1 and 3 both

3. The correct order of increasing basic nature for the bases  $\text{NH}_3$ ,  $\text{CH}_3\text{NH}_2$  and  $(\text{CH}_3)_2\text{NH}$  is-

[AIEEE-2003]

- (1)  $\text{CH}_3\text{NH}_2 < \text{NH}_3 < (\text{CH}_3)_2\text{NH}$  (2)  $(\text{CH}_3)_2\text{NH}_2 < \text{NH}_3 < \text{CH}_3\text{NH}_2$   
 (3)  $\text{NH}_3 < \text{CH}_3\text{NH}_2 < (\text{CH}_3)_2\text{NH}$  (4)  $\text{CH}_3\text{NH}_2 < (\text{CH}_3)_2\text{NH} < \text{NH}_3$

4. Consider the acidity of the carboxylic acids-

[AIEEE-2004]

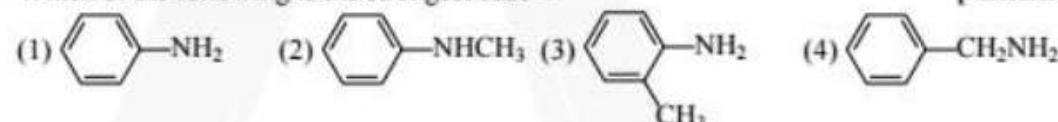
- (i)  $\text{PhCOOH}$  (ii)  $\text{o-NO}_2\text{C}_6\text{H}_4\text{COOH}$   
 (iii)  $\text{p-NO}_2\text{C}_6\text{H}_4\text{COOH}$  (iv)  $\text{m-NO}_2\text{C}_6\text{H}_4\text{COOH}$

which of the following is the correct order of acidity-

- (1) i > ii > iii > iv (2) ii > iv > iii > i (3) ii > iv > i > iii (4) ii > iii > iv > i

5. Which of the following is the strongest base -

[AIEEE-2004]

6. Among the following acids which has the lowest  $pK_a$  value-

[AIEEE-2005]

- (1)  $\text{CH}_3\text{CH}_2\text{COOH}$  (2)  $(\text{CH}_3)_2\text{CHCOOH}$  (3)  $\text{HCOOH}$  (4)  $\text{CH}_3\text{COOH}$

7. Amongst the following the most basic compound is-

[AIEEE-2005]

- (1) p-nitro aniline (2) Acetanilide (3) Aniline (4) Benzylamine

8. What is the conjugate base of  $\text{OH}^-$ ?

[AIEEE-2005]

- (1)  $\text{H}_2\text{O}$  (3)  $\text{O}_2$  (3)  $\text{O}^{2-}$  (4)  $\text{O}^-$

9. Among the following acids which has the lowest  $pK_a$  value?

[AIEEE-2005]

- (1)  $\text{HCOOH}$  (2)  $\text{CH}_3\text{COOH}$  (3)  $\text{CH}_3\text{CH}_2\text{COOH}$  (4)  $(\text{CH}_3)_2\text{CH-COOH}$



## (Organic Chemistry) GENERAL ORGANIC CHEMISTRY

10. The correct order of increasing acid strength of the compounds is: [AIEEE-2006]

- (a)  $\text{CH}_3\text{CO}_2\text{H}$       (b)  $\text{MeOCH}_2\text{CO}_2\text{H}$       (c)  $\text{CF}_3\text{CO}_2\text{H}$       (d)
- (1) d < a < c < b      (2) d < a < b < c      (3) a < d < c < b      (4) b < d < a < c

11. Which one of the following is strongest base in aqueous solution? [AIEEE-2010]

- (1) Trimehylamine      (2) Aniline      (3) Dimethylamine      (4) Methylamine

12. The correct order of increasing basicity of the given conjugated base ( $\text{R}=\text{CH}_3$ ) is : [AIEEE-2010]

- (1)  $\text{RCO}\bar{\text{O}} < \text{HC}\equiv\bar{\text{C}} < \bar{\text{NH}}_2 < \bar{\text{R}}$       (2)  $\text{RCO}\bar{\text{O}} < \text{HC}\equiv\bar{\text{C}} < \bar{\text{R}} < \bar{\text{NH}}_2$   
 (3)  $\bar{\text{R}} < \text{HC}\equiv\bar{\text{C}} < \text{RCO}\bar{\text{O}} < \bar{\text{NH}}_2$       (4)  $\text{RCO}\bar{\text{O}} < \bar{\text{NH}}_2 < \text{HC}\equiv\bar{\text{C}} < \bar{\text{R}}$

13. The strongest acid amongst the following compounds is ? [AIEEE-2011]

- (1)  $\text{CH}_3\text{CH}_2\text{CH}(\text{Cl})\text{CO}_2\text{H}$       (2)  $\text{ClCH}_2\text{CH}_2\text{CH}_2\text{CCOOH}$   
 (3)  $\text{CH}_3\text{COOH}$       (4)  $\text{HCOOH}$

14. The correct order of acid strength of the following compounds: [AIEEE-2011]

- A. Phenol      B. p-Cresol      C. m-Nitrophenol      D. p-Nitrophenol  
 (1) C > B > A > D      (2) D > C > A > B      (3) B > D > A > C      (4) A > B > D > C

15. In the following compounds: [JEE(Main)-2012]



the order of basicity is as follows:

- (1) IV > III > II > I      (2) II > III > I > IV      (3) I > III > II > IV      (4) III > I > II > IV

16. The most basic compound among the following is : [JEE(Main)-2012]

- (1) Acetanilide      (2) Benzylamine      (3) p-Nitro aniline      (4) Aniline

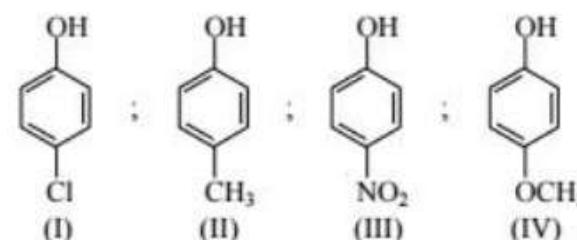
17. The order of basicity of amines in gaseous state is : [JEE(Main)-2013]

- (1)  $3^\circ > 2^\circ > \text{NH}_3 > 1^\circ$       (2)  $1^\circ > 2^\circ > 3^\circ > \text{NH}_3$   
 (3)  $\text{NH}_3 > 1^\circ > 2^\circ > 3^\circ$       (4)  $3^\circ > 2^\circ > 1^\circ > \text{NH}_3$



## (Organic Chemistry) GENERAL ORGANIC CHEMISTRY

18. Arrange the following compounds in order of decreasing acidity : [JEE(Main)-2013]



- (1) II > IV > I > III    (2) I > II > III > IV    (3) III > I > II > IV    (4) IV > III > I > II

19. The conjugate base of hydrazoic acid is : [JEE(Main)-2014]

- (1)  $\text{NH}_3^+$     (2)  $\text{N}_3^-$     (3)  $\text{N}_2^-$     (4)  $\text{N}^{-3}$

20. Which of the following compounds will not be soluble in sodium bicarbonate ?

[JEE(Main)-2014]

- (1) Benzene sulphonic acid    (2) Benzoic acid  
 (3) o-Nitrophenol    (4) 2, 4, 6-Trinitrophenol

21. Considering the basic strength of amines in aqueous solution, which one has the smallest  $pK_b$  value? [JEE(Main)-2014]

- (1)  $(\text{CH}_3)_3\text{N}$     (2)  $\text{C}_6\text{H}_5\text{NH}_2$     (3)  $(\text{CH}_3)_2\text{NH}$     (4)  $\text{CH}_3\text{NH}_2$

22. Among the following oxoacids, the correct decreasing order of acid strength is : [JEE(Main)-2014]

- (1)  $\text{HClO}_4 > \text{HClO}_3 > \text{HClO}_2 > \text{HOCl}$   
 (2)  $\text{HClO}_2 > \text{HClO}_4 > \text{HClO}_3 > \text{HOCl}$   
 (3)  $\text{HOCl} > \text{HClO}_2 > \text{HClO}_3 > \text{HClO}_4$   
 (4)  $\text{HClO}_4 > \text{HOCl} > \text{HClO}_2 > \text{HClO}_3$

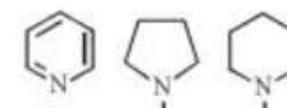
23. The correct decreasing order for acid strength is [JEE(Main)-2019]

- (1)  $\text{NO}_2\text{CH}_2\text{COOH} > \text{NCCH}_2\text{COOH} > \text{FCH}_2\text{COOH} > \text{CICH}_2\text{COOH}$   
 (2)  $\text{FCH}_2\text{COOH} > \text{NCCH}_2\text{COOH} > \text{NO}_2\text{CHCOOH} > \text{CICH}_2\text{COOH}$   
 (3)  $\text{NO}_2\text{CH}_2\text{COOH} > \text{FCH}_2\text{COOH} > \text{CNCH}_2\text{COOH} > \text{CICH}_2\text{COOH}$   
 (4)  $\text{CNCH}_2\text{COOH} > \text{O}_2\text{NCH}_2\text{COOH} > \text{FCH}_2\text{COOH} > \text{CICH}_2\text{COOH}$



## (Organic Chemistry) GENERAL ORGANIC CHEMISTRY

24. Arrange the following amines in the decreasing order of basicity: [JEE(Main)-2019]



(I) (II) (III)

- (1) I > II > III      (2) III > II > I      (3) I > III > II      (4) III > I > II

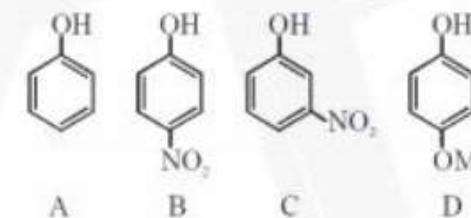
25. Which amongst the following is the strongest acid ? [JEE(Main)-2019]

- (1) CHI<sub>3</sub>      (2) CHCl<sub>3</sub>      (3) CHBr<sub>3</sub>      (4) CH(CN)<sub>3</sub>

26. The increasing basicity order of the following compounds is : [JEE(Main)-2019]

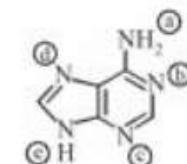


27. The increasing order of the pKa values of the following compounds is : [JEE(Main)-2019]



- (1) B < C < D < A      (2) C < B < A < D  
 (3) D < A < C < B      (4) B < C < A < D

28. In the following compound, [JEE(Main)-2019]



the favourable site/s for protonation is/are :-

- (1) (a)      (2) (a) and (d)      (3) (a) and (e)      (4) (b), (c) and (d)



29. The correct order for acid strength of compounds



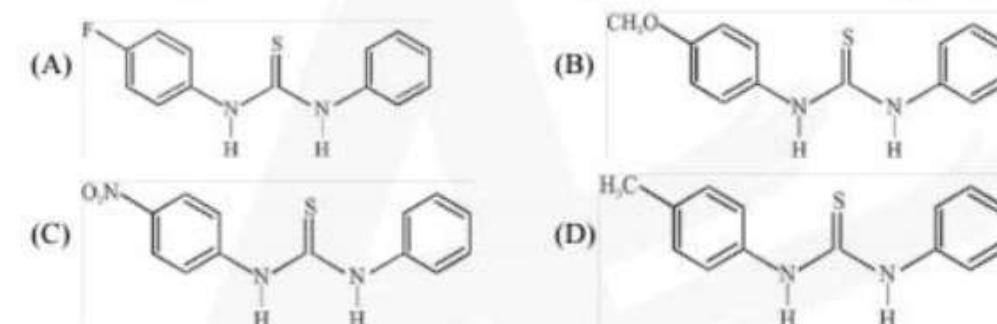
[JEE(Main)-2019]

is as follows :

- (1)  $\text{CH}=\text{CH} > \text{CH}_2=\text{CH}_2 > \text{CH}_3-\text{C}=\text{CH}$
- (2)  $\text{HC}=\text{CH} > \text{CH}_3-\text{C}=\text{CH} > \text{CH}_2=\text{CH}_2$
- (3)  $\text{CH}_3-\text{C}=\text{CH} > \text{CH}_2=\text{CH}_2 > \text{HC}=\text{CH}$
- (4)  $\text{CH}_3-\text{C}=\text{CH} > \text{CH}=\text{CH} > \text{CH}_2=\text{CH}_2$

30. The increasing order of the  $pK_b$  of the following compound is:

[JEE(Main)-2019]



- (1) (A) < (C) < (D) < (B)
- (2) (C) < (A) < (D) < (B)
- (3) (B) < (D) < (A) < (C)
- (4) (B) < (D) < (C) < (A)

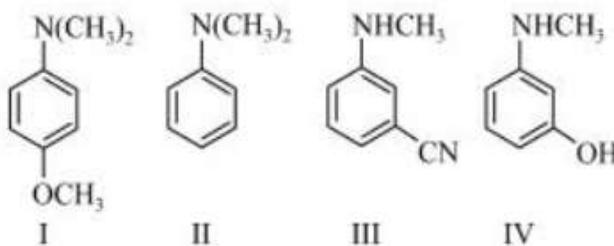
31. In the following compounds, the decreasing order of basic strength will be : [JEE(Main)-2019]

- (1)  $(\text{C}_2\text{H}_5)_2\text{NH} > \text{C}_2\text{H}_5\text{NH}_2 > \text{NH}_3$
- (2)  $\text{NH}_3 > \text{C}_2\text{H}_5\text{NH}_2 > (\text{C}_2\text{H}_5)_2\text{NH}$
- (3)  $(\text{C}_2\text{H}_5)_2\text{NH} > \text{NH}_3 > \text{C}_2\text{H}_5\text{NH}_2$
- (4)  $\text{C}_2\text{H}_5\text{NH}_2 > \text{NH}_3 > (\text{C}_2\text{H}_5)_2\text{NH}$



32. The increasing order of  $pK_b$  values of the following compounds is.

[JEE(Main)-2020]



- (A) I < II < IV < III
- (B) I < II < III < IV
- (C) II < I < III < IV
- (D) II < IV < III < I

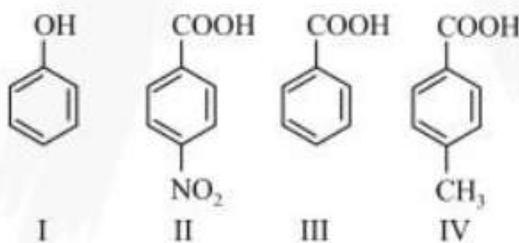
33. Which among the following is the strongest acid?

[JEE(Main)-2021]

- (A)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$
- (B)
- (C)
- (D)

34. The correct order of acid character of the following compounds is:

[JEE(Main)-2021]

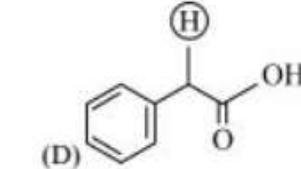
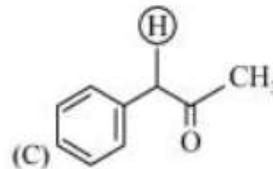
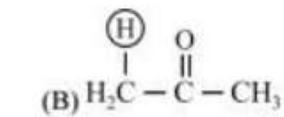
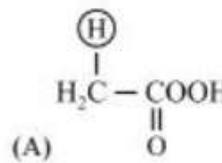


- (A) II > III > IV > I
- (B) III > II > I > IV
- (C) IV > III > II > I
- (D) I > II > III > IV



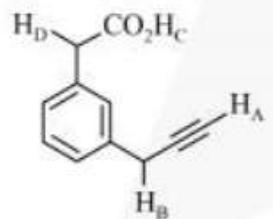
35. Among the following marked proton of which compound shows lowest  $pK_a$  value?

[JEE(Main)-2022]



36. What is the correct order of acidity of the protons marked A – D in the given compounds?

[JEE(Main)-2023]



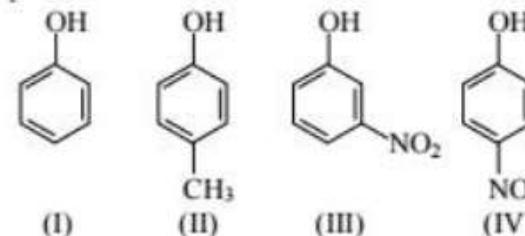
- (A)  $H_C > H_D > H_B > H_A$
- (B)  $H_C > H_D > H_A > H_B$
- (C)  $H_D > H_C > H_B > H_A$
- (D)  $H_C > H_A > H_D > H_B$

## (Organic Chemistry) GENERAL ORGANIC CHEMISTRY

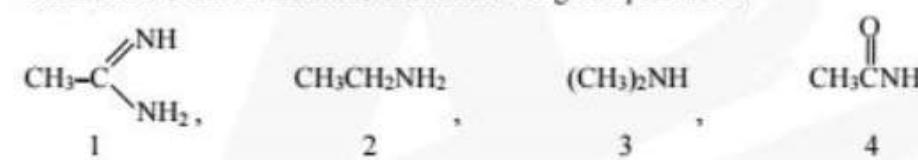
**EXERCISE # VI (JEE ADVANCE)**

- 1.** In the following compounds

[IIT-JEE-1996]



The order of acidity is-



5. Statement-I : p-Hydroxybenzoic acid has a lower boiling point than o-hydroxybenzoic acid.  
Because  
Statement-II : o-Hydroxybenzoic acid has intramolecular hydrogen bonding. [IIT-JEE-2003]  
(A) Statement-I is True, Statement-II is True; Statement-II is a correct explanation for Statement-I  
(B) Statement-I is True, Statement-II is True; Statement-II is NOT a correct explanation for Statement-I  
(C) Statement-I is True, Statement-II is False.  
(D) Statement-I is False, Statement-II is True.

6. Match K<sub>a</sub> values with suitable acid : IIT-JEE-2003

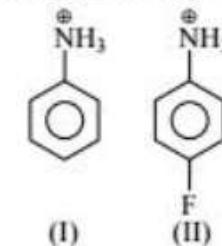
6. Match  $K_a$  values with suitable acid : [IIT-JEE-2003]

$K_a$	Acid
(A) $3.3 \times 10^{-5}$	(P) 
(B) $4.2 \times 10^{-5}$	(Q) Me- 
(C) $6.3 \times 10^{-5}$	(R) Cl- 
(D) $6.4 \times 10^{-5}$	(S) MeO- 
(E) $30.6 \times 10^{-5}$	(T) O <sub>2</sub> N- 

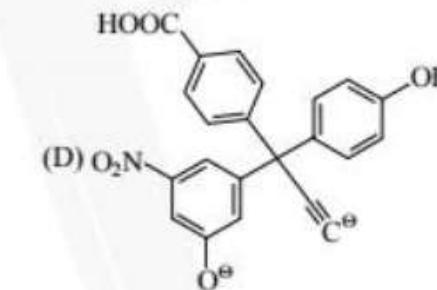
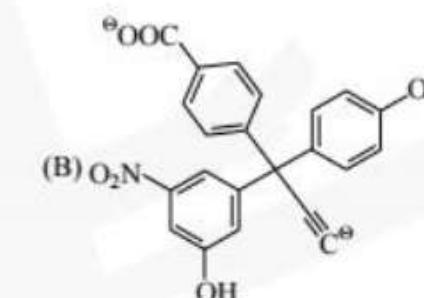
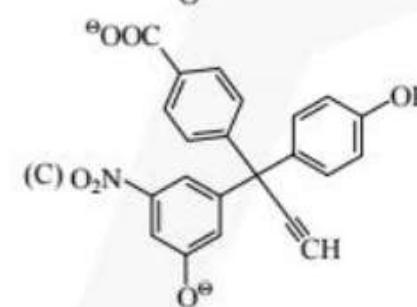
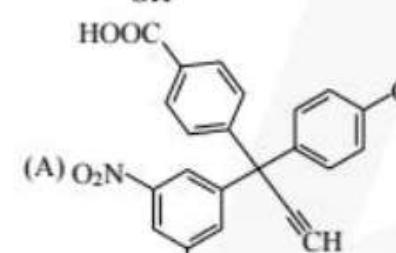
## (Organic Chemistry) GENERAL ORGANIC CHEMISTRY

7. (a) Which of the following is more acidic and why?

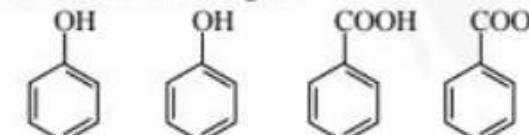
[IIT-JEE-2004]



8.  $\xrightarrow{2 \text{ Moles NaNH}_2}$  A. The product (A) will be: [IIT-JEE-2007]



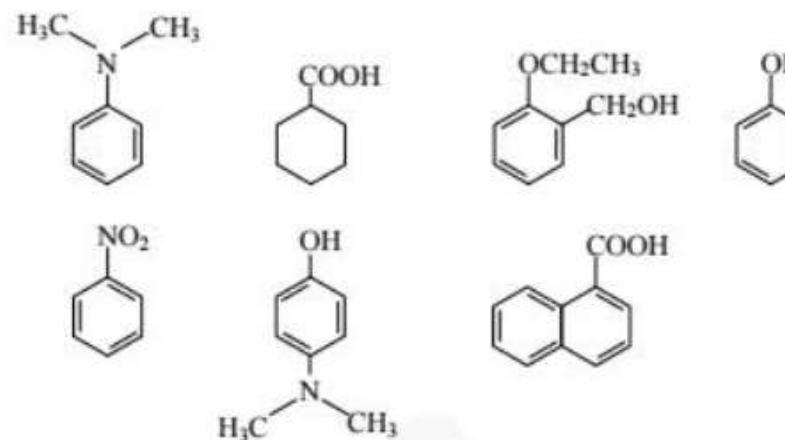
9. The correct acidity order of the following is :



- (A) (III) > (IV) > (II) > (I)  
 (C) (III) > (II) > (I) > (IV)

- (B) (IV) > (III) > (I) > (II)  
 (D) (II) > (III) > (IV) > (I)

10. Amongst the following, the number of compounds soluble in aqueous NaOH is: [IIT-JEE-2010]



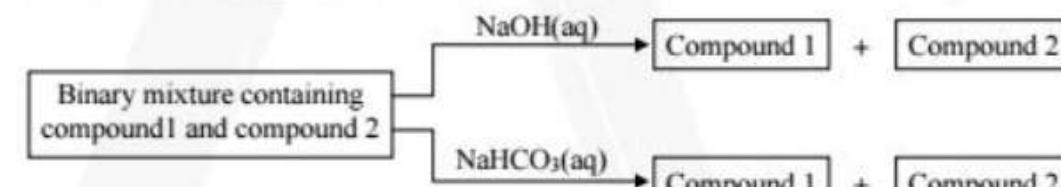
11. Among the following compounds, the most acidic is: [IIT-JEE-2011]



12. The carboxyl functional group ( $\text{--COOH}$ ) is present in –

- (A) piric acid      (B) barbituric acid      (C) ascorbic acid      (D) aspirin

13. Identify the binary mixture(s) that can be separated into the individual compounds, by differential extraction, as shown in the given scheme – **[IIT-JEE-2012]**



- (A)  $C_6H_5OH$  and  $C_6H_5COOH$       (B)  $C_6H_5COOH$  and  $C_6H_5CH_2OH$   
 (C)  $C_6H_5CH_2$  and  $C_6H_5OH$       (D)  $C_6H_5CH_2$  and  $C_6H_5CH_2COO$

14. The compound that does NOT liberate  $\text{CO}_2$ , on treatment with aqueous sodium bicarbonate solution, is – [JEE-ADVANCE-2013]

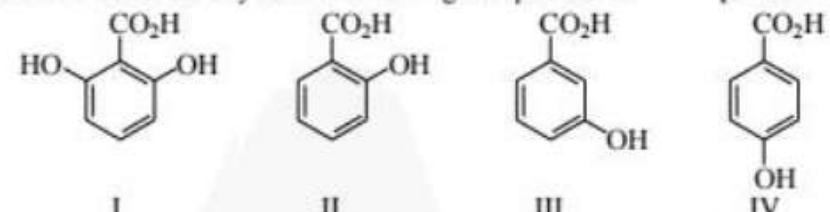


## (Organic Chemistry) GENERAL ORGANIC CHEMISTRY

15. Hydrogen bonding plays a central role in the following phenomena [JEE-ADVANCE-2013]

- (A) Ice floats in water
- (B) Higher Lewis basicity of primary amines than tertiary amines in aqueous solution
- (C) Formic acid is more acidic than acetic acid
- (D) Dimerisation of acetic acid in benzene

16. The correct order of acidity for the following compounds is : [JEE-ADVANCED-2016]



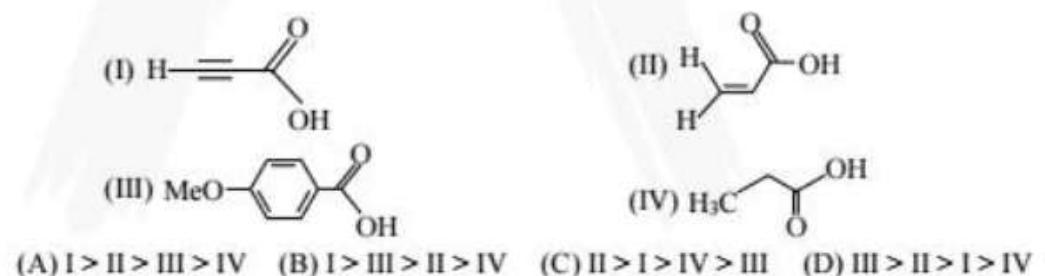
- (A) I > II > III > IV
- (B) III > I > II > IV
- (C) III > IV > II > I
- (D) I > III > IV > II

17. The order of basicity among the following compounds is [JEE-ADVANCED-2017]



- (A) II > I > IV > III
- (B) IV > I > II > III
- (C) I > IV > III > II
- (D) IV > II > III > I

18. The correct order of acid strength of the following carboxylic acids is: [JEE-ADVANCED-2019]



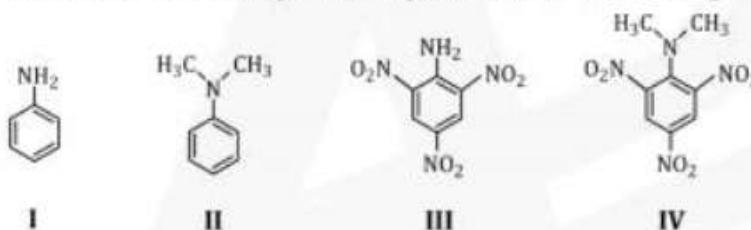
19. With respect to the compounds I-V, choose the correct statement(s).

[JEE ADVANCE-2020]



- (A) The acidity of compound I is due to delocalization in the conjugate base.  
(B) The conjugate base of compound IV is aromatic.  
(C) Compound II becomes more acidic, when it has a  $-NO_2$  substituent.  
(D) The acidity of compounds follows the order I > IV > V > II > III.

20. Consider the following four compounds I, II, III, and IV. [JEE ADVANCE-2020]



Choose the correct statement(s).

- (A) The order of basicity is II > I > III > IV.  
(B) The magnitude of  $pK_b$  difference between I and II is more than that between III and IV.  
(C) Resonance effect is more in III than in IV.  
(D) Steric effect makes compound IV more basic than III.



## ANSWER KEY

## EXERCISE # I

1. (i)  $a > b > c > d$ , (ii)  $a > b > c$ , (iii)  $c > b > a$ , (iv)  $a > b > c$ ,  
 (v)  $c > b > a$ , (vi)  $a > b > c$ , (viii)  $d > c > b > a$ , (viii)  $d > c > b > a$   
 (ix)  $d > b > a > c$  (x)  $d > a > c > b$
2. (a) 2; (b) 2; (c) 1; (d) 1      3. (a) 2; (b) 2; (c) 2      4. (C)      5. (B)
6. (B)      7. (B)      8. (A)      9. (A)
10. (i) cysteine : (ii) glutamic acid :
11. (a)  $3 < 2 < 1$ ; (b)  $1 < 2 < 3$ ; (c)  $3 < 2 < 1$ ; (d)  $2 < 1 < 3$ ; (e)  $2 < 3 < 1$
12. (i)  $d > c > a > b$ , (ii)  $a > b > c$ , (iii)  $c > a > b > d$ , (iv)  $d > b > c > a$ ,  
 (v)  $a > b > c$ , (vi)  $b > a$  (vii)  $c > a > b$
13. (i) b, (ii) a, (iii) b, (iv) b      14. (C)      15. (C)      16. (C)
17. (C)      18. (B)      19. (4)      20. (C)

## EXERCISE # II

1. (i)  $a > b > c > d$ , (ii)  $a > b > c > d$ , (iii)  $c > b > d > a$ , (iv)  $a < b < c < d$ ,  
 (v)  $a > b > c$ , (vi)  $a > b > c$ , (vii)  $c > a > b$ , (viii)  $b > c > a$ ,  
 (ix)  $c > d > b > a$
2. (i)  $a > b > c$ , (ii)  $d > c > b > a$ , (iii)  $b > c > a$ , (iv)  $d > c > b > a$ ,  
 (v)  $b > a > c$ , (vi)  $b < a$ , (vii)  $c > b > a$ , (viii)  $c < b < a < d$   
 (ix)  $a < b < c < d$
3. (i) d, (ii) b, (iii) a, (iv) a
4. (i)  $b > a > d > c$ , (ii)  $b > a > c > d$ , (iii)  $a > b > c > d$
5. (A)      6. (A)      7. (A)
8. (a) i, (b) ii, (c) i, (d) ii      9. (a) 2 ; (b) 1 ; (c) 1 ; (d) 1 ; (e) 3
10. (a) 2; (b) 1; (c) 2; (d) 2      11. (a)  $1 > 2 > 3$ ; (b)  $1 < 2 < 3$ ; (c)  $3 < 1 < 2$ ; (d)  $2 < 1 < 3$
12. (a)  $2 < 1 < 3$ ; (b)  $1 < 2 < 3$       13. (C)      14. (B)      15. (D)      16. (C)
17. (A,D)      18. (C)      19. (3)      20. (6)



## EXERCISE # III

1. (C)      2. (C)  
 3. (A)→R, S, T; (B)→P, R, S, T; (C)→P, Q, R, S, T; (D)→P, Q, R, S, T  
 4. (i), (ii) (iii) (iv), (v) (ix)      5. (D)      6. (A)  
 7. (A)→P; (B)→R; (C)→Q; (D)→S, T      8. (A)→R; (B)→S; (C)→P; (D)→Q, T  
 9. (A)      10. (A)      11. (A, D)      12. (D)  
 13. (A, B, C, D)      14. (B)      15. (C)      16. (A, B)      17. (D)  
 18. (C)      19. (A)      20. (2401)

## EXERCISE # IV

1. (A)      2. (B)      3. (A)      4. (A, B, C)      5. (A)  
 6. (D)      7. (C)      8. (B)      9. (D)      10. (A, C, D)

## EXERCISE # V (JEE-MAIN)

1. (3)      2. (4)      3. (3)      4. (4)      5. (4)      6. (3)      7. (4)  
 8. (3)      9. (1)      10. (2)      11. (3)      12. (1)      13. (1)      14. (2)  
 15. (3)      16. (2)      17. (4)      18. (3)      19. (2)      20. (3)      21. (3)  
 22. (1)      23. (1)      24. (4)      25. (4)      26. (4)      27. (3)      28. (4)  
 29. (4)      30. (3)      31. (1)      32. (A)      33. (D)      34. (A)      35. (C)  
 36. (B)

## EXERCISE # VI (JEE-ADVANCE)

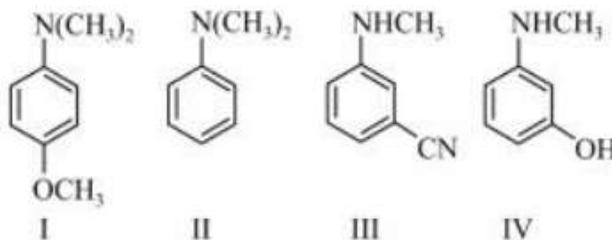
1. (D)      2. Benzoate has equivalent resonating structures      3. (D)  
 4. (B)      5. (D)      6. A→(S); B→(Q); C→(P); D→(R); E→(T)  
 7. (II is most acidic)      8. (C)      9. (A)      10. (4)      11. (C)  
 12. (D)      13. (B, D)      14. (D)      15. (A, B, D)  
 16. (A)      17. (B)      18. (A)      19. (A, B, C)  
 20. (C, D)



## SOLUTION

## EXERCISE # V (JEE-MAIN)

32.

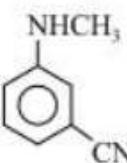


+ R effect  
and -I effect  
of  $\text{OCH}_3$

(- I effect  
of  $-\text{CN}$   
group)

(- I effect  
of  $-\text{CN}$   
group)

$-\text{OCH}_3$  group increases electron density of ring at O and P position making (I) most basic.

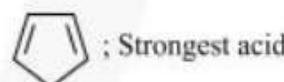


is least basic due to -I effect of  $-\text{CN}$  group at meta position.  
since -I effect of  $-\text{CN} > -\text{I effect of } -\text{OH}$  group

Hence correct basic strength will follow the order I > II > IV > III

Basic strength  $\propto \frac{1}{\text{pK}_b \text{ value}}$  Order of  $K_b$  value I < II < IV < III

33.

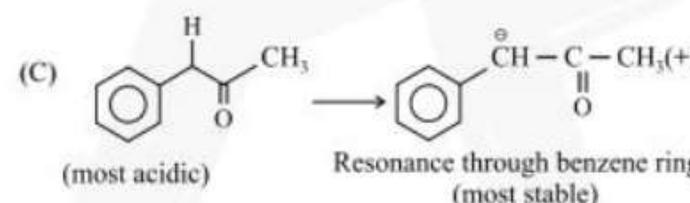
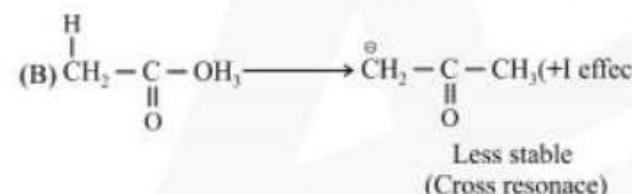
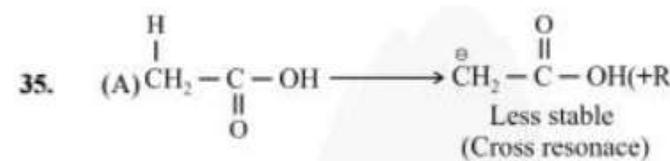
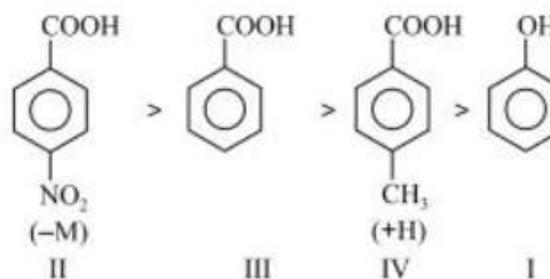


because its conjugate base is aromatic



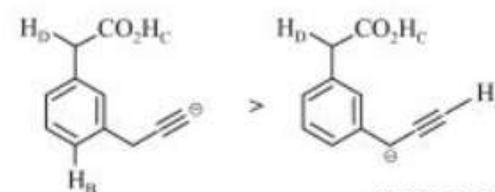
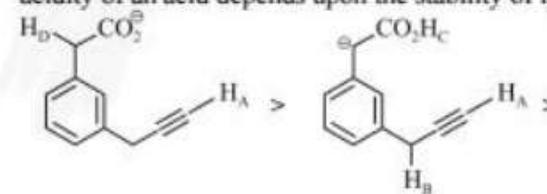


34. Acidity of carboxylic acid  $\alpha -R > -H > -I \propto \frac{1}{+R>+H>+I}$



So it has least  $pK_a$  value.

36. acidity of an acid depends upon the stability of its conjugate base





## EXERCISE # VI (JEE-ADVANCE)

19. (A) is a conjugate base of compound I Which is stabilized by delocalization or resonance.  
(B) is a conjugate base of, which is an aromatic compound.  
(C)  $-\text{NO}_2$  group is a strong electron-withdrawing group, which increases the acidic strength of compound II.  
(D) The order of acidic strength.
20. (A) Correct basic strength order of given compound is (IV) > (II) > (I) > (III)  
(B) Compound IV is a stronger base than III due to SIR effect, which basic strength difference between I & II is very less.  
(C) In compound IV due to SIR (steric inhibition due to resonance) effect both  $-\text{NO}_2$  and  $\text{N}(\text{CH}_3)_2$  group will be out of plane hence resonance effect in compound IV is less.