Exercise-1

ONLY ONE OPTION CORRECT TYPE

Part - I (GOC-I)

Section (A) : Inductive effect :

- 1. Inductive effect involves :
 - (1) delocalisation of σ -electrons
 - (3) displacement of σ -electrons
- (2) delocalisation of π -electrons
- (4) displacement of π -electrons
- 2. Which statement is correct regarding Inductive effect ?
 - (1) Electron displacement along a carbon chain and develops partial charges on atoms.
 - (2) Complete transfer of one of the shared pair of electrons to one of the atom joined by a double bond.
 - (3) Implies transfer of lone pair of electron from more electronegative atom to the less electronegative atom.
 - (4) I effect increases with increase in the distance.
- **3.** Select the correct statement about Inductive effect :
 - (1) Inductive effect transfer electrons from one carbon atom to another.
 - (2) Inductive effect is the polarisation of σ bond electrons.
 - (3) Net charge develops in the molecule by inductive effect.
 - (4) Inductive effect is distance independent.
- 4. Which of the following has incorrect direction of Inductive effect.







5. Which of the following has correct direction of Inductive effect.

(1) $CH_3 - CH_2 \rightarrow Li$ (2) $H_2N \rightarrow C \equiv CH$ (3) $H_2N \rightarrow C \equiv CH$

(4)
$$H_2 N \longrightarrow O^{\Theta}$$

- 6. Which of the following alkyl group has the maximum +I effect ? (1) $(CH_3)_2CH$ - (2) $(CH_3)_3C$ - (3) CH_3CH_2 - (4) CH_3 -
- 7. Which of the following group shows + I effects :
 - (1) F (2) CHO (3) – $\overset{\circ}{N}H$ (4) CN

 8.
 Decreasing –I effect of given groups is :
 (ii) –CN
 (ii) –NO2
 (iii) –NH2
 (iv) –CI

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

- 9. Which is the correct order of inductive effect ? (1) $-NH_2 > -OR > -F$ (2) $-F > -OR > -NH_2$ (3) $-NH_2 > -F > -OR$ (4) $-OR > -F > -NH_2$
- **10.** Arrange following compounds in decreasing order of their dipole moment.

I	II	111	IV
$CH_3 - CH_2 - NO_2$	CH ₃ —CH ₂ —CI	CH ₃ —CH ₂ —Br	CH ₃ —CH ₂ —I
(1) IV > III >I > II	(2) IV > I > III > II	(3) I > III > IV > II	(4) > > > V

Section (B) : Resonance





4.	Which of the following (1) –C–F O	group show +m and –I e (2) –C–OR II O	ffect ? (3) −O ^₀	(4) –OH
5.	Which of the following	group show +m > $-I$ effe	ect?	
	(1) –CH ₃	(2) –O–C–R	(3) –C–R II O	(4) –COOH
6.	Which of the following $(1) - NO_2$	group show –m and –I e (2) –NH ₂	ffect ? (3) –OH	(4) –F
7.	The weakest + m grou (1) – OCH ₃	p of the given species is (2) – F	: (3) – I	(4) – N (CH ₃) ₂
8.	Arrange the following ((i) NO ₂ (1) i > iii > ii > iv	groups in order of decrea (ii) COOH (2) i > ii > iii > iv	asing –m effect. (iii) CN (3) i > iii > iv > ii	(iv) CHO (4) iv > iii > ii > i
9.	Arrange the following $ $	groups in order of decrea	asing +m effect.	
	(i) −Ŏ (1) i > ii > iii > iv	(ii) – NH ₂ (2) iv > iii > ii > i	(iii) – OH (3) i > iii > ii > iv	(iv) –NHCOCH ₃ (4) i > iv > iii > ii
10.	In which of the followin (1) NH_2	ing molecule, the mesome (2) \swarrow NH ₃	eric effect is present ? (3) OH_2	(4)
11.	In which of the followin	ng molecule, the mesome	eric effect is not with the	benzene nucleus ?
	(1) NH O	(2) NH	(3) NH	(4) (4) (4) (4) (4) (4) (4) (4) (4) (4)
12.	Electron density order	in the benzene nucleus	is	
	(I)		(III) CH ₃	(IV) NO_2
	(1) I > II > III > IV	(2) I > III > II > IV	(3) IV > II > III > I	(4) $I > IV > II > III$
13.	Rank the following cor (I) Chlorobenzene (III) 2, 4-dinitrochlorob (1) I > II > III > IV	npounds in order of decr penzene (2) I > III > II > IV	easing electron density in (II) 4-nitrochlorobenze (IV) 2, 4, 6-trinitrochlo (3) III > I > IV > II	n the benzene nucleus. ne robenzene (4) IV > III > II > I
Secti	ion (D) : Hyperconj	ugation effect		

- **1.** Hyperconjugation effect involves :
 - (1) Delocalization of lone pair into an adjacent π -bond.
 - (2) Delocalization of π -electrons into an adjacent double bond.
 - (3) Delocalization of σ -electrons into an adjacent π -bond.
 - (4) All are true.



6.

9.

10.

3. Which of the following ion is nonaromatic in nature.



4. Which of the following compound is not aromatic in nature.



5. Which of the following molecules have all C–C bonds are of equal length?



- 7.In the compound C_6H_5Z which of the following set of groups is predominatly ortho/para directing ?(1) $Z = -NO_2$, -CI, -OH(2) Z = -OMe, -CN, $-NH_2$ (3) $Z = -NHCOCH_3$, -CI, -COOH(4) $Z = -NHCOCH_3$, $-CH_3$, -OH
- 8. Which of the following is aromatic hydrocarbon ?





Part - II (GOC-II)

Section (F) : Carbon free radicals & carbocations :

1. Heterolysis of a carbon -carbon bond gives :

(1) Carbanion	(2) Carbocation
(3) Both carbanion and carbocation	(4) Free radical

 $(4) (CH_3)_3 C$

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2. In CH₃CH₂OH, the bond that undergoes heterolytic cleavage most readily is :

- The geometry of a methyl carbocation and methyl carbanion is likely to be respectively :
 (1) Octahedral & linear
 (2) Tetrahedral & planar
 (3) Planar & tetrahedral
 (4) Linear & tetrahedral
- 4. The stability of given free radicals in decreasing order is :

(i)
$$CH_3 - \dot{C}H_2$$
 (ii) $CH_3 - C\dot{H} - CH_3$ (iii) $CH_3 - \dot{C} - CH_3$ (iv) $\dot{C}H_3$
(1) iii > iv > i > ii (2) i > ii > iii > iv (3) iii > ii > iv > i (4) iii > ii > i > i > i > iv

- 5. Stability of carbocations can be explained on the basis of ?
 (1) Inductive effect
 (2) Hyperconjugative effect
 (3) Resonance effect
 (4) All the three
- 6. Which one is a 1° carbocation ?

(1)
$$CH_3 \overset{\cdot}{C} H_2$$
 (2) $CH_3 \overset{\cdot}{C} H C_2 H_5$

7. The most stable carbocation is :





(3) (CH₃)₂ C H

8. The decreasing order of stability of alkyl carbonium ion is in the order of : $(R = C_2 H_z)$





- **9.** Which of the following statement is correct ?
 - (1) Allyl carbocation ($H_2C=CH-CH_2$) is more stable than propyl carbocation.
 - (2) Ethyl carbocation is more stable than allyl carbocation.
 - (3) Vinyl carbocation is more stable than ethyl carbocation.
 - (4) Benzyl carbocation is more stable than cyclopropyl methyl carbocation.
- 10. Which of the following shows the correct order of stability -

(1)
$$CH_3OCHCH_3 < CH_3OCH_2 < CH_3CHCH_3 < CH_3CH_2$$

(2) $CH_3CHCH_3 < CH_3CH_2 < CH_3OCHCH_3 < CH_3OCH_2$
(3) $CH_3CH_2 < CH_3CHCH_3 < CH_3OCH_2 < CH_3OCHCH_3$
(4) $CH_3OCH_2 < CH_3OCHCH_3 < CH_3CH_2 < CH_3CHCH_3$

11. Decreasing order of stability of given carbocations is as :

(i)
$$(i) \cap H_2 = CH - \overset{\oplus}{C}H_2$$
 (ii) $C_6H_5 - \overset{\oplus}{C}H_2$ (iv) $CH_3 - \overset{\oplus}{C}H - CH_3$
(1) $iii > ii > iv > i$ (2) $i > iii > iv > ii$ (3) $i > iii > ii > iv$ (4) $iii > ii > i > i > iv$

12. Which one of the following carbocations is most stable ?

(1)
$$\swarrow$$
 $\overset{\oplus}{\mathsf{C}}$ (2) $\mathsf{C}_{6}\mathsf{H}_{5} - \overset{\oplus}{\mathsf{C}}\mathsf{H}_{2}$
(3) $\overset{\oplus}{\checkmark}$ (4) $\mathsf{C}\mathsf{H}_{3} - \overset{\oplus}{\mathsf{C}}\mathsf{H}_{3}$

13. Which of the following shows the correct decreasing order of stability ?

(1)
$$CH_{3}$$
 \bigcirc $\dot{C}H_{2} > CH_{3}O$ \bigcirc $\dot{C}H_{2} > \bigcirc$ $\dot{C}H_{2} > CH_{3} - \dot{C}H_{2}$
(2) $CH_{3}O$ \bigcirc $\dot{C}H_{2} > CH_{3}$ \bigcirc $\dot{C}H_{2} > \bigcirc$ $\dot{C}H_{2} > CH_{3} - \dot{C}H_{2}$
(3) \bigcirc $\dot{C}H_{2} > CH_{3}O$ \bigcirc $\dot{C}H_{2} > CH_{3}$ \bigcirc $\dot{C}H_{2} > CH_{3} - \dot{C}H_{2}$
(4) $CH_{3}O$ \bigcirc $\dot{C}H_{2} > \bigcirc$ $\dot{C}H_{2} > CH_{3} - \dot{C}H_{2} > CH_{3} - \dot{C}H_{2}$

14. Which is least stable carbocation :

15. Which is most stable carbocation :

(1)
$$(2) \operatorname{Ph} - \operatorname{CH}_2$$

(3)
$$CH_3 - \overset{\oplus}{C}H - CH_3$$
 (4) $CH_2 = CH - \overset{\oplus}{C}H_2$

16. Which one is 3^o carbocation :

(1)
$$CH_3 - \overset{\oplus}{C}H_2$$
 (2) $CH_3 - \overset{\oplus}{C}H - CH_3$

$$\begin{array}{c} H_2 N - \stackrel{\oplus}{C} - C H_3 \\ (3) \qquad \qquad | \\ C H_3 \end{array}$$



17. Which one is most stable carbocaton :





19.

20.

21.

1.

2.

3.

4.

5.

6.

18. Which one will not undergo in rearrangement :



(iv) R₃C—CH₊



(ii)



(iii) R₂C=CH

- $(1) (i) > (ii) > (iii) > (iv) \quad (2) (ii) > (iii) > (iv) > (i) \quad (3) (iv) > (ii) > (iii) > (i) \quad (4) (i) > (iii) > (iv) > (iv) = (iv)$
- Arrange the following carbanions in decreasing order of stability : 8.



The correct order of stability of the following carbanion is : 9.



10. Which one is least stable carbanion :





Section (H) : Tautomerism :

1. Which of the following does not show toutomerism ?

> COCH (4) Ph (3) Ph--CH₃ (1)

2. Which of the following can show toutomerism ?



(3) CH₃ (4)

- 3. Tautomerism will be exhibited by : $(1) (CH_3)_2 NH$ $(2) (CH_3)_3 CNO$
- (3) R₃CNO₂ (4) RCH₂NO₂
- 4. The enolic form of acetone contains : (1) 9 σ bonds, 1 π bond and 2 lone pairs (3) 10 σ bond, 1 π bond and 1 lone pair
- (2) 8 σ bond, 2 π bond and 2 lone pairs (4) 9 σ bond, 2 π bond and 1 lone pair



4.	Which is strongest acid (1) HF	: (2) HCI	(3) HBr	(4) HI					
5.	For which carboxylic ac (1) CH_3 - CH_2 - $COOH$	id, the pKa value is the lo (2) CH≡C–COOH	lowest : (3) CH ₃ –CH ₂ –CH ₂ COOH (4) CH ₂ =CH–COOH						
6.	Strongest acid among the $(1) \ CF_3 \ COOH$	ne following is : (2) CCl ₃ COOH	(3) CBr ₃ COOH	(4) CH ₃ COOH					
7.	What is the correct orde	r of acidic strength in fol Cl	lowing compounds ?						
	CH ₂ –CH ₂ –COOH	I CH₃−C−COOH I	CH ₂ –CH ₂ –COOH						
	NO ₂ (x)	CI _(y)	Cl (z)						
	(1) x > y > z	(2) y > x > z	(3) x > z > y	(4) z > y > x					
8.	Which of the following o (1) $PhCO_2H > PhSO_3H$ (3) $PhCO_2H > PhOH >$	ption shows the correct > $PhCH_2OH > PhOH$ $PhCH_2OH > PhSO_3H$	order of decreasing acidity : (2) $PhSO_3H > PhOH > PhCH_2OH > PhCH_2OH$ (4) $PhSO_3H > PhCO_2H > PhOH > PhCH_2OH$						
9.	The correct order of rela (1) Phenol > Water > Et (3) Ethyl alcohol > Phen	ative acidic strength of pł hyl alcohol iol > Water	ohenol, ethtyl alcohol and water is- (2) Ethyl alcohol > Water > Phenol (4) Water > Phenol > Ethyl alcohol						
10.	Give the correct order o	f increasing acidity of the	e following compounds -						
	(I) OH	(II) OH	(III) COOH	(IV) C≡CH					
	(1) < < V <	(2) IV < II < I < III	(3) I < II < IV < III	(4) V < I < II < III					
11.	In which of the following F	compounds the hydrox	ylic proton is the most ac	idic ?					
	(1) V H	(2) I (2) H	(3) F	(4) F					
12.	Which of the following a (1) CH ₃ OH	Icohol is the strongest at (2) CH_3CH_2OH	cid ? (3) (CH ₃) ₂ CHCH ₂ OH	(4) (CH ₃) ₃ COH					
13.	Which one of the following carboxylic acid is most acidic.(1) o-Methyl benzoic acid(2) m-Methyl benzoic acid(3) p-Methyl benzoic acid(4) Benzoic acid								
14.	Arrange the following in (i) Benzoic acid (1) (i) < (ii) < (iii)	acidity ? acid (iii) o - methoxy (3) (ii) < (i) < (iii)	benzoic acid (4) (iii) < (ii) < (i).						
15.	Which of the following is	a polybasic acid :							
16.	 Acetic acid The ionistation constant phenoxide ion is bull phenoxide ion is state phenoxide ion is state phenoxide ion is less 	(2) Benzoic acid of phenol is higher than kier than ethoxide onger base than ethoxide bilised through delocalist s stable than ethoxide	(3) Salicylic aci that of ethanol because a tation	d (4) Oxalic acid					





(1) CH₃COOH + HCOONa \longrightarrow





27. Which of the following reaction is feasible :





- 1. The basic character of amines can be explained :
 - (1) Only in terms of Lowry-Bronsted concept.
 - (2) Only in terms of Lewis concept.
 - (3) Both in terms of Arrhenius and Lewis concepts.
 - (4) Both in terms of Lewis and Lowry-Bronsted concepts.

2.	Which has the hig	Which has the highest pK _b value ?										
	(1) R ₃ N	(2) R ₂ NH	(3) RNH ₂	(4) NH ₃								
3.	Amines are more	basic than :										
•••	(1) Alcohols	(2) Ethers	(3) Ester	(4) All of these								

4. Which of the following shows the correct order of decreasing basicity in gas phase ? (1) $(CH_3)_3N > (CH_3)_2NH > CH_3NH_2 > NH_3$ (2) $(CH_3)_2NH > (CH_3)_3N > CH_3NH_2 > NH_3$ (3) $(CH_3)_2NH > CH_3NH_2 > (CH_3)_3N > NH_3$ (4) $(CH_3)_2NH > CH_3NH_2 > NH_3 > (CH_3)_3N$

- 6. Which of the following shows the correct order of decreasing basicity in aqueous medium ? (1) $(C_2H_5)_3N > (C_2H_5)_2NH > C_2H_5NH_2 > NH_3$ (2) $(C_2H_5)_2NH > (C_2H_5)_3N > C_2H_5NH_2 > NH_3$ (3) $(C_2H_5)_2NH > C_2H_5NH_2 > (C_2H_5)_3N > NH_3$ (4) $(C_2H_5)_2NH > C_2H_5NH_2 > NH_3 > (C_2H_5)_3N$
- 7. The correct basic strength order of following anions is :

(1)
$$CH_{3}-\overrightarrow{C}H_{2}$$
, $\overrightarrow{N}H_{2}$, $CH_{2}=\overrightarrow{C}H$, $CH=\overrightarrow{C}$, $H\overrightarrow{O}$, \overrightarrow{F}
(2) $\overrightarrow{N}H_{2}$, $CH_{3}-\overrightarrow{C}H_{2}$, $CH_{2}=\overrightarrow{C}H$, $CH=\overrightarrow{C}$, \overrightarrow{F} , $H\overrightarrow{O}$
(3) $CH_{3}-\overrightarrow{C}H_{2}$, $CH_{2}=\overrightarrow{C}H$, $\overrightarrow{N}H_{2}$, $CH=\overrightarrow{C}$, $H\overrightarrow{O}$, \overrightarrow{F}
(4) \overrightarrow{F} , $H\overrightarrow{O}$, $CH=\overrightarrow{C}$, $CH_{2}=\overrightarrow{C}H$, $\overrightarrow{N}H_{2}$, $CH_{3}-\overrightarrow{C}H$



17. Which of the following cannot be a base ?





(3)



18. Choose the strongest base among the following :



19. The correct decreasing order of basicity in the following compound is :

|| 0



(4) || > |V > | > |||

20. Select the basic strength order of following molecules ?



21. In which of the following is strongest base :



22. Select the basic strength order of following molecule :





- 5. Which of the following statement is not true about the resonance contributing structures to a resonance hvbrid ?
 - (1) Contributing structures contribute to the resonance hybrid in proportion of their energies.
 - (2) Number of unpaired electrons remain same in the resonating structures.
 - (3) Contributing structures represent hypothetical molecules having no real existence.
 - (4) Contributing structures are less stable than the resonance hybrid.
- how many π bonds are in resonance ? 6. In (2) 2 (3) 3 (1) 4(4) None
- Which of the following resonance structures does not represent the correct stability order : 7.

(1)
$$CH_3 - CH_2 - CH - \dot{O}CH_3 < CH_3 - CH_2 - CH = \dot{O}CH_3$$

(2) $CH_2 = CH - \dot{CH} - CH = \dot{NH}_2 > \dot{CH}_2 - CH = CH - CH = \dot{NH}_2$
(3) $CH_3 - C = CH_3 - C$

The most stable resonating structure of following compound is : 8.



- 9. Which of the following series contains atoms/groups having only -m (mesomeric) effect ? (1) COR, OR, COOR (2) CI, CHO, NH₂ (3) NO₂, CN, SO₂H (4) OH,NR₂,SR
- Which of the following group can exert both + m and I effect ? 10. (1) - CHO (3) - Cl $(4) - CH_{2}$ $(2) - NO_{2}$
- 11. Hyper conjugation is possible in : $CH = CH_2$ (1) C=CH–CH₃ (2) CH₃–ČH₂ (3) CH=CH-
- 12. Which of the following compounds has inductive, mesomeric and hyperconjugative effect? (1) CH₃CI (2 (4

2)
$$CH_3 - CH = CH_2$$

4) $CH_2 = CH - CH = CH_2$

Select the correct order of heat of hydrogenation? 13.





(4) 5

22. Which of the following is correct about the following compound



(Naphthalene)

- (1) All the C-C bond length are same
- (2) $C_1 C_2$ bond length is shorter than $C_2 C_3$ bond length
- (3) $C_1 C_2$ bond length is greater than $C_2 C_3$ bond length
- (4) All the C-C bond length are equal to C-C bond length of benzene
- **23.** The correct order of + m effect of 'N' containing functional group on benzene ring, amongst the given compounds is



- 24. Aromatic compounds burn with sooty flame because :
 - (1) They contain a ring structure of carbon atoms.
 - (2) They contain a relatively high percentage of hydrogen.
 - (3) They resist reaction with oxygen of air.
 - (4) They contain a relatively high percentage of carbon.
- **25.** How many species out of the following are aromatic ?



26. What is true about the following reactions?



- (1) I is nonaromatic
- (2) II is nonaromatic
- (3) III is antiaromatic
- (4) Out of I, II and III only III compound is nonaromatic



35. Which one is least stable carbocation :







36. Which one is most stable carbocation :



37. Write correct order of stability of following carbocation :



(1) I > II > III > IV

(2) III > II > I > IV

(3) III > II > I

(4) II > III > I

38.

39.



40. In which pair of carbanions first is more stable than second ?.



41. In each of the following pairs of ions which ion is more stable :

(a)
$$CH_{2} = \overset{\circ}{C}H and CH = \overset{\circ}{C}$$

(I) (II)
(b) $\overset{\circ}{C_{6}H_{5}} \overset{\Theta}{-CH_{2}} and CH_{2} = CH - C\overset{\circ}{H_{2}}$
(I) (II)
(c) $CH_{3} - C\overset{\circ}{H} - CH = CH_{2} and C\overset{\circ}{H_{2}} - CH = CH_{2}$
(I) (II)
(d) $\overset{\circ}{\bigvee} \overset{\circ}{\inf} and CH_{2} = CH - CH = CH - \overset{\Theta}{CH_{2}}$
(I) (II)
(1) (a) - (II) (b) - (I) (c) - (II) (d) - (I) (2) (a) - (II) (b) - (II) (c) - (I) (d) - (II)
(3) (a) - (I) (b) - (II) (c) - (II) (d) - (I) (4) (a) - (I) (b) - (II) (c) - (II) (d) - (II)

42. Tautomerism does not exhibited by :





43. Which one is not tautomer of following compound :





- 44. Which statement is incorrect for keto-enol tautomerism?
 - (1) Tautomerism is catalysed by acid and base.
 - (2) Tautomers are present in dynamic equilibrium state.
 - (3) Generally keto form is more stable than enol form in mono ketones.
 - (4) Atomic arrangements are same in tatuomerism.
- **45.** Which one has maximum % of enol content



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46. In following set of compounds which is correct decreasing order of % enol content. (III)(I) (II) (IV)(1) || > | > |V > ||| (2) IV > II > I > III (3) | > || > |V > ||| (4) IV > I > II > III 47. Which one has minimum % of enol content. (3) (1) (2)48. Decreasing order of enol content of the following compounds in aqueous phase : OEt CH (3) (4) (1) (2) (3) 4 > 3 > 2 > 1 (1) 2 > 1 > 3 > 4(2) 1 > 3 > 2 > 4(4) 3 > 1 > 2 > 4 49. Which compound show tautomerism : -OH (1) Ph-NO (4) HCHO (2)(3) 50. Tautomerism is exhibited by : OMe OH OMe (4) (1) (2)(3)ŇO ŃО NO 0 51. Ph Ph 11 O The total number of enolizable H-atoms is .. (1) 8(2) 6 (3) 4 (4) 5

52. Total number of enolizable H-atoms in given compound is :





- The reason for higher Ka, value of oxalic acid (I) as compared to that of malonic acid (II) is :
- (1) The anion formed after the removal of first H[⊕] of oxalic acid (I) is more stable due to stronger -I effect of -COOH present at close distance
- (2) The anion formed after the removal of first H[⊕] of oxalic acid (I) is less stable due to +I effect of -COOH group.
- (3) The anion formed on removal of first H[⊕] of malonic acid is more stable than that of oxalic acid due to –m effect of other –COOH group.

(3

- (4) Oxalic acid is more acidic than malonic acid due to its lesser molecular weight.
- 60. Which of the following is the strongest bronsted acid :





NH-CH₃





61. Most acidic hydrogen atom is present in :



(3) (CH ₃ CO) ₃ CH	(4) (CH ₃) ₃ COH







75. Order of K_a which can be predicted by following reaction is :



- Which of the following reactions is not feasible ? 76. COOH COONa + NaHCO (1) + $H_{2}O + CO_{2}$ SO₃Na SO₃H (2) NaHCO $H_{2}O + CO_{2}$ ONa OН + NaHCO₃ + $H_{2}O + CO_{2}$ (3) COOH COONa COONa COOH (4) NO₂ NO₂
- 77 Write the basicity order of the following :

$$\begin{array}{c|c} CH_{3}-C & VH & V \\ \hline & VH_{2} & CH_{3}-CH_{2}-NH_{2} & (CH_{3})_{2}NH & U \\ \hline & (I) & (II) & (III) & (IV) \\ \hline & (1) & (II) > (I) > (IV) & (2) & (I) > (III) > (IV) & (3) & (III) > (IV) & (4) & (I) > (III) > (IV) \\ \hline & (IV) & (IV) & (IV) & (2) & (IV) &$$

- 9. Increasing pK_b values of o-, m- and p-toluidine is (1) p < m < o (2) o < m < p (3) p < o < m (4) m < o < p
- 80. Select the correct basicity order for





14. The enolic form of ethyl acetoacetate as below has :



- (1) 16 sigma bonds and 1 pi- bond (2) 9 sigma bonds and 2 pi- bond
- (3) 9 sigma bonds and 1 pi- bond (4) 18 sigma bonds and 2 pi- bond
- **15.** Consider the following compound. Hyperconjugation occurs in :

 $\begin{array}{cccc} & & & & & & \\ CH_{3}-C-CH & & & & & \\ & & CH_{3} & & Ph-C-Ph & & & & \\ & & & (i) & & (ii) & & (iii) \\ (1) \ II \ only & (2) \ III \ only & (3) \ I \ and \ III & (4) \ I \ only \end{array}$

16. Which of the following is the most **correct** electron displacement for a nuclephilic reaction to take place ? [AIPMT 2015]



17. In which of the following compounds, the C–CI bond ionisation shall give most stable carbonium ion ? [AIPMT 2015]



18. The correct statement regarding the basicity of arylamines is : [NEET-1 2016]
 (1) Arylamines are generally more basic than alkylamines, because the nitrogen atom in arylamines is sp-hybridized.

(2) Arylamines are generally less basic than alkylamines because the nitrogen lone pair electrons are delocalized by interaction with the aromatic ring π electrons system.

(3) Arylamines are generally more basic than alkylamines because the nitrogen lone pair electrons are not delocalized by interaction with the aromatic ring π electron system.

(4) Arylamines are generally more basic than alkylamines because of aryl group

19. The pair of electron in the given carbanion, $CH_3C \equiv C^{\Theta}$, is present in which of the following orbitals?

20. The correct statement regarding a carbonyl compound with a hydrogen atom on its alpha-carbon, is :

[NEET-1 2016]

[NEET-1 2016]

- (1) a carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol and this processes is known as keto-enol tautomerism .
- (2) a carbonyl compound with a hydrogen atom on its alpha-carbon never equilibrates with its corresponding enol.
- (3) a carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol and this process is known as aldehyde-ketone equilibration.
- (4) a carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol and this process is known a carbonylation.

[AIPMT 2015]

[AIPMT 2015]



Which one is the most acidic compound ?

27.

6.

INEET-20171

(4)28. Which of the following is correct with respect to -I effect of the substituents? (R = alkyl) [NEET- 2018] $(2) - NR_2 > - OR > -F$ $(3) - NH_2 > - OR > -F$ $(1) - NH_2 < -OR < -F$ $(4) - NR_2 < -OR < -F$ 29. The compound that is most difficult to protonate is : [NEET-1- 2019] (1) Dh (3) 30. The correct order of the basic strength of methyl substituted amines in aqueous solution is : [NEET-1- 2019] (2) (CH₃)₂NH > CH₃NH₂ > (CH₃)₃N (1) $CH_3NH_2 > (CH_2)_2NH > (CH_3)_3N$ (3) $(CH_3)_3N > CH_3NH_2 > (CH_3)_2NH$ (4) $(CH_3)_3N > (CH_3)_2 NH > CH_3NH_2$ 31. The most stable carbocation among the following is [NEET-2- 2019] (2) CH₃-CH₂-CH⁺-CH₂-CH₃ (1) $(CH_3)_3C-CH^+-CH_3$ (3) CH₃-CH⁺-CH₂-CH₂-CH₃ (4) CH₃–CH₂–CH⁺ PART - II : AIIMS QUESTION (PREVIOUS YEARS) 1. The most stable ion is : [AIIMS 2002] (2) (CH₂)₂ $\overset{+}{\mathsf{C}}\mathsf{H}$ (3) (CH_a)_a⁺C $(4) C_{0}H_{2}CH_{3}$ $(1) CH_2 CH_2$ 2. Assertion : Alcohol and phenol can be distinguished by sodium hydroxide. [AIIMS 2002] Reason : Phenol is acidic while alcohol is neutral. (1) If both assertion and reason are true and reason is a correct explanation of assertion. (2) If both assertion and reason are true but reason is not a correct explanation of assertion. (3) If assertion is true but reason is false. (4) If assertion and reason both are false. 3. Among the following the strongest acid is : [AIIMS 2003] (1) CH₃COOH $(2) C_{e}H_{c}COOH$ (3) m-CH₃OC_eH₄COOH (4) p-CH₃OC_eH₄COOH 4. Among the following the weakest base is : [AIIMS 2003] $(3) O_2 N.CH_2 NH_2$ (2) C_eH_eCH₂NHCH₂ (4) CH₂NHCHO $(1) C_{e}H_{e}CH_{o}NH_{o}$ 5. Assertion : The pK_a of acetic acid is lower than that of phenol. [AIIMS 2004] Reason : Phenoxide ion is more resonance stabilised. (1) If both assertion and reason are true and reason is a correct explanation of assertion. (2) If both assertion and reason are true but reason is not a correct explanation of assertion. (3) If assertion is true but reason is false. (4) If assertion and reason both are false. Among the following the dissociation constant is highest for : [AIIMS 2004]

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 $(1) C_6 H_5 OH$

(1)

7.

8.

12.

(2) Nitrogen in pyridine is sp² hybridised

- 13.
 - (2)

14.

Reason : Lone pair of electrons present on Nx are involved in delocalisation.

(1) Pyridine has aromatic character

(3) Pyridine is a cyclic system

The stronger base among the following is :

(2)

Pyridine is less basic than triethylamine because :

(2) $C_{e}H_{5}CH_{2}OH$

CH_-CH-OCH_ сн. — СН — сосн. СН. — СН — СН. (III)(I)(1) | > || > |||(2) ||| > || > |(3) || > ||| > |(4) || > | > ||

10. Assertion : Amines are more basic than esters and ethers. [AIIMS 2007] Reason: Nitrogen is less electronegative than oxygen. It is in better position to accommodate the positive charge on the proton.

(3) $CH_{3}C \equiv CH$

- (1) If both assertion and reason are true and reason is a correct explanation of assertion.
- (2) If both assertion and reason are true but reason is not a correct explanation of assertion.
- (3) If assertion is true but reason is false.
- (4) If assertion and reason both are false.

11. Maximum enol content is in :

0	0 0
(1)	(2)

Assertion : Tropylium cation

Reason : The only property that determine its aromatic behaviour is its planar structure.

- (1) If both assertion and reason are true and reason is a correct explanation of assertion.
- (2) If both assertion and reason are true but reason is not a correct explanation of assertion.
- (2) If accortion is true but reason is folds
- (4) If assertion and reason both are false.
- The most unlikely representation of resonance structure of p-nitrophenoxide is -



Assertion : In benzinidazole, both the nitrogen Nx and Ny are basic.

[AIIMS 2009]

[AIIMS 2009]

(4) In pyridine, lone pair of nitrogen is delocalised [AIIMS 2007]

[AIIMS 2005]

NH

(4) CH₃NH₃+CI[−]



[AIIMS 2004]

[AIIMS 2008]

[AIIMS 2008]

ΟН

- (1) If both assertion and reason are true and reason is a correct explanation of assertion.
- (2) If both assertion and reason are true but reason is not a correct explanation of assertion.
- (3) If assertion is true but reason is false.
- (4) If assertion and reason both are false.
- The correct order of basic strength of CH₃NH₂(I), (CH₃)₂NH(II), (CH₃)₃N(III), C₆H₅CH₂NH₂(IV) in gaseous phase is [AIIMS 2010]



Reason : The only property that determines its aromatic behaviour is its planar structure.

- (1) If both assertion and reason are true and reason is a correct explanation of assertion.
- (2) If both assertion and reason are true but reason is not a correct explanation of assertion.
- (3) If assertion is true but reason is false.
- (4) If assertion and reason both are false.



(4) iii > iv > i > iii

(1)
$$iii > ii > i > iv$$
 (2) $I > iii > ii > iv$ (3) $iv > i > ii > iii$

[AIIMS 2018]

[AIEEE-2002]

[AIEEE 2003]

29. Assertion : Benzylamine is less basic then Ethylamine Reason : Benzene Show +I Effect

- (1) If both assertion and reason are true and reason is the correct explanation of assertion.
- (2) If both assertion and reason are true but reason is not the correct explanation of assertion.
- (3) If assertion is true but reason is false.
- (4) If both assertion and reason are false.

PART - III : JEE (MAIN) / AIEEE PROBLEMS (PREVIOUS YEARS)

1. In the following benzyl/allyl system

 $R - CH = CH_{\circ}$ and R

(R is alkyl group) decreasing order of inductive effect is : (1) $(CH_3)_3 C \rightarrow (CH_3)_2 CH \rightarrow CH_3 CH_2 \rightarrow (2) CH_3 CH_2 \rightarrow (CH_3)_2 CH \rightarrow (CH_3)_3 CH_2 \rightarrow (CH_3)_2 CH_2 \rightarrow (CH_3)_3 CH_2 \rightarrow (CH_3)_3 CH_3 \rightarrow (CH_3)_3 \rightarrow (CH_3) \rightarrow (CH_3)_3 \rightarrow (CH_3) \rightarrow$ (3) $(CH_3)_2CH \rightarrow CH_3CH_2 \rightarrow (CH_3)_3C$

- 2. In the anion HCOO⁻ the two carbon-oxygen bonds are found to be of equal length. What is the reason for it?
 - (1) electronic orbitals of carbon atom are hybridised
 - (2) the C = O bond is weaker than the C O bond
 - (3) the anion HCOO- has two equivalent resonating structures
 - (4) the anion is obtained by removal of a proton from the acid molecule.
- The correct order of increasing basic nature for the bases NH₃, CH₃NH₂ and (CH₃)₂NH is : [AIEEE-2003] 3.
 - (1) $CH_{2}NH_{2} < NH_{2} < (CH_{2})_{2}NH$
 - (3) $NH_3 < CH_3NH_2 < (CH_3)_2NH$

(2) $(CH_2)_NH < NH_2 < CH_2NH_2$ (4) $CH_3NH_2 < (CH_3)_2NH < NH_3$

(4) $(CH_3)_3C \rightarrow CH_3CH_2 \rightarrow (CH_3)_3CH \rightarrow (CH_3)_3CH$

Which of the following is the strongest base? 4. [AIEEE 2004] CH₂NH₂ NHCH₃ NH₂ NH₂ CH₃ (1) (3)Consider the acidity of the carboxylic acids: 5. [AIEEE 2004] (i) PhCOOH (iv) m- NO₂C_eH₄COOH (ii) $O - NO_2C_6H_4COOH$ (iii) $p - NO_2C_6H_4COOH$ (1) i > ii > iii > iv (2) ii > iii > iv > i (3) iii > ii > iv > i (4) ii > iv > iii > i Among the following acid which has the lowest pK value ? 6. [AIEEE-2005] (1) CH₂CH₂COOH (2) $(CH_3)_2CH - COOH$ (3) HCOOH (4) CH₃COOH 7. Amongst the following the most basic compound is [AIEEE-2005] (1) p-Nitroaniline (2) Acetanilide (3) Aniline (4) Benzylamine The increasing order of stability of the following free radicals is : 8. [AIEEE 2006] (1) $(CH_{2})_{2}\dot{C}H < (CH_{2})_{2}\dot{C} < (C_{2}H_{2})_{2}\dot{C}H < (C_{2}H_{2})_{2}\dot{C}$ (2) $(C_{e}H_{e})_{2}\dot{C} < (C_{e}H_{e})_{2}\dot{C}H < (CH_{2})_{2}\dot{C} < (CH_{2})_{2}\dot{C}H$ (3) $(C_{h}H_{5})_{2}\dot{C}H < (C_{h}H_{5})_{3}\dot{C}H < (CH_{3})_{3}\dot{C} < (CH_{3})_{2}\dot{C}H$ (4) $(CH_3)_2 \overset{\bullet}{C}H < (CH_3)_3 \overset{\bullet}{C} < (C_6H_5)_3 \overset{\bullet}{C} < (C_6H_5)_2 \overset{\bullet}{C}H$ The correct order of increasing acid strength of the compounds [AIEEE 2006] 9.



17. The order of stability of the following carbocations :

[JEE(Mains)-2013]





Answers

	EXERCISE - 1												
SEC	SECTION (A)												
1.	(3)	2.	(1)	3.	(2)	4.	(4)	5.	(2)	6.	(2)	7.	(3)
8.	(4)	9.	(2)	10.	(4)								
SEC	TION (B)												
1.	(4)	2.	(1)	3.	(2)	4.	(4)	5.	(1)	6.	(2)	7.	(3)
8.	(4)	9.	(4)	10.	(1)	11.	(1)	12.	(1)	13.	(1)	14.	(2)
15.	(2)												
SEC	TION (C)												
1.	(3)	2.	(2)	3.	(4)	4.	(4)	5.	(2)	6.	(1)	7.	(3)
8.	(3)	9.	(1)	10.	(1)	11.	(4)	12.	(2)	13.	(1)		
SEC	TION (D)												
1.	(3)	2.	(4)	3.	(1)	4.	(2)	5.	(2)	6.	(4)	7.	(4)
8.	(4)	9.	(3)	10.	(2)								
SEC	TION (E)												
1.	(4)	2.	(4)	3.	(4)	4.	(1)	5.	(4)	6.	(2)	7.	(4)
8.	(3)	9.	(2)	10.	(3)								
SEC	TION (F)												
1.	(3)	2.	(4)	3.	(3)	4.	(4)	5.	(4)	6.	(1)	7.	(2)
8.	(1)	9.	(1)	10.	(3)	11.	(3)	12.	(1)	13.	(2)	14.	(3)
15.	(1)	16.	(4)	17.	(2)	18.	(4)	19.	(4)	20.	(2)	21.	(2)
SEC	TION (G)												
1.	(2)	2.	(3)	3.	(3)	4.	(3)	5.	(1)	6.	(1)	7.	(1)
8.	(4)	9.	(4)	10.	(2)								
SEC	TION (H)	_	6-3					_		_		_	
1.	(4)	2.	(2)	3.	(4)	4.	(1)	5.	(3)	6.	(1)	7.	(1)
8.	(3)	9.	(2)	10.	(2)								
SEC	TION (I)	-	<i>(</i>)	-	(-)		(_	(-)		(_	(-)
1.	(4)	2.	(4)	3.	(3)	4.	(4)	5.	(2)	6.	(1)	7.	(2)
8.	(4)	9.	(1)	10.	(2)	11.	(4)	12.	(1)	13.	(1)	14.	(3)
15.	(4)	16.	(3)	17.	(1)	18.	(1)	19.	(2)	20.	(4)	21.	(1)
22.	(3)	23.	(2)	24.	(3)	25.	(3)	26.	(2)	27.	(4)	28.	(2)
SEC	FION (J)	-		-	<i>(</i>)		())	_				_	
1.	(4)	2.	(4)	3.	(4)	4.	(1)	5.	(3)	6.	(2)	7.	(3)
8.	(1)	9.	(1)	10.	(2)	11.	(2)	12.	(3)	13.	(1)	14.	(2)
15.	(2)	16.	(1)	17.	(4)	18.	(4)	19.	(1)	20.	(1)	21.	(2)
22.	(4)	23.	(4)	24.	(1)								

	EXERCISE - 2												
1	(4)	2	(1)	3	(3)	٨	(4)	5	(1)	6	(2)	7	(4)
ו. 8	(4) (4)	2. 9	(1)	J. 10	(3)	4. 11	(4)	J. 12	(1)	0. 13	(2)	7. 14	(4) (4)
15	(1)	16	(0)	17	(0)	18	(1)	19	(3)	20	(2)	21	(3)
22.	(2)	23.	(3)	24.	(4)	25.	(1)	26.	(0)	27.	(2)	28.	(4)
29.	(1)	30.	(3)	31.	(4)	32.	(3)	33.	(2)	34.	(3)	35.	(4)
36.	(3)	37.	(2)	38.	(3)	39.	(2)	40.	(2)	41.	(1)	42.	(2)
43.	(2)	44.	(4)	45.	(3)	46.	(2)	47.	(2)	48.	(2)	49.	(3)
50.	(1)	51.	(2)	52.	(1)	53.	(2)	54.	(1)	55.	(1)	56.	(4)
57.	(1)	58.	(2)	59.	(1)	60.	(3)	61.	(3)	62.	(1)	63.	(3)
64.	(3)	65.	(3)	66.	(2)	67.	(3)	68.	(4)	69.	(2)	70.	(4)
71.	(3)	72.	(2)	73.	(2)	74.	(4)	75.	(2)	76.	(3)	77	(2)
78.	(3)	79.	(1)	80.	(2)	81.	(3)	82.	(2)	83.	(4)	84.	(2)
						EXER	CISE	- 3					
						P/	ART-I						
1.	(1)	2.	(3)	3.	(3)	4.	(4)	5.	(2)	6.	(2)	7.	(4)
8.	(2)	9.	(1)	10.	(1)	11.	(1)	12.	(3)	13.	(3)	14.	(4)
15.	(2)	16.	(2)	17.	(2)	18.	(2)	19.	(1)	20.	(1)	21.	(2)
22.	(3)	23.	(1)	24.	(4)	25.	(4)	26.	(2)	27.	(4)	28.	(1,4)
29.	(1)	30.	(2)	31.	(3)								
						PA	ART-II						
1.	(3)	2.	(2)	3.	(3)	4.	(4)	5.	(3)	6.	(4)	7.	(3)
8.	(2)	9.	(4)	10.	(1)	11.	(2)	12.	(3)	13.	(3)	14.	(4)
15.	(4)	16.	(4)	17.	(1)	18.	(3)	19.	(4)	20.	(2)	21.	(3)
22.	(3)	23.	(2)	24.	(2)	25.	(1)	26.	(2)	27.	(3)	28.	(1)
29.	(3)												
						PA	RT-III						
1.	(1)	2.	(3)	3.	(3)	4.	(4)	5.	(2)	6.	(3)	7.	(4)
8.	(1)	9.	(3)	10.	(1)	11.	(2)	12.	(4)	13.	(3)	14.	(3)
15.	(1)	16.	(3)	17.	(4)	18.	(1)	19.	(3)	20.	(1)	21.	(4)
22.	(3)	23.	(2)	24.	(1)	25.	(4)	26.	(3)	27.	(2)	28.	(3)
29.	(3)												