Exercise-1

Marked Questions may have for Revision Questions.

OBJECTIVE QUESTIONS

Section (A) : Inductive effect



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- A-3. Inductive effect involves :
 - (1) delocalisation of σ -electrons
 - (3) displacement of σ -electrons
- (2) delocalisation of π -electrons
- (4) displacement of π-electrons
- A-4. 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.
- A-5. 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.
- A-6. Which of the following has incorrect direction of Inductive effect.







 $(4) - OR > -F > -NH_2$

(4) CH₃-

(1) CH3–CH2 → Li	(2) H₂N → C≡CH	(3) H₂N → C≡CH

- A-8. Which of the following alkyl group has the maximum +I effect ? (1) $(CH_3)_2CH_-$ (2) $(CH_3)_3C_-$ (3) CH_3CH_2-
- A-9._ Which of the following group shows +I effects :

(1) – F (2) – CHO (3) – NH (4) – CN

- A-10.
 Decreasing –I effect of given groups is :
 (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
- A-11. Which is the correct order of inductive effect ? (1) $-NH_2 > -OR > -F$ (2) $-F > -OR > -NH_2$ (3) $-NH_2 > -F > -OR$
- A-12. Which of the following statement is correct?
 (1) +I group stabilises the carbocation.
 (2) +I group stabilises the carbon free radical
 (3) -I group stabilises the carbanion
 (4) all of these
- **A-13.** Arrange following compounds in decreasing order of their dipole moment.

A-7.

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B-8._ How many of the following species, the negative charge is delocalised?



B-16. HNCO (isocyanic acid) has following resonating structures : $H - \overset{\bigcirc}{\mathsf{N}} - \mathsf{C} \equiv \overset{\bigoplus}{\mathsf{O}} \qquad H - \overset{\bigoplus}{\mathsf{N}} \equiv \mathsf{C} - \overset{\bigcirc}{\mathsf{O}}$ H - N = C = OΙ П The order of stablity is : (1) I > III > II(2) I > II > III(3) II > III > I(4) II > I > III The decreasing order of stability of the following resonating structures is : B-17. $CH_2 = CH - \overset{\circ}{C}I : \longleftrightarrow \overset{\circ}{C}H_2 - CH = \overset{\circ}{C}I : \longleftrightarrow \overset{\circ}{C}H_2 - CH = \overset{\circ}{C}I :$ (II) (2) II > III > I (I) (III) (1) | > || > |||(3) ||| > || < | (4) | > ||| > ||Which of the following resonating structure will contribute minimum to resonance hybrid? B-18. П III (1) I (2) II (3) III (4) All structures contribute equally B-19. In each of the following pairs which ion is more stable : (x) (y) & CH₂=CH—CH=^{NH}₂ CH₂-CH=CH-NH₂ (i) (ii) & CH₂=CH–CH=CH–CH=CH₂ ČН, (iii) & $CH_2 = CH - CH = CH_2$ ĈΗ, (iv) CH2=CH-CH=CH-CH=CH2 & (1) y (2) х у у Х У х y (3) х х х (4) х ٧ х y Section (C) : Mesomeric effect C-1. Mesomeric effect involves the delocalisation of : (1) Protons (2) Sigma electrons (3) π electrons (4) None of these C-2. Which of the following group show +M effect? (1) - CN (3) –CCl₃ (2) –O–NO (4) –CHO C-3. Which of the following group show -M effect? (3) -NH-C -0-R (1) -CMe₃ (2)



C-13. Electron density order in the benzene nucleus is



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Exercise-2

Marked Questions may have for Revision Questions.





- (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.

		\sim				
5.	In L	how many π bor	how many π bonds are in resonance ?			
	(1) 4	(2) 2	(3) 3	(4) None		

6. Which of the following resonance structures does not represent the correct stability order :

(1)
$$CH_3-CH_2-CH_-\dot{C}CH_3 < CH_3-CH_2-CH_=\dot{C}CH_3$$

(2) $CH_2 = CH-\dot{C}H-CH = \dot{N}H_2 > \dot{C}H_2 - CH = CH-CH = \dot{N}H_2$
(3) $CH_3-C \swarrow_0^{\ominus} = CH_3-C \swarrow_0^{\ominus}$

(4) [⊕] 0[⊕] < [⊖] 0[⊕]

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

$$0 = \ddot{N} - \ddot{N} = 0$$

$$(1) \overset{\circ}{0} - \ddot{N} = 0 \qquad (2) \overset{\circ}{0} - N = 0$$

$$(3) \overset{\circ}{0} = \overset{\circ}{N} = 0 \qquad (4) \overset{\circ}{0} - N = 0$$

- Which of the following series contains atoms/groups having only –M (mesomeric) effect ?
 (1) COR, OR, COOR (2) Cl, CHO, NH₂ (3) NO₂,CN,SO₃H (4) OH,NR₂,SR
- 9. Hyper conjugation is possible in :

10.

11.

12.

13.





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

(III)

 \bigoplus_{a} H_aC–CH–CH=CH₂ does not involve : 20. (2) σ - σ overlap (4) pπ–dπ overlap (1) σ -p overlap (3) pπ-pπ overlap **PART - II : MISCELLANEOUS QUESTIONS** Section (A) : ASSERTION/REASONING DIRECTIONS : Each question has 4 choices (1), (2), (3) and (4) out of which ONLY ONE is correct. (1) Both assertion and reason are correct, and the reason is the correct explanation for the assertion (2) Both assertion and reason are correct, but the reason is not the correct explanation for the assertion (3) The assertion is incorrect, but the reason is correct (4) Both are assertion and reason are incorrect **Assertion :** The resonating structure of acylium ion, $R-C \equiv \overset{\frown}{\odot}$ is more stable than $R-\overset{+}{C} = \ddot{O}$. A-1. **Reason :** The octet of all atoms is complete in $R-C \equiv \dot{O}$ Assertion : Carbon-oxygen bonds are of equal length in acetate ion. A-2. Reason : Bond length decreases with the multiplicity of bond between two atoms. A-3. Assertion : Heterolytic fission involves the breaking of a covalent bond in such a way that both the electrons of the shared pair are carried away by one of the atoms.

Reason : Heterolytic fission occurs readily in polar covalent bonds.

- A-4. Assertion : Tertiary carbocations are generally formed more easily than primary carbocations.
 Reason : Hyperconjugation as well as inductive effect due to additional alkyl group stabilize tertiary carbocations.
- A-5. Assertion : Allyl free radical is more stable than simple alkyl free radical.Reason : The allyl free radical is stabilized by resonance.

Section (B) : MATCH THE COLUMN

B-1. Match the contribution of following resonating structures towards their resonance hybrid in Column I with their attributes (properties) mentioned in Column II.

	Column I	Column II			
(A)	O II CH ₃ CH ₂ – C – OCH ₂ CH ₃	(p)	Equal contributor		
(B)	$CH_{3}-\overset{\oplus}{N}\overset{O}{\lesssim}^{O}_{O^{O}}$	(q)	major contributor		
(C)	$\begin{array}{c} O & O \\ II & \odot & II \\ CH_3 - C - CH - C - CH_3 \end{array}$	(r)	minor contributor		

Section (C) : ONE OR MORE THAN ONE OPTIONS CORRECT

- C-1. Which statement is/are true about resonance ?
 - (1) It decreases the energy of system.
 - (2) The hybridisation of atoms do not change due to resonance
 - (3) Resonance hybrid is more stable than any resonating structure.

- (4) Resonanting structures can not be isolated at any temperature
- **C-2.** In which of the following compounds delocalisation of electrons and shifting of electron in the same direction?



(2) $CH_3 - NH - NO_2$ H (4) $H_2N - C = CH_2$

(3) -NH₃

- (3) CH₂=CH–CH=CH–NO₂
- **C-3.** Which of the following groups cannot participate in resonance with benzene :

C-4. Which of the following is/are correct :





C-5. The correct orders for bond length are :







- C-6. Which of the following statements is/are correct :
 - (1) Inductive effect involves delocalisation of σ electron.
 - (2) Inductive effect creates partial polarisation in molecule.
 - (3) I effect of OH is greater than I effect of CI
 - (4) Free radicals are stabilised by + I group

Exercise-3

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

R

1. In the following benzyl/allyl system

 $R - CH = CH_2$ and (R is alkyl group)

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$H_2C = N = \overline{N}$	$H_2 \dot{C} - N = \bar{N}$	$H_2 \overline{C} - N \equiv N$	$H_2 \overline{C} - N = N$
(1)	(11)	(111)	(IV)

The total number of contributing structures showing hyperconjugation (involving C–H bonds) for the following carbocation is [JEE-2011, 4/180]



7. The hyperconjugative stabilities of tert-butyl cation and 2-butene, respectively, are due to :

[JEE(Advanced) 2013, 4/120]

- (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.
- 8. The number of resonance structures for N is

[JEE(Advanced) 2015, 4/168]



9. Among the following, the number of aromatic compound(s) is



[JEE(Advanced)-2017, 3/122]

	Answers												
						EXER	ICSE-	·1					
A-1.	(3)	A-2.	(1)	A-3.	(3)	A-4.	(1)	A-5.	(2)	A-6.	(4)	A-7.	(2)
A-8.	(2)	A-9.	(3)	A-10.	(4)	A-11.	(2)	A-12.	(4)	A-13.	(4)	A-14.	(2)
B-1.	(4)	B-2.	(1)	B-3.	(2)	B-4.	(4)	B-5.	(2)	B-6.	(3)	B-7.	(4)
B-8.	(4)	B-9.	(1)	B-10.	(2)	B-11.	(3)	B-12.	(4)	B-13.	(4)	B-14.	(1)
B-15.	(1)	B-16.	(1)	B-17.	(1)	B-18.	(2)	B-19.	(2)	C-1.	(3)	C-2.	(2)
C-3.	(4)	C-4.	(4)	C-5.	(2)	C-6.	(1)	C-7.	(2)	C-8.	(3)	C-9.	(3)
C-10.	(1)	C-11.	(1)	C-12.	(4)	C-13.	(2)	C-14.	(1)	D-1.	(3)	D-2.	(4)
D-3.	(1)	D-4.	(2)	D-5.	(2)	D-6.	(2)	D-7.	(4)	D-8.	(4)	D-9.	(4)
D-10.	(3)	D-11.	(2)	E-1.	(4)	E-2.	(4)	E-3.	(4)	E-4.	(1)	E-5.	(4)
E-6.	(2)	E-7.	(3)	E-8.	(2)	E-9.	(1)	E-10.	(3)				
						EXER	ICSE-	· 2					
						PAI	RT - I						
1.	(4)	2.	(3)	3.	(4)	4.	(1)	5.	(2)	6.	(4)	7.	(4)
8.	(3)	9.	(1)	10.	(2)	11.	(1)	12.	(4)	13.	(4)	14.	(3)
15.	(1)	16.	(3)	17.	(2)	18.	(1)	19.	(4)	20.	(4)		
						PAF	RT - II						
A-1.	(1)	A-2.	(2)	A-3.	(2)	A-4.	(1)	A-5.	(1)				
B-1.	(A – c	ą) ; (В – р);(C –	r) C-1.	(1, 2,	3 & 4)	C-2.	(2)	C-3.	(3)	C-4.	(2 & 4)	
C-5.	(1, 2 8	& 4)	C-6.	(2)									
						EXER	ICSE-	• 3					
						PAI	RT - I						
1.	(1)	2.	(3)	3.	(4)	4.	3						
			6			PAF	RT - II						
	CHN		, ČH₂										

1.	⊕OH			2.	(A)	3.	(A)	4.	(B)	5.	(B)
6.	6	7.	(A)	8.	(9)	9.	5				