Exercise-1

Marked Questions may have for Revision Questions.

OBJECTIVE QUESTIONS

Section (A) : Inductive effect

- A-3. Sol. As per the definition.
- A-4. Sol. As per the definition.

-C--|| ○ shows -I effect, so correct direction of I effect is

 $CH_3 \rightarrow C \rightarrow CH_2 \rightarrow CH_3$ $\downarrow \downarrow$ O

- **A-8.** Sol. Order of $+I = (CH_3)_3 C > (CH_3)_2 CH > CH_3 CH_2 > CH_3$.
- **A-10.** Sol. $-NO_2 > -CN > -CI > -NH_2$.
- A-13. Sol. Dipole moment increases with electron withdrawing nature (-I) of groups.

Section (B) : Resonance

- B-1. Sol. This is fact.
- B-2. Sol. This is fact.
- B-3. Sol. Due to presence of conjugated system.

B-6._ Sol.

A-6.

Sol.

$$CH_{2} \xrightarrow{CH_{2}} CH_{2} \xrightarrow{CH_{2}} CH_{$$

B-9. Sol. (1) $CH_3 - CH = CH - CH_3$ only hyper conjugation $\frac{1}{4} dsoy virla; qXeu \frac{1}{2}$

Sol.

- B-12. Sol. 7 including the given structure in which every C will recieve a positive charge.
- **B-14.** Sol. a is least stable since charge separation is done and +ve charge is towards –m group. d is most stable due to no charge separation and more linearly conjugation.
- B-15. Sol. Lone pair present on nitrogen repel the negative charge.

$$H-N = C = O \qquad H-\overset{\circ}{N} = C-\overset{\circ}{O} \qquad H-\overset{\circ}{N} - C = \overset{\circ}{O}$$

$$I \qquad III \qquad III \qquad II$$

$$(Uncharged species \qquad (-ve charge is more \qquad (-ve charge less stable is most stable) > stable on high E.N. atom) > on less E.N. atom)$$

$$B-17. Sol. \qquad CH_2 = CH-\overset{\circ}{CH} : \longleftrightarrow \overset{\circ}{CH}_2 - CH = \overset{\circ}{CH}^{-1} : \longleftrightarrow \overset{\circ}{CH}_2 - CH = \overset{\circ}{C}^{-1} : \vdots$$

$$\overset{\circ}{B-10} : \overset{\circ}{CH} = \overset{\circ}{CH}_2 - CH = \overset{\circ}{CH}^{-1} : \overset{\circ}{CH}_2 - CH = \overset{\circ}{C}^{-1} : \vdots$$

$$\overset{\circ}{B-10} : \overset{\circ}{B-10} : \overset{\circ}{CH}_3 = \overset{\circ}{B-10} : \overset{\circ}{B-10} : \overset{\circ}{B-10} : \overset{\circ}{CH}_3 = \overset{\circ}{CH}_3 = \overset{\circ}{B-10} : \overset{\circ}{B-1$$

Section (C) : Mesomeric effect



- **C-9.** Sol. $-NO_2 > -CN > -CHO > -COOH.$
- **C-10.** Sol. $-\overset{\smile}{O} > NH_2 > OH > -NHCOCH_3$

Section (D) : Hyperconjugation effect

D-3. Sol. Hyperconjugation $\frac{1}{4}$ vfrla; qXeu $\frac{1}{2}$ CH₃- > CH₃CH₂- > (CH₃)₂CH- > (CH₃)₃C-

D-4. Sol. For showing hyperconjugation their must be minimum of 1 α -hydrogen atom to sp₂ hybridized carbon in

Which is only possible in toulene.

- **D-5.** Sol. Species which has more α –H, shows maximum hyperconjugation.
- **D-7.** Sol. Those species which has no α –H, not show hyperconjugation.
- **D-10.** Sol. Hyperconjugation.

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D-11. Sol. Heat of hydrogenation \propto stability of alkene . (III & IV have both resonance and hyperconjugation where as I and II have only hyperconjugation.)

Section (E) : Aromaticity

E-6. Sol. Here the lone pair present over nitrogen atom is involved in conjugation thus is sp₂ hybrdized.

E-8.

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Sol. contain 10 π electrons. Azulene is a dipolar ion and has both rings aromatic in its ionic form.

E-9. Ans. Aromatic : c,f,g,h,i,n,p,s,u,v,w,x Antiaromatic : b,d,j,k,o Nonaromatic : a,e,l,m,q,r,t,y

Exercise-2

Marked Questions may have for Revision Questions.

PART - I : OBJECTIVE QUESTIONS

1. Sol. Correct respesentation for incorrect representations given : (fn;s x, xyr fodYi dk lgh fu:i.k %)

$$S \Rightarrow CH_3CH_2 - MgBr$$

- **4. Sol.** As per the definitions.
- 6. Sol. More electronegative atom having –ve charge and more electropositive having +ve charge.
- 7. Sol. Maximum charge separation stability increases



- 8. Sol. NO₂,CN,SO₃H having only –M (mesomeric) effect.
- 9. Sol. No α hydrogen is present in any other option.
- **11. Sol.** Stability \propto Number of hyperconjugative H-atoms.
- 13. Sol. This is fact.
- **14. Sol.** C–C bond length \propto No. of hyperconjugative structure.
- **17. Sol.** C_1-C_2 is shorter because it is double bond in two of three resonance strucutre; C_2-C_3 is a single bond in two of three resonance strucutres.
- **18. Sol.** Aromatic species are

19. Sol. I = Aromatic II = Aromatic III = Nonaromatic

20. Sol. $H_3C-CH-CH=CH_2$ in this σ -p orverlapping occurs due to hyperconjugation and $p\pi-p\pi$ overlap occur due to resonance.

PART - II : MISCELLANEOUS QUESTIONS

Section (A) : ASSERTION/REASONING

- **A-1. Sol.** (1)
- **A-2. Ans.** (2)
- **Sol.** Acetate ion have two equivalent resonating structure and thus both the bonds have identical bond I ength.
- A-3.
- Ans. (2)
- A-4.
- Ans. (1)
- A-5.
- Ans. (1)

Section (B) : MATCH THE COLUMN

- B-1.
- **Ans.** (A q); (B p); (C r)

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

C-5. Sol. Due to hyperconjugation, bond length decreases for a single bond and increases for a double bonds.

C-6.

Sol. Inductive effect creates partial polarisation in molecule. Free radicals are stabilised by + I group

Exercise-3

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

- 1. Sol. CH₃ group has + I effect, as number of CH₃ group increases the inductive effect increases.
- 2. Sol. HCOO_ exists as

 0^{-} $H = C = 0^{-} \iff H = C = 0$ [Identical resonating structures]

So, the carbon-oxygen bonds are found to be of equal length.



Sol. All are aromatic compounds except O. It is non aromatic so least resonance stabilised.

PART - II : JEE (ADVANCED) / IIT-JEE PROBLEMS (PREVIOUS YEARS)

* Marked Questions may have more than one correct option.

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Sol.

1.

2. Sol. Negative charge and lone pair on adjacent atom will increase potential energy and decrease stability.

ÊH₂

3. Sol.

 $-NO_2$ group will withdraw electrons hence π bond will be polarised towards it (not in opposite direction).

4.

Sol. (sigma-p conjugation)

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 $H_{2}C = \stackrel{+}{N} = \bar{N} \qquad H_{2}\stackrel{+}{C} - N = \bar{N} \qquad H_{2}\bar{C} - \stackrel{+}{N} \equiv N \qquad H_{2}\bar{C} - N = \stackrel{+}{N}$ 5. Sol. (I) (II) (III) (IV) octet complete octet incomplete octet complete octet incomplete -ve charge on nitrogen -ve charge on carbon -ve charge on carbon

6. Ans. 6

Sol. There are total 6 hyperconjugable H-atoms in this carbocation which are countributing in the hyperconjugation.

8. Ans. (9)

