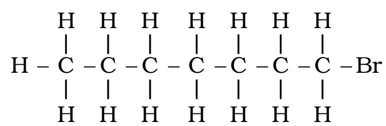
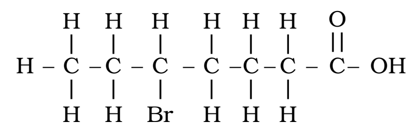
VMC Vidyamandir Classes SINCE 1986
IIT JEE | MEDICAL | FOUNDATION

Introduction to Organic Chemistry

Level - 0	**DTS-0**

1. Carbon atom is more electronegative as compared to magnesium. As a result, partial negative charge is developed on carbon whereas magnesium acquires a partial positive charge

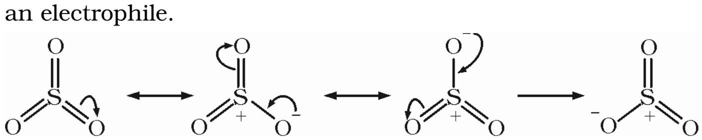
$CH_3-CH_2-CH_2-\overset{\delta-}{C}H_2-\overset{\delta+}{M}gX$

2. **(a)**  **(b)** 

3.

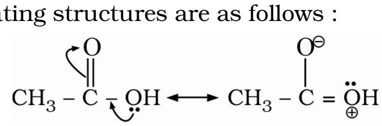
	Inductive effect	**Resonance effect**
(1)	This effect involves displacement of σ - electron	The resonance involves displacement of π - electrons or lone pair of electrons.
(2)	It operates in Saturated compounds	It operates only in unsaturated conjugated system.
(3)	This effect moves up to three carbon atoms and becomes negligible from fourth carbon atom onward	This effect moves all along the length of the conjugated system.
(4)	This effect causes slight drift of σ - electrons towards the more electronegative atom and hence only partial charges ($\delta+$ and $\delta-$) are developed.	This result in complete transfer of electrons and hence full +ve and –ve charges are developed.

4. Three highly electronegative oxygen atoms are attached to sulphur atom. This makes sulphur atom electron deficient. Due to resonance, sulphur also acquires positive charge. Both these factors make SO_3 an electrophile.



5. $CH_2=CH-CH=O$ is more stable then $\overset{+}{C}H_2-CH=CH-O^-$ since the octet of C and O is complete and no separation of opposite charges is there.

6. Resonating structures are as follows :

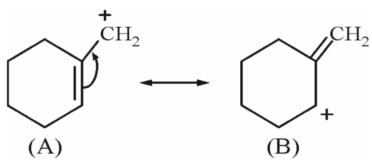
(A)  **(B)** 

Structure ‘B’ is more stabilised as it does not involve charge separation.

7. Electronegativity increases as the state of hybridization changes from sp^3 to sp^2 and sp^2 to sp. This is because s-electrons are more strongly attracted by the nucleus than p-electrons. Thus, sp hybridized carbon has the highest electronegativity. The order of electronegativity is $sp^3 < sp^2 < sp$

8. They show position isomerism.

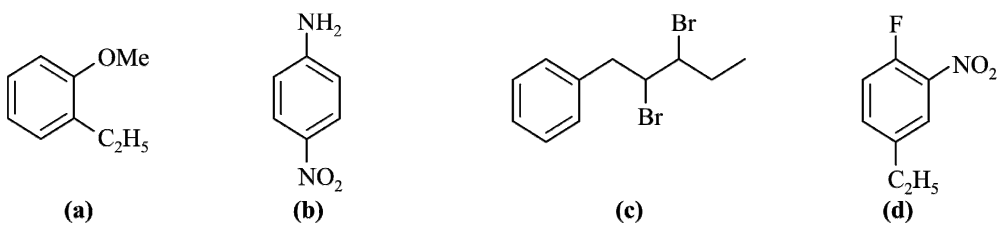
9. $CH_3 - \overset{\oplus}{O} = CH_2$ (More stable due to complete octet).

10. 

Double bond is more stable within the ring in comparison to outside the ring. Hence A is more stable.

11. **(a)** $\overset{+}{C}H_3$ is the most stable. The replacement of H by Br increases positive charge on carbon atom because Br is more electronegative than H and consequently the species becomes less stable.

(b) $\overset{-}{C}Cl_3$ is the most stable because Cl is more electronegative than hydrogen. On replacing hydrogen by chlorine, negative charge on C is reduced and the species becomes stable.

12. 

13. First draw the structures yourself and then check the names :

(a) 2, 2-Dimethylpentane

(b) 2, 4, 7-Trimethyloctane (lowest set of locants)

(c) 2-Chloro-4-methylpentane (Cl atom gets priority over methyl)

(d) But-3-yne-1-ol (OH group gets priority over $-C \equiv C-$)

14. On adding dilute H_2SO_4 for testing halogens in an organic compound with $AgNO_3$, white precipitate of Ag_2SO_4 is formed. This will interfere with the test of chlorine and this Ag_2SO_4 may be mistaken for white precipitate of chlorine as AgCl. Hencce,dilute HNO_3 should be used instead of dilute H_2SO_4.

15. Mass of the compound = 0.468 g

Mass of barium sulphate = 0.668 g

$$\text{Percentage of sulphur} = \frac{32}{233} \times \frac{\text{Mass of barium sulphate}}{\text{Mass of compound}} \times 100$$

$$= \frac{32}{233} \times \frac{(0.668\text{g})}{(0.468)} \times 100 = 19.60\%$$

16. **(a)** **Crystallisation :** In this process the impure solid is dissolved in the minimum volume of a suitable solvent. The soluble impurities pass into the solution while the insoluble ones left behind. The hot solution is then filtered and allowed to cool undisturbed till crystallisation is complete. The crystals are then separated from the mother liquor by filtration and dried.

Example : Crystallisation of sugar

(b) Distillation : The operation of distillation is employed for the purification of liquids from non-volatile impurities. The impure liquid is boiled in a flask and the vapours so formed are collected and condensed to give back pure liquid in another vessel. Simple organic liquids such as benzene, toluene, xylene etc.

(c) Chromatography : Chromatography is based on the principle of selective distribution of the components of a mixture between two phases, a stationary phase and a moving phase. The stationary phase can be a solid or liquid, while the moving phase is a liquid or a gas. When the stationary phase is solid the basis is adsorption and when it is a liquid the basis is partition. Chromatography is generally used for the separation of coloured substances such as plant pigments or dyestuffs.

17. Given that, total mass of organic compound = 0.50 g

60 mL of 0.5 M solution of NaOH was required by residual acid for neutralisation.

60 mL of 0.5 M NaOH solution $= \frac{60}{2}$ mL of 0.5 M H_2SO_4 = 30 mL of 0.5 M H_2SO_4

$\therefore$ Acid consumed in absorption of evolved ammonia is $(50 - 30)$ mL = 20mL

Again, 20mL of 0.5M H_2SO_4 = 40 mL of 0.5 M NH_3

Also, since 1000 mL of 1 M NH_3 contains 14 g of nitrogen,

$\therefore$ 40 mL of 0.5 M NH_3 will contain $= \frac{14 \times 40}{1000} \times 0.5 = 0.228$ g of N

Therefore, percentage of nitrogen in 0.50 g of organic compound $= \frac{0.28}{0.50} \times 100 = 56\%$

18. **(a)** 2, 5, 6-Trimethyloctane **(b)** 3-Ethyl-6-methyloctane **(c)** 6-Methyloctan-3-ol

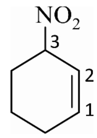
(d) Hexan-2, 4-dione **(e)** 5-Oxohexan-1-oic acid **(f)** Hexa-1, 3-diene-5-yne

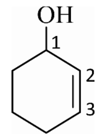
19.

Corresponding alcohols	Name of alcohol
$CH_3-CH_2-CH_2-CH_2-CH_2-OH$	Pentan-1-ol
$CH_3-\underset{\underset{OH}{\mid}}{CH}-CH_2-CH_2-CH_3$	Pentan-2-ol
$CH_3-CH_2-\underset{\underset{OH}{\mid}}{CH}-CH_2-CH_3$	Pentan-3-ol
$CH_3-\overset{\overset{CH_3}{\mid}}{CH}-CH_2-CH_2-OH$	3-Methyl-butan-1-ol
$CH_3-CH_2-\overset{\overset{CH_3}{\mid}}{CH}-CH_2-OH$	2-Methyl-butan-1-ol
$CH_3-\overset{\overset{CH_3}{\mid}}{\underset{\underset{CH_3}{\mid}}{C}}-CH_2-CH_3$	2-Methyl-butan-2-ol
$CH_3-\overset{\overset{CH_3}{\mid}}{\underset{\underset{CH_3}{\mid}}{C}}-CH_2OH$	2, 2-Dimethyl-propan-1-ol
$CH_3-\overset{\overset{CH_3}{\mid}}{CH}-\overset{\overset{OH}{\mid}}{CH}-CH_3$	3-Methyl-butan-2-ol

Note : Each of the above isomeric alcohol is called as *Amyl alcohol* (in Trivial system).

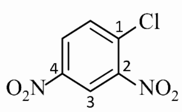
20. **(a)** $CH_3CH_2CH_2CH_2CH(Cl)CH_3$ **(b)** $CH_2 = CHCH_2CH(OH)CH_3$

(c) 

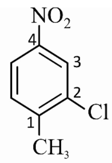
(d) 

(e) $CH_3CH(OH)CH_2CH_2CH_2CH_2CH_2CHO$

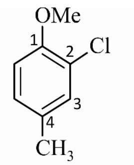
21.



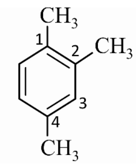
1-Chloro-2, 4-dinitrobenzene
(not 4-chloro, 1, 3-dinitrobenzene)
(a)



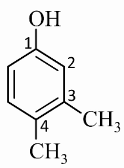
2-Chloro-1-methyl-4-nitrobenzene
(not 4-methyl-5-chloro-nitrobenzene)
(b)



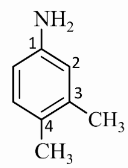
2-Chloro-4-methylanisole
(c)



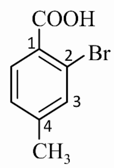
2, 4, Dimethyltoluene or
(1, 2, 4-Trimethyl benzene)
(d)



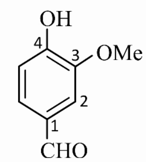
3, 4-Dimethylphenol
(e)



3, 4-Dimethylbenzenamine
or 3, 4-Dimethylaniline
(f)



2-Bromo-4-methylbenzoic acid
(g)



4-Hydroxy-3-methoxybenzaldehyde
(h)

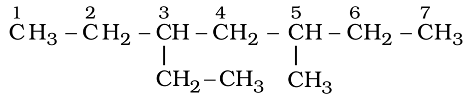
22. **(a)** Butylbenzene or (1-Phenylbutane) **(b)** 3-Methylpentanenitrile

(c) 2, 5-Dimethylheptane **(d)** 3-Bromo-3-chloroheptane

(e) 3-Chloropropanal

23.

	Structure and IUPAC Name	**Remarks**
(a)	$\overset{1}{C}H_3-{}^2CH(CH_3)-\overset{3}{C}H_2-{}^4CH(CH_2-CH_3)-\overset{5}{C}H_2-\overset{6}{C}H_3$ 4-Ethyl-2-methylhexane	Lowest sum/Lowest set of locants and alphabetical arrangement
(b)	$\overset{8}{C}H_3-\overset{7}{C}H_2-\overset{6}{C}H_2-\overset{5}{C}H(CH(CH_3)_2)-\overset{4}{C}H(CH_3)-{}^3C(CH_2-CH_3)(CH_2-CH_3)-\overset{2}{C}H_2-\overset{1}{C}H_3$ (3, 3-Diethyl-5-isopropyl-4-methyloctane)	Lowest set of locant and alphabetical arrangement
(c)	$\overset{1}{C}H_3-\overset{2}{C}H_2-\overset{3}{C}H_2-{}^4CH(CH(CH_3)_2)-\overset{5}{C}H(CH(CH_3)-CH_2-CH_3)-\overset{6}{C}H_2-\overset{7}{C}H_2-\overset{8}{C}H_2-\overset{9}{C}H_3$ 5-sec-Butyl-4-isopropylnonane or 5-(1-Methylpropyl)-4-(1-methylethyl) nonane	*sec* is not considered while arranging alphabetically, is taken as one word [IUPAC name of sec-butyl : 1-Methylpropyl and of Isopropyl : 1-Methylethyl]
(d)	$\overset{1}{C}H_3-\overset{2}{C}H_2-\overset{3}{C}H_2-\overset{4}{C}H_2-\overset{5}{C}H(CH_2-{}^2C(CH_3)_2-{}^3CH_3)-\overset{6}{C}H_2-\overset{7}{C}H_2-\overset{8}{C}H_2-\overset{9}{C}H_3$ 5-(2, 2-Dimethylpropyl) nonane	*Further numbering to the substituents of the side chain*

(e)	 3-Ethyl-5-methylheptane	*Alphabetical priority order*

24. **(i)** 2, 2, 4, 4-Tetramethylpentane

(ii) 2-Ethyl-2-methylbutane

(iii) 3, 3-Di-tert-butyl-2, 2, 4, 4-tetramethylpentane or 3, 3-Di-(1,1-Dimethylethyl)-2, 2, 4, 4-tetra methylpentane [IUPAC name of tert-butyl : 1, 1-Dimethylethyl]

(iv) 3, 4, 4, 5-Tetramethylheptane

(v) 2, 5-Dimethylhexane

25. **(a)** 2-Methylbut-2-ene **(b)** Pent-1-en-3-yne

(c) 1, 3-Butadiene **(d)** 1-Phenylpent-1-en-3-yne

(e) 2-Methylphenol **(f)** 5-(2′-Methylpropyl)-decane