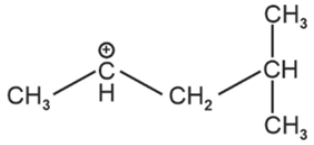
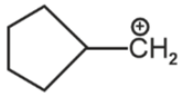
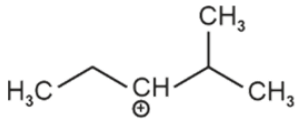
S1. Ans.(c)

The stability of carbocation can be described by the hyperconjugation. Greater the extent of hyperconjugation, more is the stability of carbocation.

(1)  5 α – H

(2)  1 α – H

(3)  7 α – H

(4)  3 α – H

Stability order of carbocations = (3) > (1) > (4) > (2)

S2. Ans.(b)

$CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$ (n-Hexane) has no tertiary cation.

$H_3\overset{5}{C} - \overset{4}{C}H_2 - \overset{3}{C}H_2 - \underset{\underset{CH_3}{|}}{\overset{2}{C}H} - \overset{1}{C}H_3$ (2-Methyl pentane) has only one tertiary carbon.

$H_3\overset{1}{C} - \underset{\underset{CH_3}{|}}{\overset{2}{C}H} - \underset{\underset{CH_3}{|}}{\overset{3}{C}H} - \overset{4}{C}H_3$ (2,3-Dimethyl butane) has two tertiary carbon.

$H_3C - \underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}} - CH_2 - CH_3$ (2,2-Dimethyl butane) has no tertiary carbon.

S3. Ans.(a)

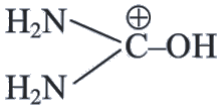
(1) **Sublimation:** It is the purification technique based on principle that on heating, some solid substances change from solid to vapour state without passing through liquid state.

(2) **Distillation:** It is used to separate volatile liquids from non-volatile impurities and the liquids having sufficient difference in their boiling point.

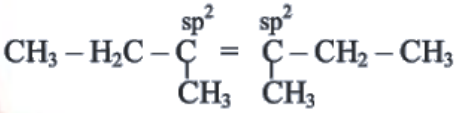
(3) **Chromatography:** It is based on separation by using stationary and mobile phase.

(4) **Crystallization:** It is based on difference in the solubilities of the compound and impurities in a suitable solvent.

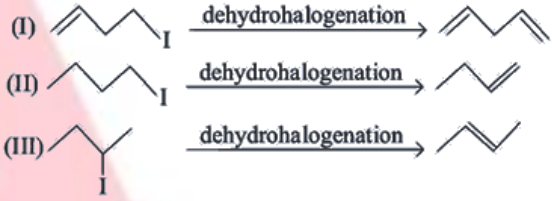
S4. Ans.(b)



S5. Ans.(d)



S6. Ans.(d)

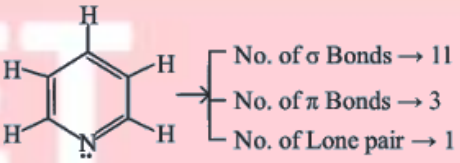


Rate of Dehydrohalogenation: II < III < I.

S7. Ans.(b)

Statement I is false but Statement II is true.

S8. Ans.(b)



S9. Ans.(c)

In case nitrogen and sulphur both are present in an organic compound, sodium thiocyanate is formed, it give blood red colour and no Prussian blue since there are no free cyanide Ions.

$Na + C + N + S \longrightarrow NaSCN$

$Fe^{+3} + SCN^{\ominus} \longrightarrow [Fe(SCN)]^{2+}$ Blood red

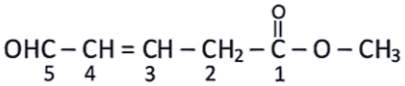
S10. Ans.(d)

Huckle's rule = $(4n + 5)\pi$ electrons

Comp (i), (ii), (v), (vii) obey Huckle's rule

S11. Ans.(b)

$-COOCH_3$ has higher priority than – C = C – and – CHO in IUPAC nomenclature.

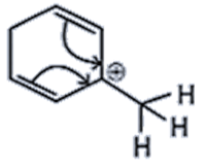


$C_1 = sp^2$

$C_2 = sp^3$

S12. Ans.(a)

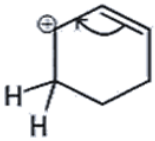
(1)



⟶ Cross conjugation and 3α-H [Hyperconjugation]

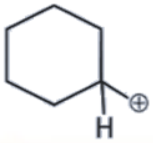
Due to cross-conjugation and 3α-H [Hyperconjugation], (1) is most stable.

(2)



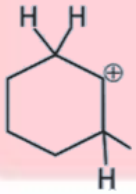
⟶ Resonance & 2α-H [Hyperconjugation]

(3)



⟶ 1α-H [Hyperconjugation]

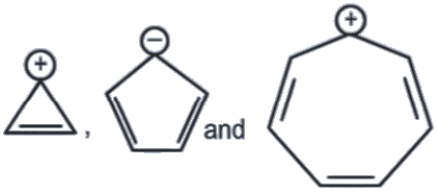
(4)



⟶ 3α-H [Hyperconjugation]

S13. Ans.(d)

Planar, cyclic, conjugated species containing (4n + 2)π electrons will be aromatic in nature (n is an integer)

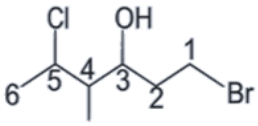


are aromatic species.

S14. Ans.(c)

Kjeldahl method is not applicable to compounds containing nitrogen in nitro group, azo groups and nitrogen present in the ring (e.g., pyridine) as nitrogen of these compounds does not change to ammonium sulphate under these conditions.

S15. Ans.(a)



1-bromo-5-chloro-4-methylhexan-3-ol

S16. Ans.(c)

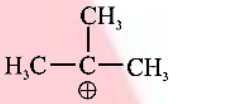
S17. Ans.(d)

S18. Ans.(a)

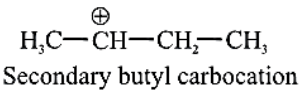
The example of partition chromatography is seen in paper chromatography.

In this process, chromatography paper is used as a stationary phase which is suspended in a mixture of solvents that act as a mobile phase.

S19. Ans.(c)



Tertiary butyl carbocation (9 α-H atoms)



Secondary butyl carbocation (5 α-H atoms)

A tertiary butyl carbocation has 9 alpha hydrogen atoms whereas secondary butyl carbocation has 5 alpha hydrogen atoms.

So, when more number of a-H atoms is present, more will be the hyperconjugation effect hence more will be the stability of carbocation.

Thus, tertiary butyl carbocation is more stable than a secondary butyl carbocation due to hyperconjugation

S20. Ans.(d)

Steam distillation technique is applied to separate the substances which are steam volatile and immiscible with water

S21. Ans.(a)

Number of σ bonds = 10

And number of π bonds = 3

S22. Ans.(b)

$\overset{sp^2}{C}\ H_2 = \overset{sp^2}{C}\ H - \overset{sp}{C} \equiv \overset{sp}{C}\ H$ Number of orbital require in hybridization = Number of σ-bonds around each carbon atom.

S23. Ans.(d)

NO_2 group exhibit-I effect and it decreases with increase in distance. In option (d), positive charge present on C atom at maximum distance S –I effect reaching to it is minimum and stability is maximum.

S24. Ans.(a, b)

–I effect increases on increasing electronegativity of atom. So, correct order of –I effect is

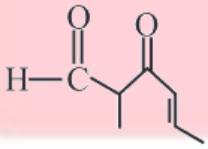
$-NH_2 < -OR < -F$.

Also $-NR_2 < -OR < -F$

S25. Ans.(a)

The most suitable method of separation of 1 : 1 mixture of ortho and para – nitrophenol is steam distillation, because there is large difference in the boiling point of ortho and para position as ortho form intra hydrogen bonding and there is large difference in the boiling point of ortho and para position as ortho form intra hydrogen bonding and para form inter-molecular hydrogen bonding.

S26. Ans.(b)



→ –keto – 2 – methylhex – 4 – enal

The order of decreasing priority for some functional groups is:-

–COOH, $-SO_3H$, –COOR, –COCl, $-CONH_2$, –CN, –HC = O, > C = O, –OH, $-NH_2$, > C = C <, –C ≡C–.

S27. Ans.(a)

Electrophile can be either neutral or positively charged species and can form a bond by accepting a pair of electrons from nucleophile.

An electron loving species is called electrophile.

Electrophile: Electron can be accepted by positively charged or neutral species.

Nucleophile: A negatively charged species or neutral species can accepted by positive charge or donate their electron to positively charge species or neutral species.

S28. Ans.(a)

$\alpha - H$ at bridge carbon never participate in tautomerism.

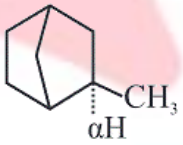
Thus, only (III) shows tautomerism.

S29. Ans.(b)

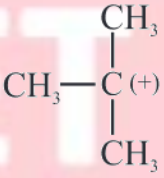
Nucleophiles are positive charge loving species or electron rich compounds. Lewis acids are those species which are electron deficient so nucleophiles cannot act as Lewis acids, they instead are Lewis bases.

S30. Ans.(b)

Hyperconjugation provides extra stability by removal of H from α carbon which is only possible in:



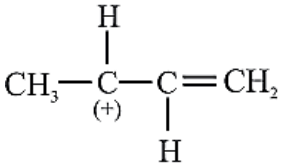
S31. Ans.(a)



3° carbocation is most stable than benzyol carbocation because of 9 hyper-conjugation of 3 inductive effects of $-CH_3$.

S32. Ans.(b)

So, the new species formed will be resonance stabilisied (alternating positive and negative charge).



S33. Ans.(b)

According to Duma's method:

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} \Rightarrow V_1 = \frac{P_2V_2T_1}{P_1T_2}$

$\frac{(725-25)\times 40}{300} = \frac{760V_2}{273}$

$V_2 = 33.53$ ml

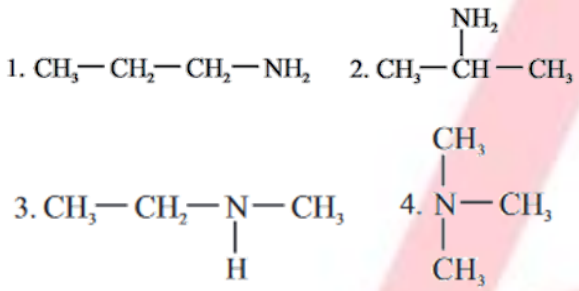
Mass = $\frac{33.53}{22400} \times 28 = 0.042\ g$

% N = $\frac{28\times V\times 100}{22400\times m}$

% of nitrogen = $\frac{0.042}{0.25} \times 100 = 16.76\%$

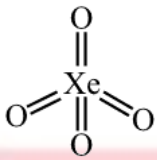
S34. Ans.(b)

C_3H_9N Total possible isomers.



S35. Ans.(a)

$4-\sigma$ and $4-\pi$ bonds



S36. Ans.(c)

Conceptual

S37. Ans.(d)

Kjeldahl's method is used for estimation of N in organic sample where

%N = $\frac{1.4 \times N \times V}{w}$

N = Normality of acid H_2SO_4 = 2

W = weight of NH_3 evolved

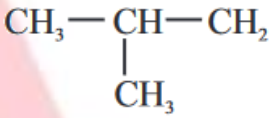
V = Vol. of H_2SO_4

= $\frac{1.4\times 10\times 2}{0.75}$

= 37.33%

S38. Ans.(a)

Isobutyl group is represented as:



S39. Ans.(b)

Structure of 3-Ethyl-2-hydroxy-4-methyl hex 3-en-5-ynoic acid