Miscellaneous Exercise Question Bank

1.(C) Both carbons of double bond have equal number of hydrogens and thus it is symmetrical, alkane.

2.(B) Peroxide effect is observed only in case of addition of HBr in presence of peroxide.

3.(A) Since, the compound on oxidative ozonolysis gives 1 mol of CO_2 and butanoic acid it must be terminal alkyne, pent-1-yne

$$CH_3-CH_2-CH_2-C\equiv CH \xrightarrow[\text{ii) } H_2O]{\text{i) } O_3} CH_3-CH_2-CH_2-COOH+CO_2+H_2O$$

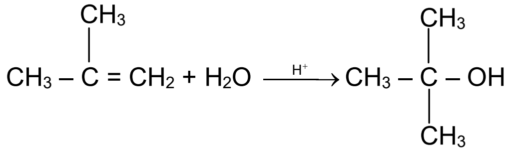
4.(C) $CH\equiv CH + HCl \xrightarrow{HgCl_2} CH_2=CH-Cl$

5.(C) $CH_3-C\equiv CH \xrightarrow{H_2SO_4/HgSO_4} CH_3-COCH_3$

6.(C) If $CH\equiv CH$ were to dissolve in H_2SO_4 a bisulphate salt of vinyl carbocation $H_2C=\overset{+}{C}H$ would be formed. The more s-character in the positively charged 'C' less stable is the carbocation and less likely to be formed.

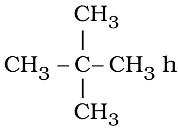
7.(B) Peroxide effect is observed when unsymmetrical alkene is treated with HBr only (and not with HCl and HI).

8.(A) Addition of H_2O occurs according to Markownikoff's rule.



$$CH_3-\underset{}{\overset{CH_3}{\overset{|}{C}}}=CH_2+H_2O\xrightarrow{H^+}CH_3-\underset{\underset{CH_3}{|}}{\overset{CH_3}{\overset{|}{C}}}-OH$$

9.(A)

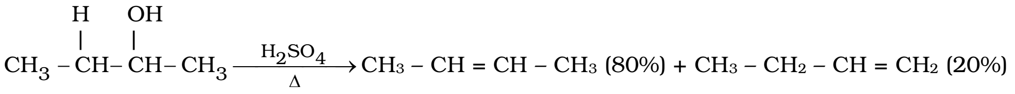


$$CH_3-\underset{\underset{CH_3}{|}}{\overset{CH_3}{\overset{|}{C}}}-CH_3$$

has twelve equivalent 1°H. Hence it forms only one product on monobromination.

10.(A) $2C_6H_5COONa+2H_2O\longrightarrow C_6H_5-C_6H_5+2CO_2+2NaOH+H_2$

11.(B)

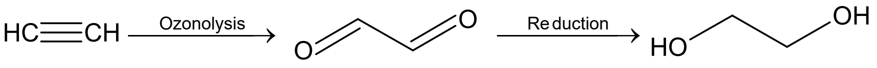


$$CH_3-\overset{H}{\overset{|}{C}H}-\overset{OH}{\overset{|}{C}H}-CH_3\xrightarrow[\Delta]{H_2SO_4}CH_3-CH=CH-CH_3\ (80\%)+CH_3-CH_2-CH=CH_2\ (20\%)$$

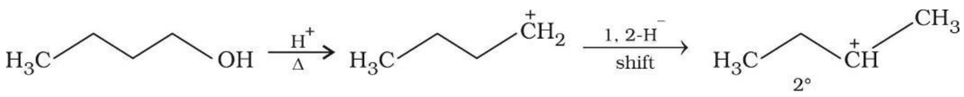
This is in accordance with saytzeff rule.

12.(B) Isomerisation occurs, when 2-butyne is treated with $NaNH_2$, it converts into terminal alkyne (1-butyne).

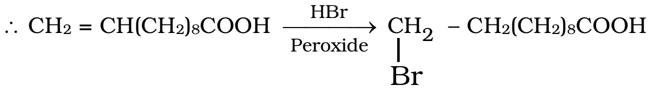
13.(A)



14.(C)



15.(C) Follows the peroxide effect



$$\therefore CH_2=CH(CH_2)_8COOH\xrightarrow[\text{Peroxide}]{HBr}\underset{\underset{Br}{|}}{CH_2}-CH_2(CH_2)_8COOH$$

16.(A) It is a test for unsaturation. As benzene and naphthalene is also unsaturated, but they are stabilized due to resonance, and thus does not give Bayer's test.

17. **(A – p), (B – r), (C – s), (D – q)**

[A-p] $(RCO)_2O_2$ initiate free radical mechanism

[B-r] This is electrophilic aromatic substitution

[c-s] Unsaturation is present which gives addition reaction.

[D-q] Good base and leaving group is present which gives elimination reaction

18. **(A – r), (B – s), (C – p), (D – q)**

[A-r] $KMnO_4$ gives syn addition

[B-s] Br_2 gives anti-addition

[c-p] R_2O_2 (peroxide) gives free radical mechanism, which gives anti-Markovnikov's product

[D-q] Hot acidic $KMnO_4$ is very strong oxidising agent.

19. **(A – p), (B – s), (C – q), (D – r)**

[A-p] As HBr addition is by Markovnikov's rule

[B-s] As HBr is adding by anti-Markovnikov's rule

[c-q] NBS gives allylic halogenation product.

[D-r] Br_2 addition is taking place.

20.(A)

$$\left.\begin{aligned} &CH_4 + Cl^{\bullet} \longrightarrow \dot{C}H_3 + HCl \\ &CH_3^{\bullet} + Cl_2 \longrightarrow CH_3Cl + Cl^{\bullet} \end{aligned}\right\} \text{Chain propagating steps}$$

One radical (reactive species) reacts with neutral species to give another radical (reactive species)

21.(D) In chain terminating step all radicals formed in other two steps combine to terminate the chain reaction.

$$Cl^{\bullet} + Cl^{\bullet} \longrightarrow Cl - Cl$$

$$CH_3^{\bullet} + Cl^{\bullet} \longrightarrow CH_3 - Cl$$

$$CH_3^{\bullet} + CH_3^{\bullet} \longrightarrow CH_3 - CH_3$$

22.(C) Chain initiation step involves bond breaking which requires energy. So, that step is endothermic.

23.(B) In order to slow down the process, less reactive species must have been formed.

24.(A) Less hyperconjugation, less stable, more reactive is the species, more is the rate of reaction.

25.(B) Lindlar's catalyst reduces alkyne to cis-alkene.

26.(B) Most exothermic means product of that species comparative to others species is more stable after the reaction. So, least stable species undergoing reaction will give most exothermic reaction.
Having least hyperconjugation.

27.(A) Lindlar's catalyst gives cis-alkene by reducing alkyne.

28.(A) Due to large surface area in case of powdered nickel.

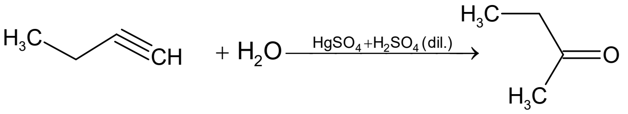
29.(C) H attached with highly electronegative element is acidic. C_{sp} is more electronegative than N. So, H of terminal alkyne is acidic.

30.(C) $H - C \equiv C - H + \overset{+}{Na}\overset{-}{O}Cl \longrightarrow H - C \equiv \overset{-}{C}\overset{+}{Na} + HOCl$

31.(A) $H-C\equiv C-H+Na \longrightarrow H-C\equiv\overset{-}{C}Na^{+} \xrightarrow{Na} \overset{+}{Na}\overset{-}{C}\equiv\overset{-}{C}Na^{+} \xrightarrow{2CH_3I} CH_3-C\equiv C-CH_3$

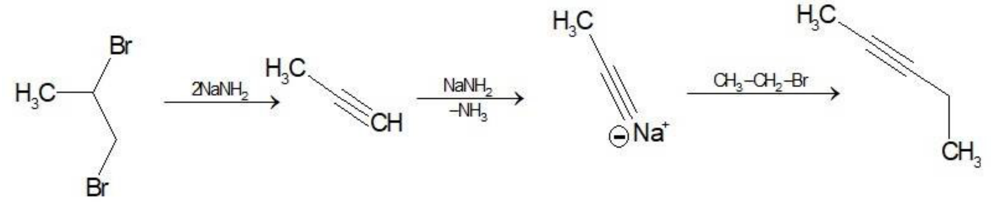
32.(B) Tollen's reagent react with terminal alkyne only.

33.(A) Oxymercuration of terminal alkynes always gives methyl ketones as the major products.



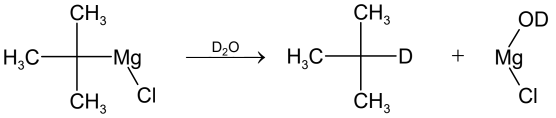
Hence **(A)** is the correct answer.

34.(C)

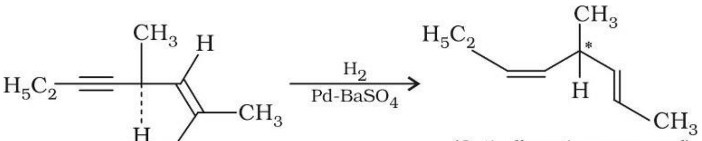


Thus, X is three.

35.(A)



36.(A)

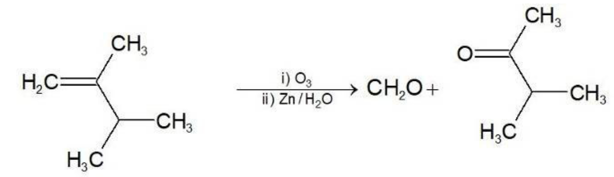


(Optically active compound)

37.(B) Clemmenson Reduction $(Zn/Hg\ in\ HCl)$ is carried out under strongly acidic conditions & the alcohol group $-OH$ is acid sensitive group. Therefore, wolf-Kishner reduction is chosen.

$$\text{Ketone}\xrightarrow[{}^{-}OH]{NH_2NH_2}\text{Alkane}$$

38.(B)



2,3-dimethylbut-1-ene

39.(A) Due to more angle strain.

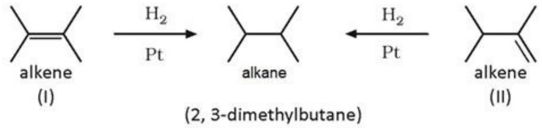
40.(A) Cyclopropane due to small size of ring.

41.(A) cyclopropane > cyclobutane > cyclopentane (Due to angle strain)

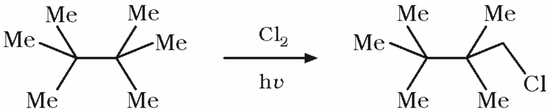
42.(D) Larger size rings has greater bond angle.

43.(C) cyclopentane, due to least angular deviation.

44.(B)



45.(D) This hydrocarbon has only one type of H-atoms.



Other hydrocarbons produce two or more mono-chloro derivative.

n-octane → Four monochloro derivative

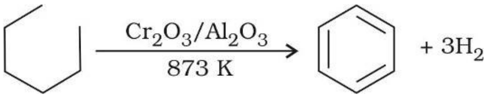
2-Methylheptane → seven monochloro derivative

2, 2, 4-trimethylpentane → Four monochloro derivative

46.(A) An octane rating, or octane number, is a standard measure of the performance of an engine or aviation fuel. The higher the octane number, the more compression the fuel can withstand before detonating (igniting) use of gasoline with lower octane numbers may lead to the problem of engine knocking.

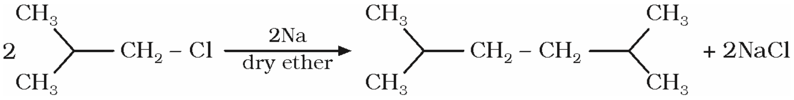
The octane number is a figure indicating the anti-knock properties of a fuel, based on a comparison with a mixture of isooctane and heptane.

47.(C)



48.(D) One mono-substitution, two di-substituted, two tri-substituted, two tetra-substituted, one penta-substituted and one hexa-substituted.

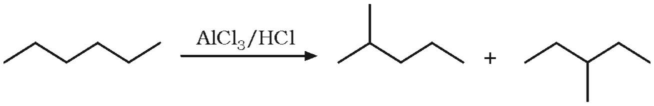
49.(B) Only symmetrical alkane having even number of carbon atoms can be synthesized in good yield by wurtz reaction.



50.(B) Unsymmetrical as well as symmetrical alkanes can be prepared in good yield by corey-House synthesis.

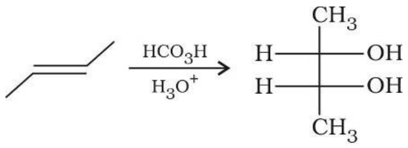
$(Me_3C)_2CuLi + 2MeCH_2Br \longrightarrow Me_3C - CH_2Me + CuBr + LiBr$

51.(D) Isomerization takes place.



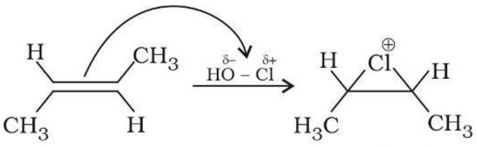
52.(D) Carbonyl compounds on wolf-kishner reduction produce hydrocarbons.

53.(B)



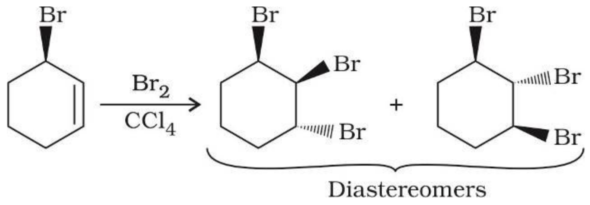
2, 3-butandiol

54.(B)

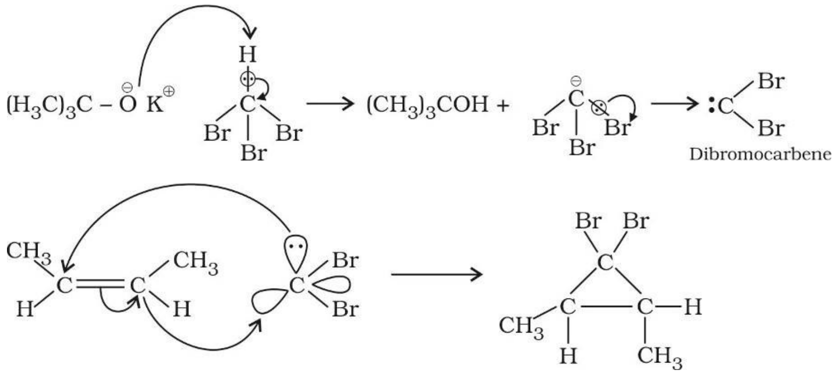


chloronium ion

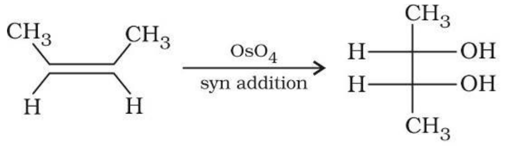
55.(B)



56.(C)



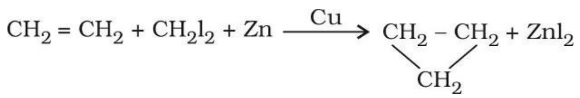
57.(A)



Meso-2, 3- Butanediol

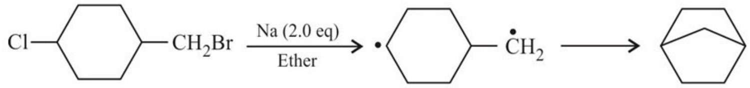
58.(A) n-hexane is highest boiling point compound among given compound due to large size and greater Van der Waal's force.

59.(B)



$$CH_2 = CH_2 + CH_2I_2 + Zn \xrightarrow{Cu} \underbrace{CH_2 - CH_2}_{CH_2} + ZnI_2$$

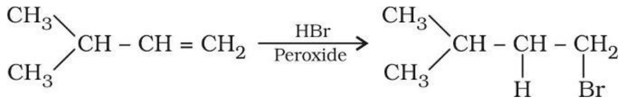
60.(D)



61.(D) Reaction with NBS is free radical substitution reaction. Reactivity order is 1°H < 2°H < 3°H because we know tertiary free radical is more stable than 2° and primary.

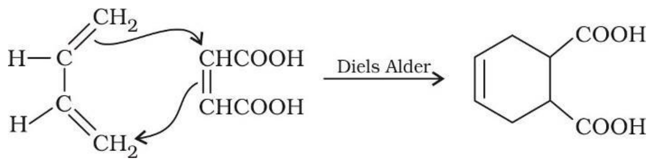
62.(B) $CH_2 = CH - CH = CH_2 \xrightarrow[1,4-\text{addition}]{H_2/Pt} CH_3 - CH = CH - CH_3 \xrightarrow{O_3/H_2O} 2CH_3COOH$

63.(B)



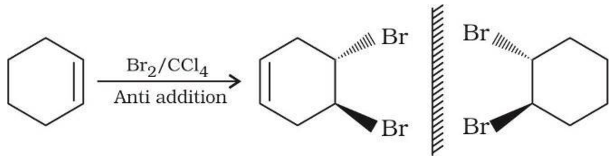
$$(CH_3)_2CH - CH = CH_2 \xrightarrow[\text{Peroxide}]{HBr} (CH_3)_2CH - \underset{H}{CH} - \underset{Br}{CH_2}$$

64.(A)

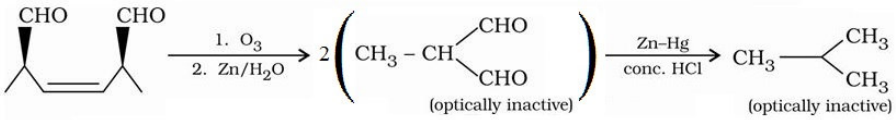


65.(B) Anti-Markovnikoff addition takes place.

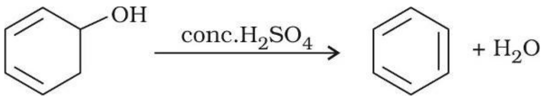
66.(B)

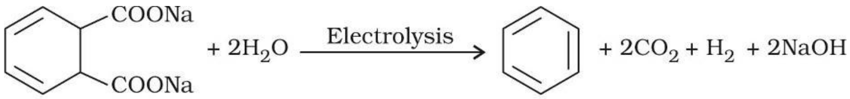


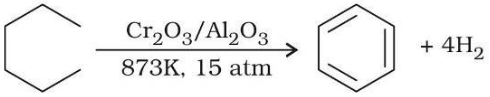
67.(B)

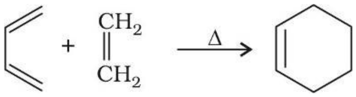


68.(ABC)



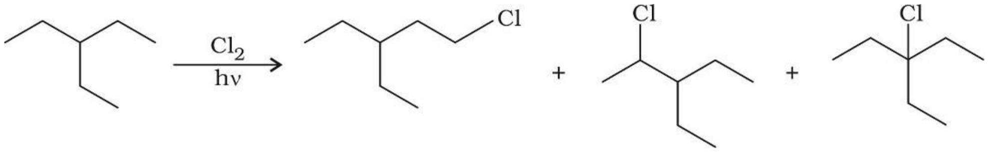




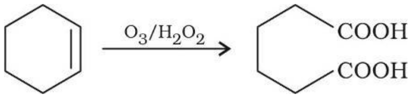


69.(BC) Syn addition of reagent on cyclohexene produce meso isomer.

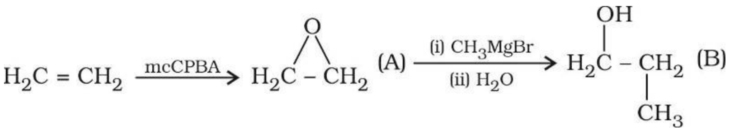
70.(A)



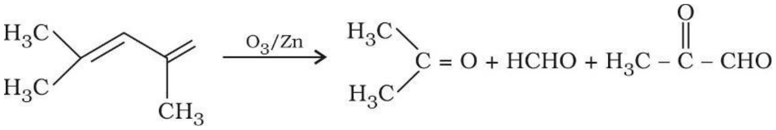
71.(D)



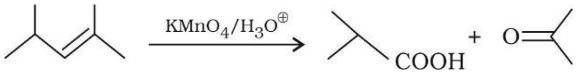
72.(A)



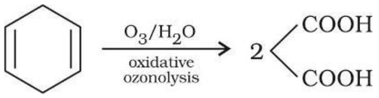
73.(C)



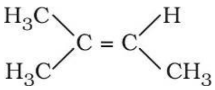
74.(D)



75.(C)



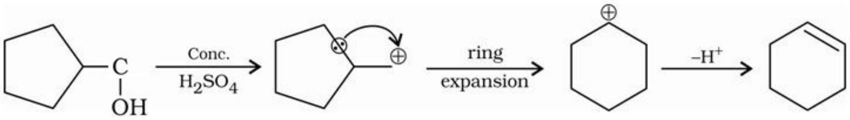
76.(A)



$$\underset{\mathrm{H_3C}}{\overset{\mathrm{H_3C}}{}}\!>C=C<\!\underset{\mathrm{CH_3}}{\overset{\mathrm{H}}{}}$$

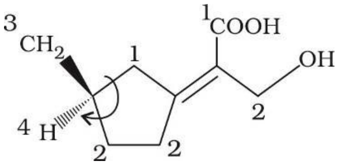
Has maximum α hydrogen among all given alkene therefore it is more stable.

77.(C)



78.(A) More substituted alkene is more stable due to more number of hyperconjugable H atoms. Hence reason is correct explanation of assertion.

79.(B)



Chiral C atom has R configuration while C = C has Z configuration.

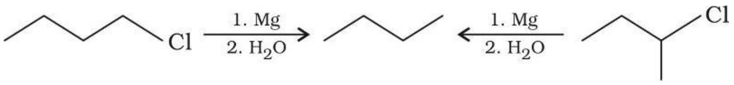
80.(A) Electron rich alkene will give faster addition of HCl.

$(CH_3)_2C = CH_2 > CH_3 - CH = CH_2 > H_2C = CH_2$

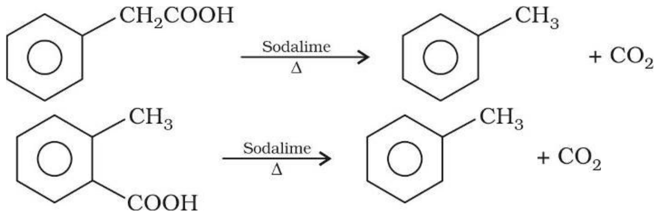
81.(BD) $(CH_3)_2CHCH = CH_2 \xrightarrow[\text{KMnO}_4]{\text{hot alkaline}} (CH_3)_2CHCOOH + CO_2 + H_2O$

$CH_3CH_2CH_2CH = CH_2 \xrightarrow[\text{KMnO}_4]{\text{hot alkaline}} CH_3CH_2CH_2COOH + CO_2 + H_2O$

82.(AB)

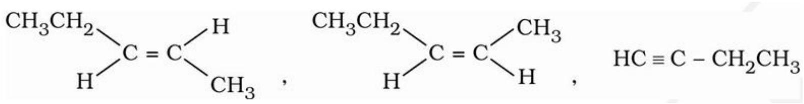


83.(ABCD)



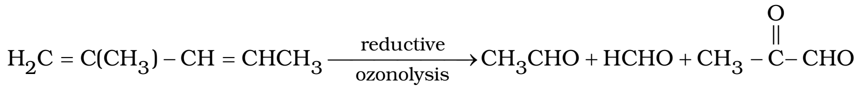
84.(AC) Alkaline solution of cold $KMnO_4$ (Baeyer's reagent) used for detection of double bond and for oxidation process

85.(ABC)



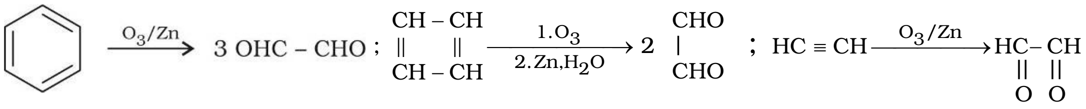
Have finite value of dipole moment

86.(CD)

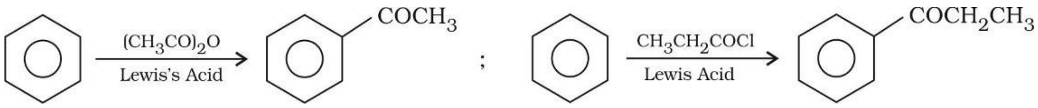


$$H_2C = C(CH_3) - CH = CHCH_3 \xrightarrow[\text{ozonolysis}]{\text{reductive}} CH_3CHO + HCHO + CH_3 - \overset{\overset{\displaystyle O}{\|}}{C} - CHO$$

87.(ABD)



88.(AD)



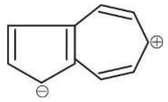
89.(ABCD) Symmetrical alkene will give same product with HBr in presence or absence of peroxide.

90.(ABC) Benzene ring in phenol, aniline and toluene is more electron rich therefore it will give faster ESR than benzene.

91.(BD) $CH_3MgBr \xrightarrow{H_2O} CH_4 + Mg(OH)Br$

$CH_3COOH \xrightarrow[\text{heat}]{\text{Soda lime}} CH_4 + CO_2$

92.(BC) trans-2-pentene and azzulene (due to dipolar structure) will have dipole moment,



93.(A) Boiling point α Vander Waal's Force

94.(B) Iodination of alkane is reversible because HI is reducing agent.

95.(B) H of acetylene does not react with NaOH because H is not very acidic.

96.(B) H_2SO_4 undergoes electrophilic addition reaction with ethylene.

97.(B) Neopentane form more compact structure than n-pentane therefore neopentane has higher melting point.

98.(A) Statement-2 is correct explanation of statement-1.

$2R - CH_2 - Cl \xrightarrow[\text{dry ether}]{2Na} R - CH_2 - CH_2 - R + 2NaCl$, R is alkyl or H.

99.(B) Resultant dipole moment of 2 polar bond depends upon angle between them.

$u_{resultant} = \sqrt{\mu_1^2 + \mu_2^2 + 2\mu_1\mu_2 \cos\theta}$

100.(B) Iodination is very slow and reversible process because C – I bond is weaker and HI is reducing agent. Hence is carried out in presence of oxidizing agent.