DPP - Daily Practice Problems

Chapter-wise Sheets

Date : **Start Time :** **End Time :**

CHEMISTRY (CC13)

SYLLABUS : Hydrocarbons

Max. Marks : 180 **Marking Scheme :** + 4 for correct & (–1) for incorrect **Time : 60 min.**

INSTRUCTIONS : This Daily Practice Problem Sheet contains 45 MCQ's. For each question only one option is correct. Darken the correct circle/ bubble in the Response Grid provided on each page.

1. When neo-pentyl bromide is subjected to Wurtz reaction, the product formed is
(a) 2,2,4,4-tetramethylhexane
(b) 2,2,4,4-tetramethylpentane
(c) 2,2,5,5-tetramethylhexane
(d) 2,2,3,3-tetramethylhexane

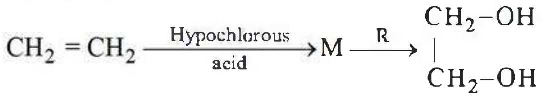
2. The conversion of 2, 3-dibromobutane to 2-butene with Zn and alcohol is
(a) redox reaction (b) α-elimination
(c) β-elimination (d) Both (a) and (b)

3. 1, 3-Butadiene when treated with Br_2 gives
(a) 1, 4-dibromo-2-butene (b) 1, 3-dibromo-2-butene
(c) 3, 4-dibromo-1-butene (d) 2, 3-dibromo-2-butene

4. An alkene having molecular formula C_7H_{14} was subjected to ozonolysis in the presence of zinc dust. An equimolar amount of the following two compounds was obtained
CH_3COCH_3 and $CH_3COC_2H_5$
The IUPAC name of the alkene is
(a) 3,4-dimethyl-3-pentene (b) 3,4-dimethyl-2-pentene
(c) 2,3-dimethyl-3-pentene (d) 2,3-dimethyl-2-pentene

5. Acid catalyzed hydration of alkenes except ethene leads to the formation of
(a) mixture of secondary and tertiary alcohols
(b) mixture of primary and secondary alcohols
(c) secondary or tertiary alcohol
(d) primary alcohol

6. In a reaction



$$CH_2 = CH_2 \xrightarrow[\text{acid}]{\text{Hypochlorous}} M \xrightarrow{R} \begin{array}{l} CH_2-OH \\ | \\ CH_2-OH \end{array}$$

Where M = molecule; R = reagent; M and R are
(a) CH_3CH_2Cl and NaOH
(b) $CH_2Cl - CH_2OH$ and aq. $NaHCO_3$
(c) CH_3CH_2OH and HCl
(d) $CH_2 = CH_2$ and heat

7. The negative part of an addendum adds on to the carbon atom joined to the least number of hydrogen atoms. This statement is called
(a) Thiele's theory (b) Peroxide effect
(c) Markownikoff's rule (d) Baeyer's strain theory

RESPONSE GRID

1. ⓐⓑⓒⓓ 2. ⓐⓑⓒⓓ 3. ⓐⓑⓒⓓ 4. ⓐⓑⓒⓓ 5. ⓐⓑⓒⓓ
6. ⓐⓑⓒⓓ 7. ⓐⓑⓒⓓ

Space for Rough Work

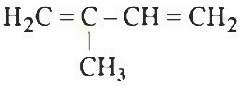
8. Match the columns

	Column-I		**Column-II**
A.	$CH\equiv CH+H_2\rightarrow CH_2=CH_2$	I.	Zn
B.	$CH_3CH_2Br\rightarrow CH_2=CH_2$	II.	Conc. H_2SO_4
C.	$CH_2BrCH_2Br\rightarrow CH_2=CH_2$	III.	Pd/C
D.	$CH_3CH_2OH\rightarrow CH_2=CH_2$	IV.	Alc.KOH

(a) A – III; B – IV; C – I; D – II
(b) A – IV; B – III; C – II; D – I
(c) A – II; B – I; C – IV; D – III
(d) A – III; B – IV; C – II; D – I

9. Which of the following will yield a mixture of 2-chlorobutene and 3-chlorobutene on treatment with HCl ?

(a) $CH_2=C=CH-CH_3$

(b) 
$H_2C=\underset{\displaystyle CH_3}{\underset{|}{C}}-CH=CH_2$

(c) $CH_2=CH-CH=CH_2$

(d) $HC\equiv C-CH=CH_2$

10. Lindlar's catalyst is
(a) Na in alcohol (b) Raney nickel
(c) $Pd/BaSO_4$ (d) Na/liq. NH_3

11. The treatment of CH_3MgX with $CH_3C\equiv C-H$ produces
(a) $CH_3-CH=CH_2$ (b) $CH_3C\equiv C-CH_3$
(c) $CH_3-HC=CH-CH_3$ (d) CH_4

12. A group which deactivates the benzene ring towards electrophilic substitution but which directs the incoming group principally to the o- and p-positions is
(a) $-NH_2$ (b) $-Cl$ (c) $-NO_2$ (d) $-C_2H_5$

13. Isopropyl alcohol is obtained by reacting which of the following alkenes with conc. H_2SO_4 and H_2O
(a) Ethylene (b) Propylene
(c) 2-methyl propene (d) Isoprene

14. In the preparation of alkanes from hydrogenation of alkenes and alkynes. Finely divided catalysts are used which of the following statement(s) is/are correct regarding these catalysts
(i) Platinum and palladium catalyse the reaction at room temperature.
(ii) Nickel catalyse the reaction at relatively higher temperature and pressure.
(iii) Platinum and palladium catalyse the reaction at higher temperature.
(a) (i) and (iii) (b) (i) and (ii)
(c) (ii) and (iii) (d) (i) only

15. Which one of the following reactions is expected to readily give a hydrocarbon product in good yields ?

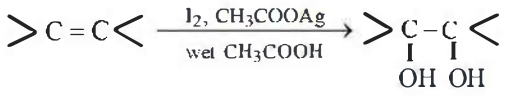
(a) $RCOOK \xrightarrow[\text{oxidation}]{\text{Electrolytic}}$

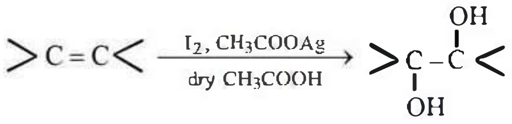
(b) $RCOO^-Ag^+ \xrightarrow{Br_2}$

(c) $CH_3CH_3 \xrightarrow[h\nu]{Cl_2}$

(d) $(CH_3)_3CCl \xrightarrow{C_2H_5OH}$

16. Which of the following change is correct

(a) 
$$>C=C< \xrightarrow[\text{wet } CH_3COOH]{I_2,\ CH_3COOAg} >\underset{\displaystyle OH}{\underset{|}{C}}-\underset{\displaystyle OH}{\underset{|}{C}}<$$

(b) 
$$>C=C< \xrightarrow[\text{dry } CH_3COOH]{I_2,\ CH_3COOAg} >\underset{\displaystyle OH}{\underset{|}{C}}-\overset{\displaystyle OH}{\overset{|}{C}}<$$

(c) Both (a) and (b) one correct
(d) Neither (a) nor (b)

17. The products obtained via oxymercuration ($HgSO_4$ + H_2SO_4) of 1-butyne would be

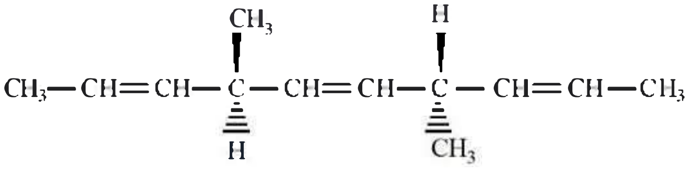
(a) $CH_3-CH_2-CO-CH_3$

(b) $CH_3-CH_2-CH_2-CHO$

(c) $CH_3-CH_2-CHO+HCHO$

(d) $CH_3CH_2COOH+HCOOH$

18. The number of optically active products obtained from the **complete** ozonolysis of the given compound is :



(a) 0 (b) 1 (c) 2 (d) 4

19. Propyne on polymerisation gives
(a) Mesitylene (b) Benzene
(c) Ethyl benzene (d) Propyl benzene

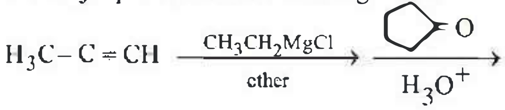
20. The electrophilic substitutions reactions of benzene takes place via
(i) generation of electrophile
(ii) generation of nucleophile
(iii) formation of carbocation intermediate
(iv) removal of proton from the carbocation intermediate
(a) (i), (iii) and (iv) (b) (ii), (iii) and (iv)
(c) (i) and (iv) (d) (ii) and (iv)

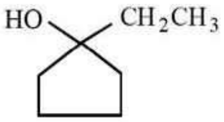
RESPONSE GRID				
8. ⓐⓑⓒⓓ	9. ⓐⓑⓒⓓ	10. ⓐⓑⓒⓓ	11. ⓐⓑⓒⓓ	12. ⓐⓑⓒⓓ
13. ⓐⓑⓒⓓ	14. ⓐⓑⓒⓓ	15. ⓐⓑⓒⓓ	16. ⓐⓑⓒⓓ	17. ⓐⓑⓒⓓ
18. ⓐⓑⓒⓓ	19. ⓐⓑⓒⓓ	20. ⓐⓑⓒⓓ		

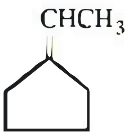
21. Two organic compounds A and B both containing only carbon and hydrogen, on quantitative analysis gave the same percentage composition by weight :
$C = (12/13) \times 100\%, H = (1/13) \times 100\%$
A decolourises bromine water but B does not. A and B respectively are

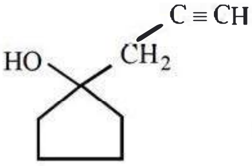
(a) C_2H_2 and C_6H_6 (b) C_6H_6 and C_2H_2
(c) C_2H_4 and C_2H_6 (d) C_2H_2 and C_2H_6

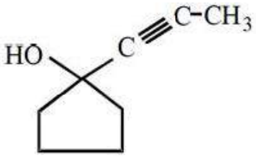
22. The major product of the following reaction



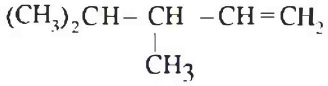
(a)


(b)


(c)


(d)


23. 2,3-Dimethyl-2-butene can be prepared by heating which of the following compounds with a strong acid ?

(a)

$(CH_3)_2CH-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH=CH_2$

(b) $(CH_3)_3C-CH=CH_2$
(c) $(CH_3)_2C=CH-CH_2-CH_3$
(d) $(CH_3)_2CH-CH_2-CH=CH_2$

24. Which C-atom is the most electronegative in this structure?

$\overset{III}{CH_3}-\overset{II}{CH_2}-\overset{I}{C\equiv CH}$

(a) I
(b) II
(c) III
(d) all are equal electronegative

25. Which of the following will have least hindered rotation around carbon - carbon bond ?

(a) Ethane (b) Ethylene
(c) Acetylene (d) Hexachloroethane

26. Match the columns

	Column - I		Column - II
A.	Alkyl + Acid halide in presence of dry ether	I.	Sulphonation
B.	Arene + Acid halide in presence of $AlCl_3$	II.	Wurtz reaction
C.	Arene + Fuming sulphuric in presence of $AlCl_3$	III.	Catalytic hydrogenation
D.	Arene + Hydrogen in presence of Ni	IV.	Friedel-Crafts reaction

(a) A – I; B – III; C – II; D – IV
(b) A – IV; B – II; C – III; D – I
(c) A – III; B – I; C – IV; D – II
(d) A – II; B – IV; C – I; D – III

27. Of the three isomeric C_3H_4 hydrocarbons shown below how many can exist with all carbon and hydrogen nuclei located in a single plane

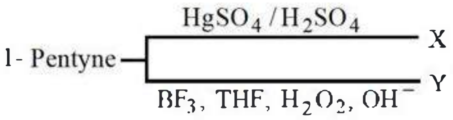
(a) 0 (b) 1 (c) 2 (d) 3

28. Excess of CH_3COOH is reacted with $CH\equiv CH$ in presence of Hg^{2+}, the product is

(a) $CH_3CH(OCOCH_3)_2$
(b) $CH_2=CH(OCOCH_3)$
(c) $(CH_3COO)CH_2-CH_2(OOCCH_3)$
(d) None of these

29. Which one of the following contain isopropyl group?

(a) 2, 2, 3, 3-tetramethylpentane
(b) 2, 4-dimethylhexone
(c) 2, 2, 3-trimethylpentane
(d) 3, 3-dimethylpentane

30.


X and Y can be distinguished by

(a) Silver-mirror test (b) Iodoform test
(c) Both (d) None

31. The major product obtained in the photo catalysed bromination of 2-methylbutane is:

(a) 1-bromo-2-methylbutane
(b) 1-bromo-3-methylbutane
(c) 2-bromo-3-methylbutane
(d) 2-bromo-2-methylbutane

32. Acetylenic hydrogens are acidic because

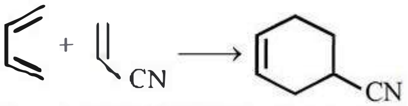
(a) Sigma electron density of C – H bond in acetylene is nearer to carbon, which has 50% *s*-character
(b) Acetylene has only open hydrogen in each carbon
(c) Acetylene contains least number of hydrogens among the possible hydrocarbons having two carbons
(d) Acetylene belongs to the class of alkynes with molecular formula, C_nH_{2n-2}.

RESPONSE GRID					
	21.ⓐⓑⓒⓓ	22.ⓐⓑⓒⓓ	23.ⓐⓑⓒⓓ	24.ⓐⓑⓒⓓ	25.ⓐⓑⓒⓓ
	26.ⓐⓑⓒⓓ	27.ⓐⓑⓒⓓ	28.ⓐⓑⓒⓓ	29.ⓐⓑⓒⓓ	30.ⓐⓑⓒⓓ
	31.ⓐⓑⓒⓓ	32.ⓐⓑⓒⓓ			

33. Which of the following will be most easily attacked by an electrophile?

(a) C_6H_6 (b) C_6H_5Cl (c) C_6H_5OH (d) $C_6H_5CH_3$

34. Name of the following reaction is



(a) Claisen Condensation (b) Diel's Alder reaction
(c) Dieckmann cyclisation (d) Michael addition reaction

35. The most suitable catalyst for the hydrogenation of 2-Hexyne ⟶ 2-cis-Hexene is

(a) Pd–$BaSO_4$ (b) $(Ph_3P)_3RhCl$
(c) 10% Pd –C (d) Raney Ni

36.  NH_2 + Excess of Et. MgBr → ?

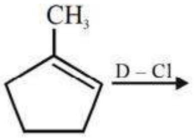
(a) 1 mole of Ethane
(b) 3 mole of ethane
(c) $EtC\equiv CCH_2CH_2NHEt$
(d) 4 mole of ethane

37. Among the following compounds (I – III), the correct order of reactivity with an electrophile is

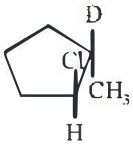
$C_6H_5OCH_3$	C_6H_6	$C_6H_5NO_2$
I	II	III

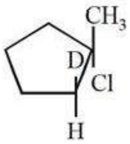
(a) II > III > I (b) III < I < II
(c) I > II > III (d) I = II > III

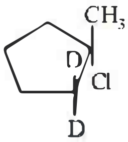
38. What is the major product expected from the following reaction ?

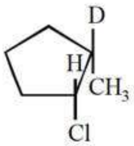


Where D is an isotope of hydrogen

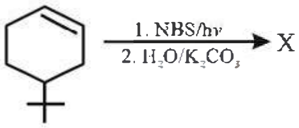
(a) 

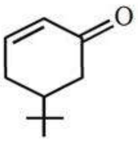
(b) 

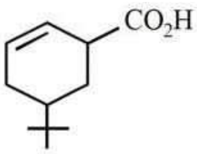
(c) 

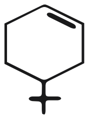
(d) 

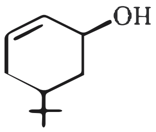
39. The product of the reaction given below is:



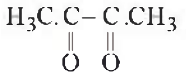
(a) 

(b) 

(c) 

(d) 

40. $CH_3C\equiv CCH_3 \xrightarrow[\text{(ii) } H_2O/Zn]{\text{(i) } X}$

 In the above reaction X is

$H_3C.\underset{\underset{O}{\|}}{C}-\underset{\underset{O}{\|}}{C}.CH_3$

(a) HNO_3 (b) O_2 (c) O_3 (d) $KMnO_4$

41. Which of the following represent the correct order of acidic strength ?

(i) $HC\equiv CH > H_2C=CH_2 > CH_3-CH_3$
(ii) $HC\equiv CH > CH_3-CH_3 > H_2C=CH_2$
(iii) $CH_3C\equiv CH > HC\equiv CH > CH_3-C\equiv C-CH_3$
(iv) $HC\equiv CH > CH_3-C\equiv CH > CH_3-C\equiv C-CH_3$

(a) (i) and (iii) (b) (ii) and (iv)
(c) (i) and (iv) (d) (i) and (iv)

42. Which one of the following compounds would have the highest heat of hydrogenation ?

(a) $CH_2=CH_2$
(b) $CH_3-CH_2-CH=CH_2$
(c) $CH_3CH=CHCH_3$
(d) $(CH_3)_2C=C(CH_3)_2$

43. On mixing a certain alkane with chlorine and irradiating it with ultraviolet light, it forms only one monochloroalkane. This alkane could be

(a) pentane (b) isopentane
(c) neopentane (d) propane

44. Acetylene gives

(a) white ppt with $AgNO_3$ and red ppt with Cu_2Cl_2
(b) white ppt with Cu_2Cl_2 and red ppt with $AgNO_3$
(c) white ppt with both
(d) red ppt with both

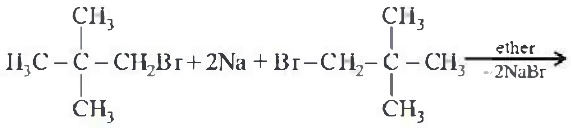
45. Sodium ethoxide is a specific reagent for

(a) dehydration (b) dehydrogenation
(c) dehydrohalogenation (d) dehalogenation

RESPONSE GRID	33.ⓐⓑⓒⓓ	34.ⓐⓑⓒⓓ	35.ⓐⓑⓒⓓ	36.ⓐⓑⓒⓓ	37. ⓐⓑⓒⓓ
	38.ⓐⓑⓒⓓ	39.ⓐⓑⓒⓓ	40.ⓐⓑⓒⓓ	41.ⓐⓑⓒⓓ	42. ⓐⓑⓒⓓ
	43.ⓐⓑⓒⓓ	44.ⓐⓑⓒⓓ	45.ⓐⓑⓒⓓ		

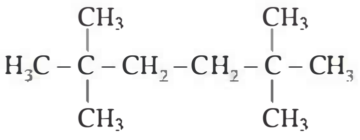
DAILY PRACTICE PROBLEMS

CHEMISTRY SOLUTIONS

1. (c) 

$$H_3C-\underset{CH_3}{\overset{CH_3}{C}}-CH_2Br+2Na+Br-CH_2-\underset{CH_3}{\overset{CH_3}{C}}-CH_3 \xrightarrow[-2NaBr]{ether}$$

neo-pentyl bromide



$$H_3C-\underset{CH_3}{\overset{CH_3}{C}}-CH_2-CH_2-\underset{CH_3}{\overset{CH_3}{C}}-CH_3$$

2,2,5,5-tetramethylhexane

2. (c) $CH_3CHBrCHBrCH_3 \xrightarrow{Zn/alcohol} CH_3CH=CHCH_3$

Since two bromine atoms are lost from different carbon atom, the reaction is known as β-elimination.

3. (a) The intermediate 2° carbocation shows resonance

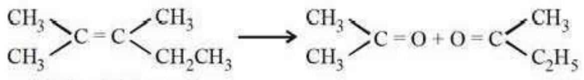
$$CH_2=CH-CH=CH_2 \xrightarrow{Br^+}$$

$$\left[CH_2Br-\overset{+}{C}H-CH=CH_2\right.$$

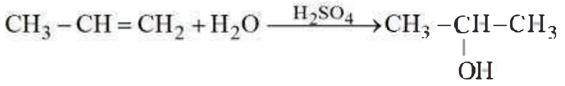
$$\left.\longleftrightarrow CH_2Br-CH=CH-\overset{+}{C}H_2\right]$$

$$\xrightarrow{Br^-} CH_2Br-CH=CH-CH_2Br$$

1,4-dibromo-2-butene

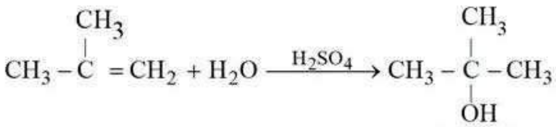
4. (d) 

2,3-dimethyl-2-pentene

5. (c) 

$$CH_3-CH=CH_2+H_2O \xrightarrow{H_2SO_4} CH_3-\underset{OH}{CH}-CH_3$$

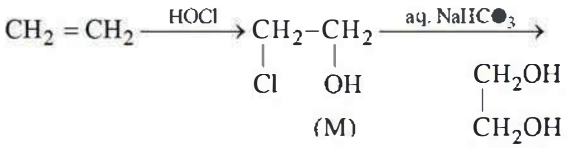
2° alcohol



$$CH_3-\overset{CH_3}{C}=CH_2+H_2O \xrightarrow{H_2SO_4} CH_3-\underset{OH}{\overset{CH_3}{C}}-CH_3$$

3° alcohol

Addition follows Markownikoff's rule.

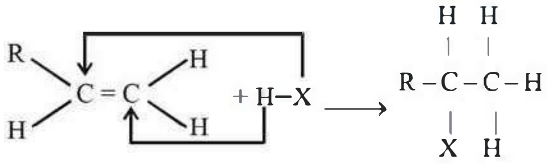
6. (b) 

$$CH_2=CH_2 \xrightarrow{HOCl} \underset{Cl}{CH_2}-\underset{OH}{CH_2} \xrightarrow{aq.\ NaHCO_3} \begin{matrix}CH_2OH\\ |\\ CH_2OH\end{matrix}$$

(M)

Glycol

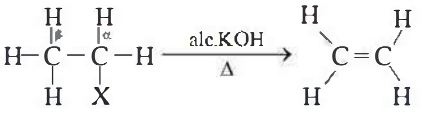
7. (c) According to Markownikoff's rule, "in case of addition of an unsymmetrical reagent (H– X), the positive part get attached to the C which is least substituted or which bears larger number of hydrogen atoms."



Markownikoff's rule is based on the stability of carbocations (3° > 2° > 1° > methyl).

8. (a) $CH\equiv CH+H_2 \xrightarrow{Pd/C} CH_2=CH_2$

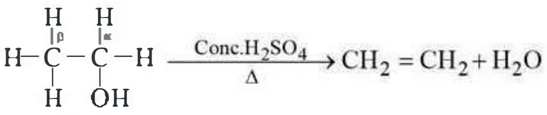
Ethyne Ethene



$$H-\underset{H}{\overset{H}{C}}-\underset{X}{\overset{H}{C}}-H \xrightarrow[\Delta]{alc.KOH}$$

(X = Cl, Br, I)

$CH_2Br-CH_2Br+Zn \longrightarrow CH_2=CH_2+ZnBr_2$

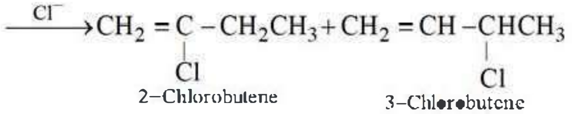


$$H-\underset{H}{\overset{H}{C}}-\underset{OH}{\overset{H}{C}}-H \xrightarrow[\Delta]{Conc.H_2SO_4} CH_2=CH_2+H_2O$$

Ethanol

9. (a) $CH_2=C=CH-CH_3 \xrightarrow{H^+}$

$$\left[CH_2=\overset{+}{C}-CH_2CH_3+CH_2=CH-\overset{+}{C}HCH_3\right]$$



$$\xrightarrow{Cl^-} CH_2=\underset{Cl}{C}-CH_2CH_3+CH_2=CH-\underset{Cl}{C}HCH_3$$

2–Chlorobutene 3–Chlorobutene

10. (c)

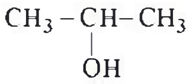
11. (d) Writing the reaction we get

$$CH_3MgX+CH_3-C\equiv C-H \longrightarrow$$

$$CH_3-C\equiv CMgX+CH_4(g)$$

12. (b) –Cl group is o-, p-directing due to +R effect ; however it is deactivating due to strong –I effect of Cl (different from other o-, p-directing groups which are activating). The net result is that chlorobenzene undergoes o-, p-substitution, with difficulty.

13. (b) $CH_3\text{-}CH = CH_2 + H_2O \xrightarrow[\text{Markonikoff's rule}]{\text{conc. }H_2SO_4}$



$$\underset{\displaystyle OH}{CH_3-\underset{|}{CH}-CH_3}$$

Isopropyl alcohol

14. (b) Dihydrogen gas adds to alkenes and alkynes in the presence of finely divided catalysts like platinum, palladium or nickel to form alkanes. These metals adsorb dihydrogen gas on their surfaces and activate the hydrogen-hydrogen bond. Platinum and palladium catalyse the reaction at room temperature but relatively higher temperature and pressure are required with nickel catalyst.

15. (a) Electrolysis of a concentrated aqueous solution of either sodium or potassium salts of saturated non-carboxylic acids yields higher alkane at anode.

$$2RCOOK \xrightarrow[\text{Oxidation}]{\text{Electrolytic}} \underset{\text{Anode}}{2RCOO^{-}} + \underset{\text{Cathode}}{2K^{+}}$$

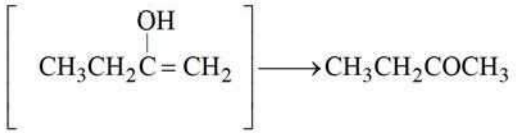
At anode : $2RCO\bullet^{-} \rightarrow 2RCO\bullet + 2e^{-} \longrightarrow R—R + 2CO_2$

At Cathode : $2K^{+} + 2e^{-} \longrightarrow 2K$
$2K + H_2O \rightarrow 2KOH + H_2\uparrow$

16. (c) Both (a) and (b) are correct. Wet CH_3COOH gives cis addition and dry CH_3COOH gives trans addition products.

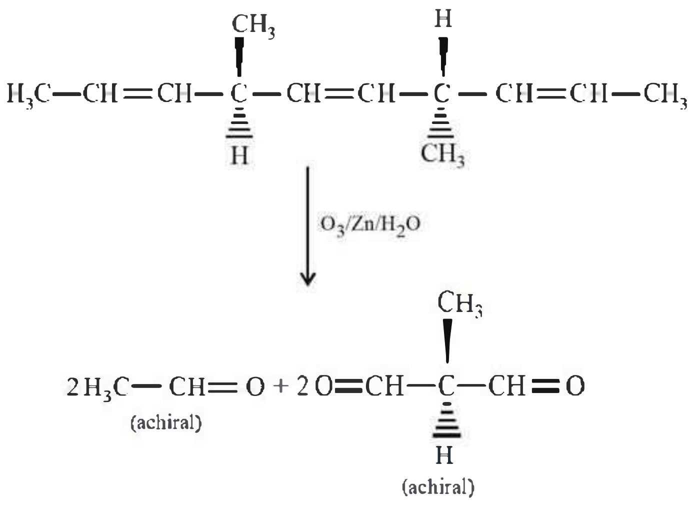
17. (a) Oxymercuration leads to hydration according to Markownikoff's rule.

$CH_3CH_2C \equiv CH \xrightarrow{HgSO_4 + H_2SO_4}$

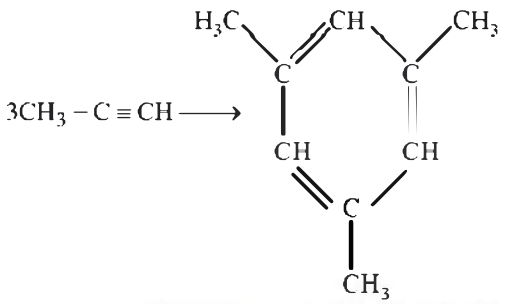


$$\left[CH_3CH_2\overset{\displaystyle OH}{\overset{|}{C}} = CH_2 \right] \longrightarrow CH_3CH_2COCH_3$$

18. (a)



19.



Mesitylene or 1, 3, 5-trimethyl benzene

20. (a) According to experimental evidences, electrophilic substitution reactions are supposed to proceed via the following three steps:

(1) Generation of the electropbile
(2) Formation of carbocation intermediate
(3) Removal of proton from the carbocation intermediate

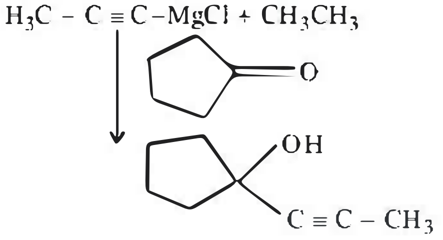
21. (a) Determine the empirical formula of the two compounds

$$C : H = \left(\frac{12}{13} \times 100\right) : \left(\frac{1}{13} \times 100\right) = 92.3 : 7.7$$

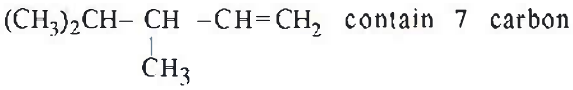
$$= \frac{92.3}{12} : \frac{7.7}{1} = 7.7 : 7.7 = 1 : 1$$

∴ The empirical formula of the two compounds is CH. Thus the molecular formula of A and B will be the simple multiple of CH, i.e. C_2H_2, C_3H_3, C_4H_4, C_6H_6, etc. Thus options (c) and (d) are discarded. Further since A decolourises bromine water and B does not, A and B should be C_2H_2 (acetylene) and C_6H_6 (benzene) respectively.

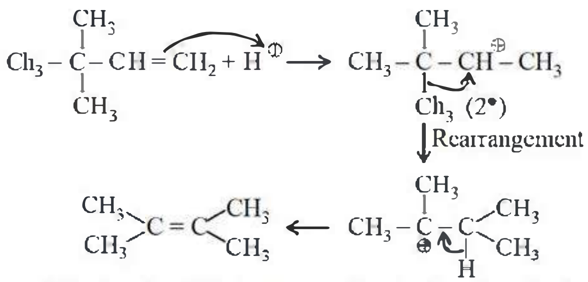
22. (d) $H_3C - C \equiv C \boxed{H + CH_3CH_2} MgCl \longrightarrow$



23. (b)



$$(CH_3)_2CH-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH=CH_2$$ contain 7 carbon atoms



24. (a) As the number of bonds between carbon atoms increases, electronegativity of that carbon also increases due to increasing active power of electrons. Also *sp* hybrid is more electronegative than sp^2 which is more electronegative than sp^3($\because$ *s* character decreases) Hence, option (a) is correct.

25. (a) Ethylene has restricted rotation, acetylene has no rotation, hexachloroethane has more rotation than ethylene but less than ethane because of greater size of the substituent (chlorine) in hexachloroethane than in ethane (substituent is hydrogen).

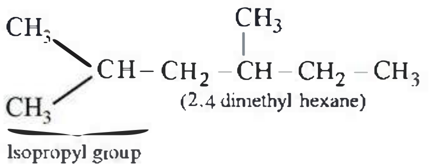
26. (d)

27. (a) In $H_2C = C = CH_2$ hybridisation of C atoms is sp^2 and sp. The molecule is monoplanar but H–atoms lie in different planes.

28. (a) $CH \equiv CH \xrightarrow[Hg^{2+}]{CH_3COOH} CH_2 = CHOCOCH_3$

$\xrightarrow{CH_3COOH} CH_3CH(OCOCH_3)_2$

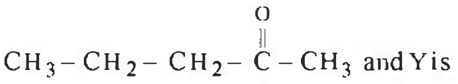
29. (b)



$$(CH_3)_2CH-CH_2-\underset{}{\overset{CH_3}{\overset{|}{C}H}}-CH_2-CH_3$$

It contains isopropyl group.

30. (c) In the given reactions, X is



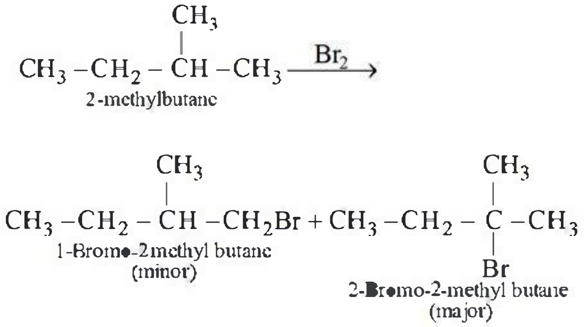
$CH_3-CH_2-CH_2-\overset{O}{\overset{\|}{C}}-CH_3$ and Y is

$CH_3CH_2CH_2CH_2CHO$, X will give +ve iodoform test and Y will give +ve silver mirror test.

31. (d) The order of substitution in different alkanes is

$3° > 2° > 1°$

Thus the bromination of 2-methylbutane mainly gives 2-Bromo-2-methyl butane



$$CH_3-CH_2-\overset{CH_3}{\overset{|}{C}H}-CH_3 \xrightarrow{Br_2}$$

$$CH_3-CH_2-\overset{CH_3}{\overset{|}{C}H}-CH_2Br + CH_3-CH_2-\underset{Br}{\underset{|}{\overset{CH_3}{\overset{|}{C}}}}-CH_3$$

32. (a) The acidity of acetylene or 1–alkyne can be explained on the basis of molecular orbital concept according to which formation of C—H bond in acetylene involves *sp*-hybridised carbon atom. Now since s electrons are closer to the nucleus than *p* electrons, the electrons present in a bond having more *s* character will be correspondingly more closer to the nucleus. Thus owing to high *s* character of the C—H bond in alkynes ($s = 50\%$), the electrons constituting this bond are more strongly held by the carbon nucleus i.e., the acetylenic carbon atom or the *sp* orbital acts as more electronegative species than the sp^2 and sp^3 with the result the hydrogen present on such a carbon atom ($\equiv$C—H) can be easily removed as a proton.

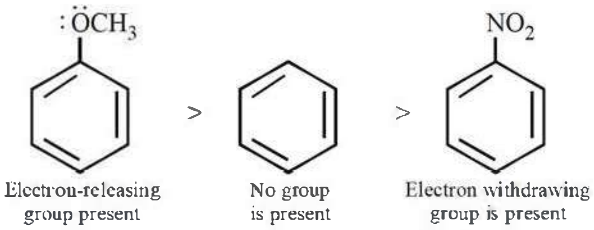
33. (c) Phenol as well as toluene have electron-releasing groups, however –OH group, in phenol, is more electron-releasing (due to +R effect) than the $-CH_3$ group in toluene, so phenol is more easily attacked by an electrophile.

34. (b) The given reaction is Diel's Alder reaction. This reaction involves a cycloaddition between a conjugated diene and a substituted alkene.

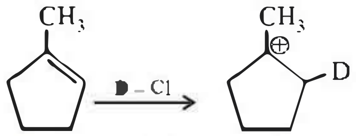
35. (a) Reduction of alkynes with Lindar's catalyst ($Pd\text{-}BaSO_4$) gives cis-alkenes.

36. (b) $HC \equiv C-CH_2-CH_2NH_2$ contains three active hydrogen atoms (one attached to sp hybridised carbon atom and two attached to N). Hence, EtMgBr will give three moles of C_2H_6.

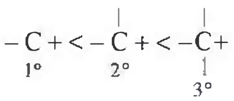
37. (c)



38. (b)

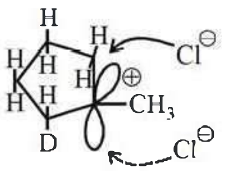


Formation of above species is more favourable. The stability order of carbocations is

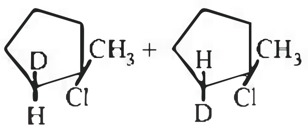


$$\underset{1°}{-C+} < \underset{2°}{-\overset{|}{C}+} < \underset{3°}{-\underset{|}{\overset{|}{C}}+}$$

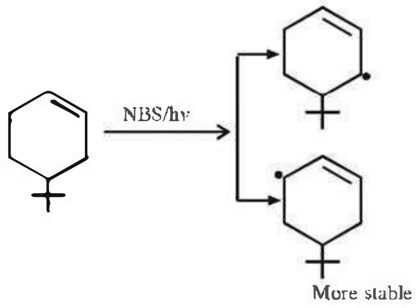
Now, carbocation formed is sp^2 hybridised that is triangular planar as shown below

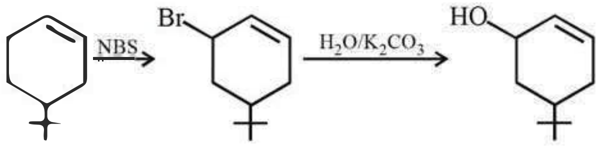


Either the $Cl^{\ominus}$ attack from above or below formation of the plane of the molecule, so there is probability of resultant product as shown below i.e., both product will form.

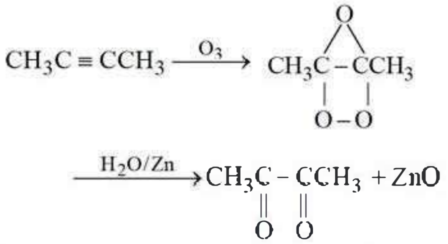


39. **(d)** N – bromosuccinimide results into bromination at allylic and benzylic positions





40. **(c)**



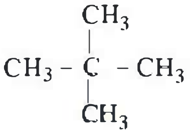
$$CH_3C\equiv CCH_3 \xrightarrow{O_3} CH_3\overset{\displaystyle O}{\overset{/\ \backslash}{C-C}}H_3 \ (\text{with } \underset{O-O}{})$$

$$\xrightarrow{H_2O/Zn} CH_3\underset{\underset{O}{\|}}{C}-\underset{\underset{O}{\|}}{C}CH_3 + ZnO$$

41. **(c)** Due to the maximum percentage of *s* character (50%), the *sp* hybridised orbitals of carbon atoms in ethyne molecules have highest electronegativity; hence, these attract the shared electron pair of the C-H bond of ethyne to a greater extent than that of the sp^2 hybridised orbitals of carbon in ethene and the sp^3 hybridised orbital of carbon in ethane. Thus in ethyne, hydrogen atoms can be liberated as protons more easily as compared to ethene and ethane.

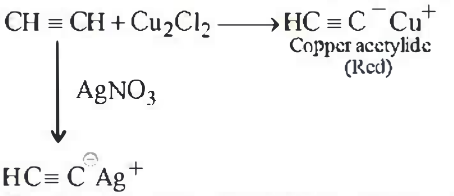
42. **(a)** The heat of hydrogenation of an alkene depends upon its stability. Higher the stability, lower the heat of hydrogenation. Since $CH_2=CH_2$ has no substituent, it is the least stable alkene and hence has the highest heat of hydrogenation.

43. **(c)** In neopentane all the H atoms are same (1°).



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

44. **(a)** This is due to acidity of the alkyne hydrogen

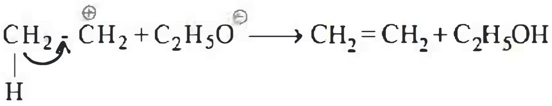


$$\begin{tikzcd} CH\equiv CH + Cu_2Cl_2 \arrow[r] \arrow[d, "AgNO_3"] & \underset{\text{Copper acetylide (Red)}}{HC\equiv C^-Cu^+} \\ HC\equiv C^{\ominus}Ag^+ & \end{tikzcd}$$

The above reactions forms basis of test to distinguish between terminal and non-terminal alkynes, since non-terminal alkynes $(R-C\equiv C-R')$ do not react with these metal salts.

45. **(c)** $CH_3CH_2Br \xrightarrow{C_2H_5O^-Na^+} CH_3\overset{\oplus}{C}H_2 + C_2H_5O^{\ominus}$

Ethoxide ion is a strong base which abstracts proton from carbocation to form alkene.



$$\underset{\underset{H}{|}}{CH_2}-\overset{\oplus}{C}H_2 + C_2H_5O^{\ominus} \longrightarrow CH_2=CH_2 + C_2H_5OH$$

Thus, there is a loss of hydrogen and halogen both leading to dehydrohalogenation.