DAY THIRTY TWO

Unit Test 5

(Organic Chemistry-I)

1 Which of the following species is paramagnetic in nature?

(a) Carbonium ion (b) Free radical
(c) Carbene (d) Nitrene

2 Which of the following statement(s) is/are wrong?

➞ NCERT Exemplar

(a) Ozone is not responsible for greenhouse effect
(b) Ozone can oxidise sulphur dioxide present in the atmosphere to sulphur trioxide
(c) Ozone hole is thinning of ozone layer present in stratosphere
(d) Ozone is produced in upper stratosphere by the action of UV-rays on oxygen

3 Among the following, the strongest nucleophile is

(a) C_2H_5SH (b) CH_3COO^-
(c) CH_3NH_2 (d) $NC\bar{C}H_2$

4 Which of the following reactions represent the conversion of CH_4 into CH_3Cl?

(a) Electrophilic substitution (b) Free radical addition
(c) Nucleophilic substitution (d) Free radical substitution

5 In the dehydration reaction,

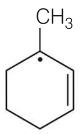
$CH_3CONH_2 \xrightarrow{P_2O_5} CH_3C{\equiv}N$, the hybridisation state of carbon changes from

(a) sp^3 to sp^2 (b) sp to sp^2
(c) sp^2 to sp (d) sp to sp^3

6 The compound obtained when acetaldehyde reacts with dilute aqueous sodium hydroxide exhibits

(a) geometrical isomerism
(b) optical isomerism
(c) neither optical nor geometrical isomerism
(d) Both optical and geometrical isomerism

7 The most stable free radical is

(a)


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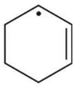

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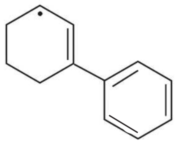

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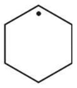
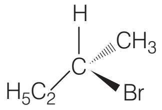


8 Identify Z in the following series.

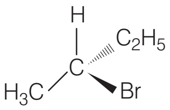
$$CH_2{=}CH_2 \xrightarrow{HBr} X \xrightarrow{Hydrolysis} Y \xrightarrow[I_2\ (excess)]{Na_2CO_3} Z$$

(a) C_2H_5I (b) CHI_3
(c) CH_3CHO (d) C_2H_5OH

9 Which of the following structures is enantiomeric with the molecule (A) given below. ➞ NCERT Exemplar



(A)

(a)


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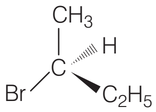

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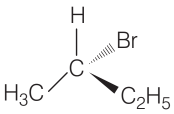

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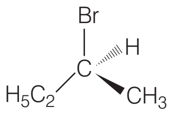


10 Benzene vapours mixed with air when passed over V_2O_5 catalyst at 775 K gives

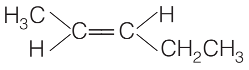
(a) glyoxal (b) oxalic acid
(c) maleic anhydride (d) fumaric acid

11 Cyclopentene on treatment with alkaline $KMnO_4$ gives

(a) cyclopentanol
(b) *trans* -1, 2-cyclopentanediol
(c) *cis*-1, 2- cyclopentanediol
(d) 1 : 1 mixture of *cis* and *trans*-1, 2-cyclopentanediol

12 $CH_3C \equiv CH \xrightarrow[\text{(ii) } C_2H_5Br]{\text{(i) } NaNH_2} A \xrightarrow[\text{Lindlar's catalyst}]{H_2} B$

What is *B* in the above reaction?

(a)


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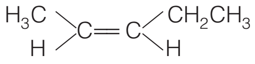

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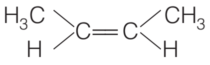

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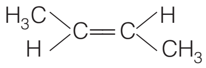
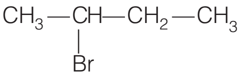
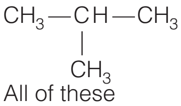
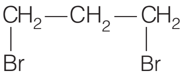


13 $CH_3CH_2CH_2CH_3 \xrightarrow[HCl]{AlCl_3}$ product

Product in the above reaction is

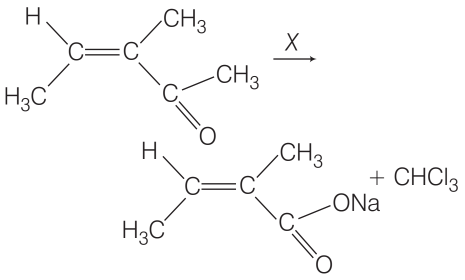
(a)

$CH_3-\underset{\underset{Br}{|}}{CH}-CH_2-CH_3$

(b)

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

(c)

$\underset{\underset{Br}{|}}{CH_2}-CH_2-\underset{\underset{Br}{|}}{CH_2}$

(d) All of these

14 Identify the reagent *X* in the following reaction.



(a) NaCl (b) $SOCl_2$
(c) NaOCl (d) $KMnO_4$ / H^+

15 Which of the following statements regarding the effect of trifluoromethyl, $-CF_3$ present on a benzene ring towards electrophilic substitution is correct?

[NCERT Exemplar]

(a) — CF_3 group activates the ring
(b) — CF_3 group renders the ring basic
(c) — CF_3 group is a *meta*-directing group, therefore, deactivates the ring
(d) — CF_3 group is an *ortho, para*-directing group

16 HBr reacts with $CH_2 = CHOCH_3$ under anhydrous conditions at room temperature to give

(a) CH_3CHO and CH_3Br (b) $BrCH_2CHO$ and CH_3OH
(c) $BrCH_2 - CH_2 - OCH_3$ (d) $H_3C - CHBr - OCH_3$

17 2-methylbutane on reacting with bromine in the presence of sunlight gives mainly

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

18 Elimination of bromine from 2-bromobutane results in the formation of

(a) predominantly 2-butyne
(b) predominantly 1-butene
(c) predominantly 2-butene
(d) equimolar mixture of 1-butene and 2-butene

19 Reaction of one molecule of HBr with one molecule of 1,3-butadiene at 40°C gives predominantly

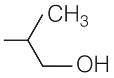
(a) 1-bromo-2-butene under kinetically controlled conditions
(b) 3-bromobutene under thermodynamically controlled conditions
(c) 1-bromo-2-butene under thermodynamically controlled conditions
(d) 3-bromobutene under kinetically controlled conditions

20 The compound formed as a result of oxidation of ethyl benzene by $KMnO_4$ is

(a) benzophenone (b) acetophenone
(c) benzoic acid (d) benzyl alcohol

21 Among the following, the one that gives positive iodoform test upon reaction with I_2 and NaOH is

(a) $CH_3CH_2CH(OH)CH_2CH_3$ (b) $C_6H_5CH_2CH_2OH$

(c)


(d) $PhCHOHCH_3$

22 The increasing order of the rate of HCN addition to compound *A*-*D* is

A. HCHO B. CH_3COCH_3
C. $PhCOCH_3$ D. PhCOPh

(a) *A*<*B*<*C*<*D* (b) *D*<*B*<*C*<*A* (c) *D*<*C*<*B*<*A* (d) *C*<*D*<*B*<*A*

23 Acid catalysed 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) both secondary or tertiary alcohol
(d) only primary alcohol

24 The best reagent to convert pent-3-en-2-ol into pent-3-en-2-one is

(a) pyridinium chlorochromate
(b) chromic acid in aqueous acetone
(c) acidic dichromate
(d) acidic permanganate

25 Which one of the following undergoes reaction with 50% sodium hydroxide solution to give corresponding alcohols and acids?

(a) Phenol
(b) Benzaldehyde
(c) Butanol
(d) Benzoic acid

26 Ethyl isocyanide on hydrolysis in acidic medium generates

(a) ethylamine salt and methanoic acid
(b) propanoic acid and ammonium salt
(c) ethanoic acid and ammonium salt
(d) methylamine salt and ethanoic acid

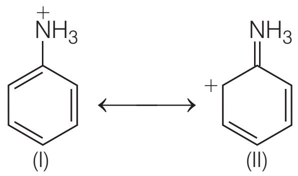
27 In the chemical reaction,

$$CH_3CH_2NH_2 + CHCl_3 + 3KOH \longrightarrow A + B + 3H_2O$$

the compounds *A* and *B* respectively are

(a) C_2H_5CN and 3KCl
(b) $CH_3CH_2CONH_2$ and 3KCl
(c) C_2H_5NC and K_2CO_3
(d) C_2H_5NC and 3KCl

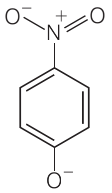
28 Examine the following two structures for the anilinium ion and choose the correct statement from the ones given below.

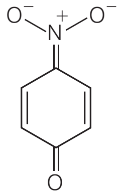


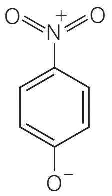
(I) (II)

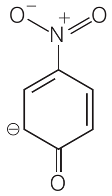
(a) II is not an acceptable canonical structure because carbonium ions are less stable than ammonium ions
(b) II is not an acceptable canonical structure because it is non-aromatic
(c) II is not an acceptable canonical structure because the nitrogen has 10 valence electrons
(d) II is an acceptable canonical structure

29 The most unlikely representation of resonance structures of *p*-nitrophenoxide ion is

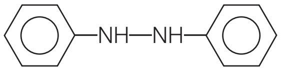
(a)


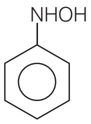
(b)


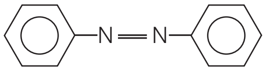
(c)


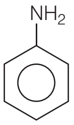
(d)


30 The structure of the compound formed, when nitrobenzene is reduced by lithium aluminium hydride ($LiAlH_4$) is

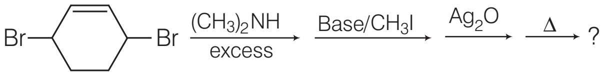
(a)


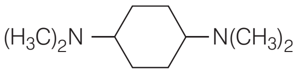
(b)


(c)


(d)


31 Final major product obtained in the following transformation is



(a)


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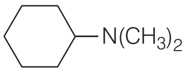

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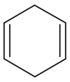

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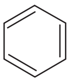
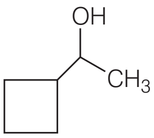


32 Cyclobutyl bromide on treatment with magnesium in dry ether forms an organometallic compound *A*. The organometallic compound reacts with ethanal to give an alcohol *B* after mild acidification. Prolonged treatment of alcohol *B* with an equivalent amount of HBr gives 1-bromo-1-methylcyclopentane *C*. Identify the alcohol *B*.

(a)


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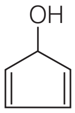

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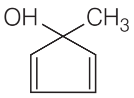

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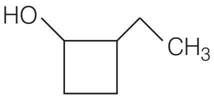
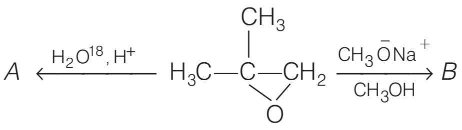
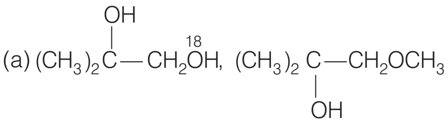
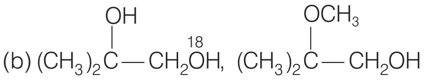


33


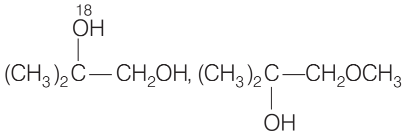
A and *B* respectively are

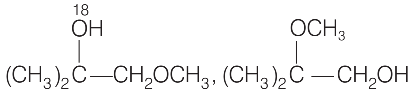
(a)


$(CH_3)_2\overset{OH}{\overset{|}{C}}—CH_2\overset{18}{O}H,\ (CH_3)_2\underset{OH}{\underset{|}{C}}—CH_2OCH_3$

(b)


$(CH_3)_2\overset{OH}{\overset{|}{C}}—CH_2\overset{18}{O}H,\ (CH_3)_2\overset{OCH_3}{\overset{|}{C}}—CH_2OH$

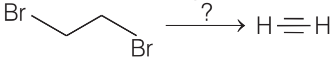
(c) 
$(CH_3)_2\overset{^{18}OH}{C}-CH_2OH, \; (CH_3)_2\underset{OH}{C}-CH_2OCH_3$

(d) 
$(CH_3)_2\overset{^{18}OH}{C}-CH_2OCH_3, \; (CH_3)_2\overset{OCH_3}{C}-CH_2OH$

34 $(CH_3)_3CMgCl$ on reaction with D_2O produces

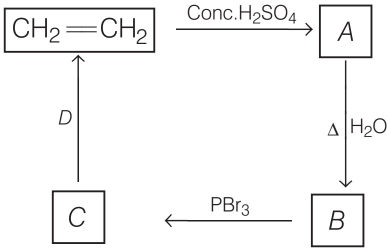
(a) $(CH_3)_3COD$	(b) $(CD_3)_3CH$
(c) $(CH_3)_3CD$	(d) $(CD_3)_3CD$

35 The reagent(s) for the following conversion, is/are



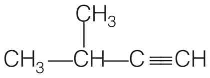
(a) alcoholic KOH ➞ [IIT JEE]
(b) alcoholic KOH followed by $NaNH_2$
(c) aqueous KOH followed by $NaNH_2$
(d) Zn / CH_3OH

36 Identify *B* and *D* in the following sequence of reactions.

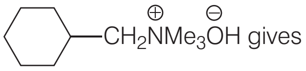


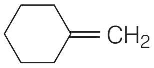
(a) Methanol and bromoethane
(b) Ethyl hydrogen sulphate and alcoholic KOH
(c) Ethyl hydrogen sulphate and aqueous KOH
(d) Ethanol and alcoholic KOH

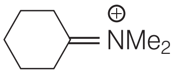
37 Which compound does not give precipitate with ammoniacal silver nitrate solution?

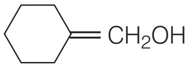
(a) $C_2H_5-C\equiv CH$
(b) $CH_3-C\equiv C-CH_3$
(c) 
$CH_3-\overset{CH_3}{CH}-C\equiv CH$
(d) $Ph-CH_2-C\equiv CH$

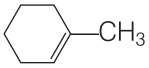
38 Thermal decomposition of



(a) 

(b) 

(c) 

(d) 

39 The dihalogen derivative *X* of a hydrocarbon with three carbon atoms reacts with alcoholic KOH and produces another hydrocarbon which forms a red precipitate with ammoniacal Cu_2Cl_2. *X* gives an aldehyde on reaction with aqueous KOH. The compound *X* is

(a) 1, 3-dichloropropane	(b) 1, 2-dichloropropane
(c) 2, 2-dichloropropane	(d) 1, 1-dichloropropane

Direction (Q. Nos. 40-44) *In the following questions, Assertion* (A) *followed by a Reason* (R) *is given. Choose the correct answer out of the following choices.*

(a) Both A and R are correct and R is the correct explanation of A
(b) Both A and R are correct but R is not the correct explanation of A
(c) A is correct but R is incorrect
(d) Both A and R are incorrect

40 **Assertion** (A) Phenol forms 2,4,6-tribromophenol on treatment with Br_2 in carbon disulphide at 273 K.

Reason (R) Bromine polarises in carbon disulphide.
➞ [NCERT Exemplar]

41 **Assertion** (A) Pent-1-ene and pent-2-ene are position isomers.

Reason (R) Position isomers differ in the position of functional group or a substituent. ➞ [NCERT Exemplar]

42 **Assertion** (A) The presence of nitro group facilitates nucleophilic substitution reactions in aryl halides.

Reason (R) The intermediate carbanion is stabilised due to presence of nitro group.

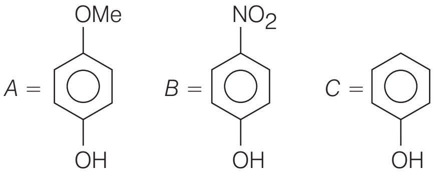
43 **Assertion** (A) *trans*-2-butene on reaction with Br_2 gives *meso*-2,3-dibromobutane.

Reason (R) The reaction involves *syn*-addition of bromine.

44 **Assertion** (A) Anilinium chloride is more acidic than ammonium chloride.

Reason (R) Anilinium ion is resonance stabilised.

45 Given,



The decreasing order of the acidic character is

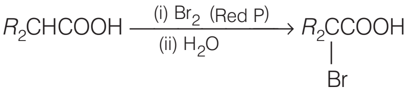
(a) $A > B > C$	(b) $B > A > C$
(c) $B > C > A$	(d) $C > B > A$

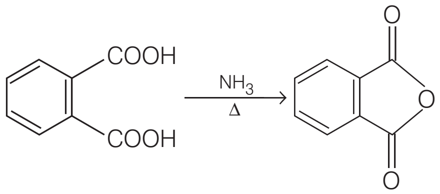
46 2,3-dimethylpentane on treatment with $Cl_2/h\nu$ produces how many monochloro isomers (only constitutional isomers)?

(a) 4	(b) 5
(c) 6	(d) 8

47 Which one of the following is an example of Hell-Volhard-Zelinsky reaction?

(a) $RCOOH \xrightarrow[\text{(ii) } H_3O^+]{\text{(i) } B_2H_6} RCH_2OH$

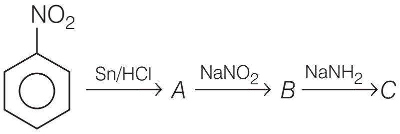
(b) 
$R_2CHCOOH \xrightarrow[\text{(ii) } H_2O]{\text{(i) } Br_2 \text{ (Red P)}} R_2\underset{Br}{C}COOH$

(c) 

(d) $RCOOH \xrightarrow{PCl_5} RCOCl$

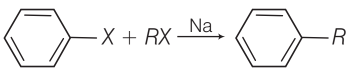
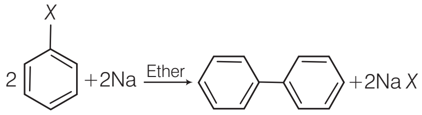
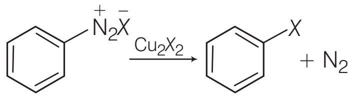
48 Zeisel's method is used to estimate
(a) alcoholic group
(b) amino group
(c) methoxy group
(d) halo group

49 Identify *C*, in the following reaction.



(a) Benzamide
(b) Benzoic acid
(c) Chlorobenzene
(d) Aniline

50 Match the reactions given in Column I with the names given in Column II.

	Column I	Column II
A.		1. Fittig reaction
B.		2. Wurtz Fittig reaction
C.		3. Finkelstein reaction
D.	$C_2H_5Cl + NaI \xrightarrow{\text{Dry acetone}} C_2H_5I + NaCl$	4. Sandmeyer reaction

Codes

	A	B	C	D
(a)	1	2	4	3
(b)	2	1	4	3
(c)	1	2	3	4
(d)	2	3	1	4

ANSWERS

1 (b)	**2** (a)	**3** (a)	**4** (d)	**5** (c)	**6** (d)	**7** (c)	**8** (b)	**9** (a)	**10** (c)
11 (c)	**12** (b)	**13** (b)	**14** (c)	**15** (c)	**16** (d)	**17** (c)	**18** (c)	**19** (c)	**20** (c)
21 (d)	**22** (c)	**23** (c)	**24** (b)	**25** (b)	**26** (a)	**27** (d)	**28** (c)	**29** (c)	**30** (c)
31 (d)	**32** (a)	**33** (c)	**34** (c)	**35** (b)	**36** (d)	**37** (b)	**38** (a)	**39** (d)	**40** (d)
41 (a)	**42** (a)	**43** (c)	**44** (c)	**45** (c)	**46** (c)	**47** (b)	**48** (c)	**49** (d)	**50** (b)

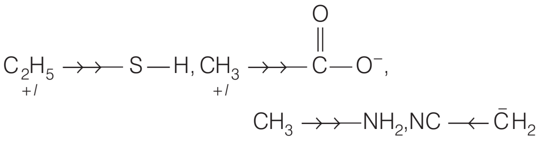
Hints and Explanations

1.

Species	Valence electrons	Magnetic behaviour
Carbonium ion	6	Diamagnetic
Free radical	7	Paramagnetic
Carbene	6	Diamagnetic
Nitrene	6	Diamagnetic

2. O_3 is responsible for greenhouse effect. Its contribution is about 8%.

3. Greater the +*I*-effect, greater the nucleophilic power. The +*I*-effect of ethyl is greater than +*I*-effect of methyl group.

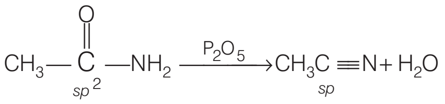


$$\underset{+I}{C_2H_5} \twoheadrightarrow S-H,\ \underset{+I}{CH_3} \twoheadrightarrow \overset{\overset{O}{\|}}{C}-O^-,$$
$$CH_3 \twoheadrightarrow NH_2, NC \twoheadleftarrow \bar{C}H_2$$

4. $CH_4 + Cl_2 \xrightarrow{h\nu} CH_3Cl$ (Free radical substitution)

The steps involved in the process are as follows:

$$Cl-Cl \xrightarrow{h\nu} Cl^\bullet + Cl^\bullet$$
$$CH_4 + Cl^\bullet \longrightarrow \dot{C}H_3 + HCl$$
$$\dot{C}H_3 + Cl-Cl \longrightarrow CH_3Cl + Cl^\bullet$$
$$Cl^\bullet + Cl^\bullet \longrightarrow Cl_2$$

5. 

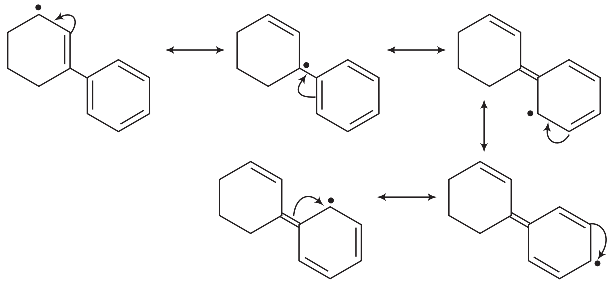
$$CH_3-\underset{sp^2}{\overset{\overset{O}{\|}}{C}}-NH_2 \xrightarrow{P_2O_5} CH_3\underset{sp}{C}\equiv N + H_2O$$

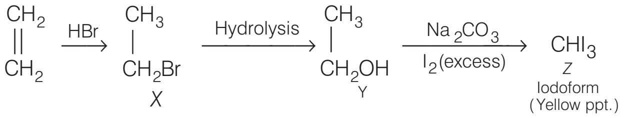
6. When acetaldehyde is treated with aqueous sodium hydroxide solution, it undergoes aldol condensation because of the presence of α-H-atom.

$2CH_3CHO \xrightarrow{dil.NaOH(aq)} CH_3CH(OH)CH_2CHO$
Aldol shows optical isomerism

$\xrightarrow{\Delta} CH_3CH{=}CHCHO$
(Shows geometrical isomerism)

7. Due to resonance stabilisation option (c) forms more stable free radical.

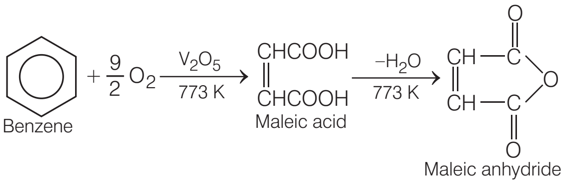


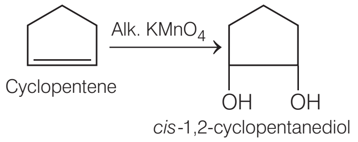
8. 

$$\underset{CH_2}{\overset{CH_2}{||}} \xrightarrow{HBr} \underset{\underset{X}{CH_2Br}}{\overset{CH_3}{|}} \xrightarrow{Hydrolysis} \underset{\underset{Y}{CH_2OH}}{\overset{CH_3}{|}} \xrightarrow[I_2(excess)]{Na_2CO_3} \underset{Z}{CHI_3}$$

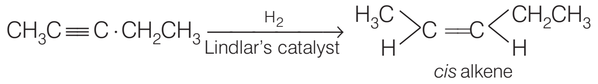
Iodoform
(Yellow ppt.)

9. Compound (a) is an enantiomer of compound (*A*) because in them, the configuration of two groups, i.e. CH_3 and C_2H_5 are reversed at the chiral carbon.

10. 

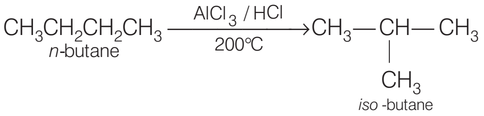
11. 

12. $CH_3C{\equiv}CH \xrightarrow[-NH_3]{NaNH_2} CH_3-C{\equiv}CNa \xrightarrow[-NaBr]{CH_3CH_2Br}$



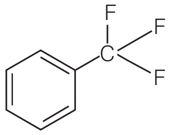
$CH_3C{\equiv}C\cdot CH_2CH_3 \xrightarrow[\text{Lindlar's catalyst}]{H_2}$

13. When alkane is passed over $AlCl_3$ in presence of HCl, isomerisation takes place.

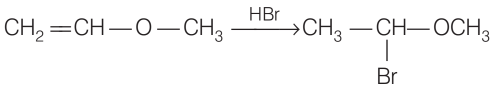


$$\underset{n\text{-butane}}{CH_3CH_2CH_2CH_3} \xrightarrow[200°C]{AlCl_3/HCl} CH_3-\underset{\underset{\underset{iso\text{-butane}}{CH_3}}{|}}{CH}-CH_3$$

14. Methyl ketones are oxidised by sodium hypohalite to sodium salts of corresponding carboxylic acids having one carbon atom less than that of carbonyl compound.

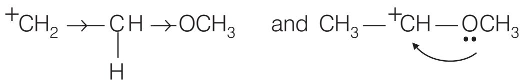
15. 

—CF_3 group withdraws electrons from the ring, shows –M effect, makes ring electron deficient, thus deactivates ring for electrophilic substitution.

16. 

$$CH_2{=}CH-O-CH_3 \xrightarrow{HBr} CH_3-\underset{\underset{Br}{|}}{CH}-OCH_3$$

First protonation occurs, two possible intermediates are

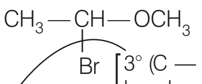


$$\overset{+}{C}H_2 \rightarrow \underset{\underset{H}{|}}{CH} \rightarrow OCH_3 \quad \text{and} \quad CH_3-\overset{+}{C}H-\ddot{O}CH_3$$

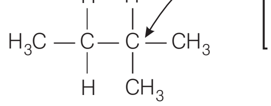
(I)
(–*I*-effect of OCH_3 destabilises carbocation)

(II)
(+*M*- effect stabilises carbocation)

II is more favourable, hence Br^- attacks and product is

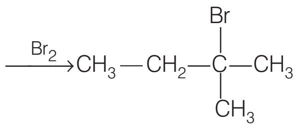


$$CH_3-\underset{\underset{Br}{|}}{CH}-OCH_3$$

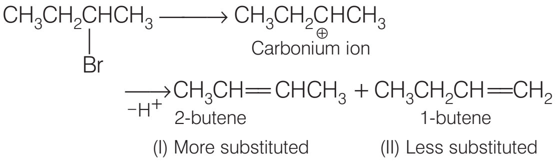
17. 

$$H_3C-\underset{\underset{H}{|}}{\overset{\overset{H}{|}}{C}}-\underset{\underset{CH_3}{|}}{\overset{\overset{H}{|}}{C}}-CH_3$$

[3° (C — H) bond has minimum bond energy, hence easily gives 2-bromo-2-methylbutane.]



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

18. 

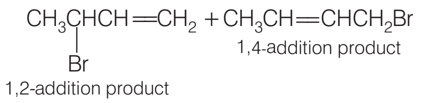
$$CH_3CH_2\underset{\underset{Br}{|}}{CH}CH_3 \longrightarrow \underset{\text{Carbonium ion}}{CH_3CH_2\overset{\oplus}{C}HCH_3}$$

$$\xrightarrow[-H^+]{} \underset{\text{2-butene}}{CH_3CH{=}CHCH_3} + \underset{\text{1-butene}}{CH_3CH_2CH{=}CH_2}$$

(I) More substituted (II) Less substituted

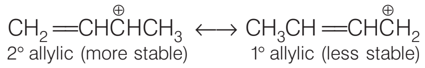
Stability of I > II, hence I is predominant.

19. $CH_2{=}CHCH{=}CH_2 + HBr \longrightarrow$



$$\underset{\text{1,2-addition product}}{CH_3\underset{\underset{Br}{|}}{C}HCH{=}CH_2} + \underset{\text{1,4-addition product}}{CH_3CH{=}CHCH_2Br}$$

Addition is through the formation of allylic carbocation.

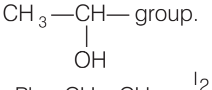


$$\underset{2°\text{ allylic (more stable)}}{CH_2{=}CH\overset{\oplus}{C}HCH_3} \longleftrightarrow \underset{1°\text{ allylic (less stable)}}{CH_3CH{=}CH\overset{\oplus}{C}H_2}$$

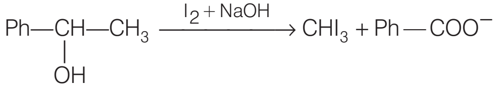
Under mild conditions (–80°C), kinetic product is the 1,2-addition product and under vigorous conditions (40°C), thermodynamic product is 1,4-addition product. Hence, 1-bromo-2-butene is the major product under given conditions.

20. Any aliphatic carbon with hydrogen attached to it on combination with benzene ring will be oxidised to benzoic acid by $KMnO_4/H^+$.

21. For positive iodoform test, alcohol molecule must have

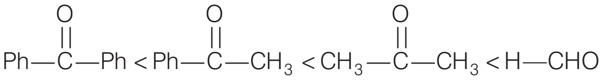


$$CH_3-\underset{\underset{OH}{|}}{CH}- \text{ group.}$$



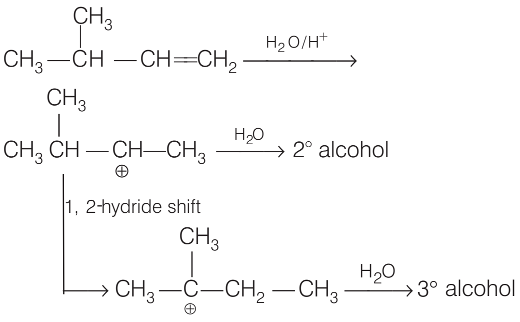
$$Ph-\underset{\underset{OH}{|}}{CH}-CH_3 \xrightarrow{I_2+NaOH} CHI_3 + Ph-COO^-$$

22. Addition of HCN is nucleophilic reaction. Greater the electron deficiency of carbonyl group, higher the rate of reaction.



$$Ph-\overset{\overset{O}{||}}{C}-Ph < Ph-\overset{\overset{O}{||}}{C}-CH_3 < CH_3-\overset{\overset{O}{||}}{C}-CH_3 < H-CHO$$

23. $CH_2{=}CH_2 \xrightarrow{H_2O/H^+} CH_3CH_2OH$



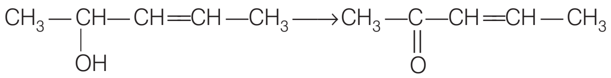
$$CH_3-\underset{\displaystyle CH_3}{CH}-CH{=}CH_2 \xrightarrow{H_2O/H^+}$$

$$CH_3\underset{\displaystyle CH_3}{CH}-\overset{\oplus}{CH}-CH_3 \xrightarrow{H_2O} 2^\circ \text{ alcohol}$$

1, 2-hydride shift

$$CH_3-\overset{\displaystyle CH_3}{\underset{\oplus}{C}}-CH_2-CH_3 \xrightarrow{H_2O} 3^\circ \text{ alcohol}$$

24.

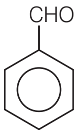


$$CH_3-\underset{\displaystyle OH}{CH}-CH{=}CH-CH_3 \longrightarrow CH_3-\underset{\displaystyle O}{\overset{\|}{C}}-CH{=}CH-CH_3$$

Suitable reagent is chromic acid in aqueous acetone solution while others will also affect (C=C) bond.

25. $A + NaOH \longrightarrow$ alcohol + acid (Cannizaro reaction)

A must be aldehyde without H at α-carbon.



$2\,C_6H_5CHO + NaOH \longrightarrow C_6H_5CH_2OH + C_6H_5COONa$

Benzaldehyde

26. $C_2H_5NC + H_2O \xrightarrow{H^+} HCOOH + C_2H_5NH_2$

$C_2H_5NH_2 + H^+ \longrightarrow \underset{\text{Salt}}{C_2H_5NH_3^+}$

27. $CHCl_3 + KOH \longrightarrow :CCl_2 + KCl + H_2O$

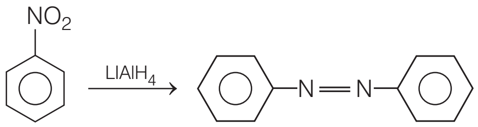
$CH_3CH_2NH_2 + :CCl_2 \longrightarrow \underset{\text{Carbylamine}}{CH_3CH_2NC} + 2HCl$

or $CH_3CH_2NH_2 + CHCl_3 + 3KOH \xrightarrow{\Delta} CH_3CH_2NC + 3\,KCl + 3H_2O$

28. In the given resonating structures, structure II is not an acceptable canonical structure because the nitrogen has ten valence electrons.

29. In structure (c), N-atom forms five bonds and contains positive charge, so the structure is not possible.

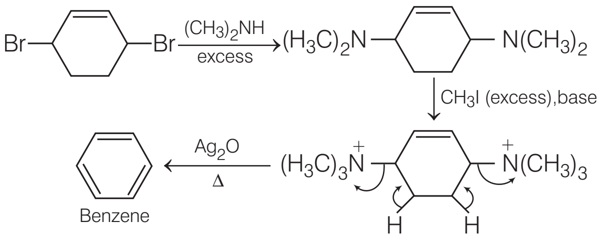
30. Nitrobenzene on reduction with $LiAlH_4$ gives azobenzene.



Nitrobenzene Azobenzene

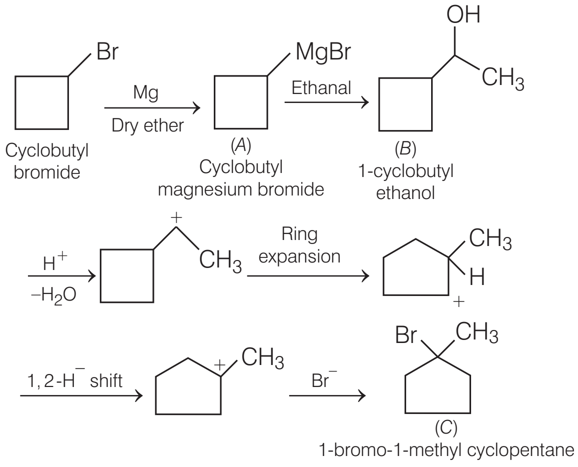
Aromatic nitro compounds on reduction with $LiAlH_4$ gives azo compounds and not primary amines. Aliphatic nitro compounds are reduced to primary amines with $LiAlH_4$.

31.



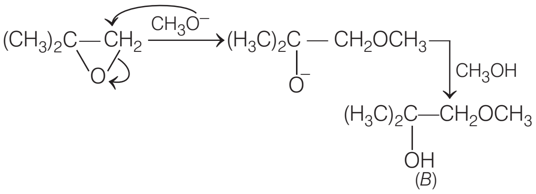
Benzene

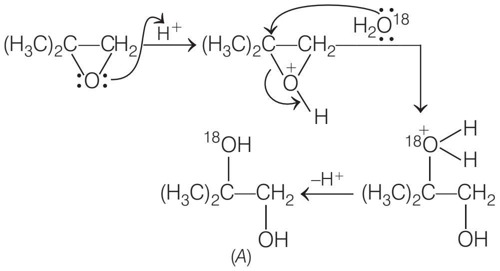
32.



(C) 1-bromo-1-methyl cyclopentane

33.

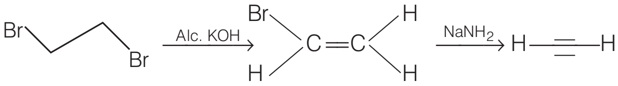




34. $\underset{\text{Grignard reagent}}{(CH_3)_3C{-}MgCl} + D_2O \longrightarrow (CH_3)_3C{\cdot}D + MgCl(OD)$

[Grignard reagent when reacts with a protic solvent, gives alkane.]

35.



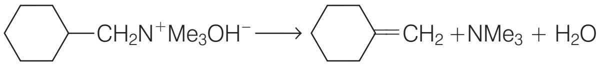
Vinylic bromide is more stable and stronger base ($-NH_2^-$) is required for elimination.

36.

$$\begin{tikzcd}
CH_2{=}CH_2 \arrow[r, "conc.\,H_2SO_4"] & \underset{A}{CH_3CH_2HSO_4} \arrow[d, "H_2O", "\Delta"'] \\
\underset{(C)}{CH_3CH_2Br} \arrow[u, "\underset{(D)}{\text{Alcoholic KOH}}"] & \underset{(B)}{CH_3CH_2OH} \arrow[l, "PBr_3"']
\end{tikzcd}$$

37. Only terminal alkynes give precipitate with ammoniacal silver nitrate solution. Among the given, $CH_3-C\equiv C-CH_3$ is not a terminal alkyne. Thus, it does not give precipitate with ammoniacal $AgNO_3$.

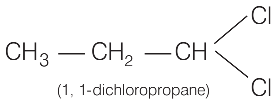
38. The formation of the alkene in an elimination reaction is called Hofmann elimination (thermal decomposition). Elimination of hydrogen occurs from the β-carbon. So,



39. X is a three carbon compound with two halogen atom, so its molecular formula is $C_3H_6Cl_2$. Only terminal alkynes give red ppt. with ammoniacal Cu_2Cl_2, so the hydrocarbon produced by the reaction of X with alcoholic KOH, must be a terminal alkyne i.e. $CH_3C\equiv CH$.

$$C_3H_6Cl_2 \xrightarrow{\text{Alc}\cdot\text{KOH}} CH_3C\equiv CH \xrightarrow{\text{Ammoniacal } Cu_2Cl_2} \underset{\text{Red ppt.}}{CH_3C\equiv CCu\downarrow}$$

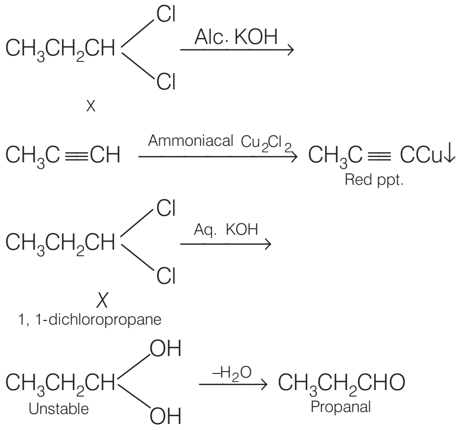
Compound (X) gives an aldehyde when reacts with aqueous KOH. This suggests that both the halogens are present on same terminal carbon atom. Thus, the formula of compound X is



$$CH_3-CH_2-CH\begin{smallmatrix}Cl\\Cl\end{smallmatrix}$$

(1, 1-dichloropropane)

and the reactions are as follows :



$$\underset{X}{CH_3CH_2CH\begin{smallmatrix}Cl\\Cl\end{smallmatrix}} \xrightarrow{\text{Alc. KOH}}$$

$$CH_3C\equiv CH \xrightarrow{\text{Ammoniacal } Cu_2Cl_2} \underset{\text{Red ppt.}}{CH_3C\equiv CCu\downarrow}$$

$$\underset{\substack{X\\\text{1, 1-dichloropropane}}}{CH_3CH_2CH\begin{smallmatrix}Cl\\Cl\end{smallmatrix}} \xrightarrow{\text{Aq. KOH}}$$

$$\underset{\text{Unstable}}{CH_3CH_2CH\begin{smallmatrix}OH\\OH\end{smallmatrix}} \xrightarrow{-H_2O} \underset{\text{Propanal}}{CH_3CH_2CHO}$$

40. Correct Assertion Phenol forms 2,4,6-tribromophenol on treatment with Br_2 in water.

Correct Reason In H_2O, phenoxide ion is formed which highly activates it towards electrophilic substitution reaction.

41. $$\overset{5}{C}H_3-\overset{4}{C}H_2-\overset{3}{C}H_2-H\overset{2}{C}=\overset{1}{C}H_2$$

Pent-1-ene

$$\overset{5}{C}H_3-\overset{4}{C}H_2-H\overset{3}{C}=\overset{1}{C}H-\overset{1}{C}H_3$$

Pent-2-ene

When two or more compounds differ in the position of substituent atom or functional group on the carbon skeleton then it shows position isomerism. Double bond is a functional group whose position varies.

42. Both Assertion and Reason are correct as presence of nitro group (electron withdrawing group) with respect to halogen activates the aryl halides towards nucleophilic substitution reaction because the carbanions formed in the reaction are stabilised by the NO_2 group.

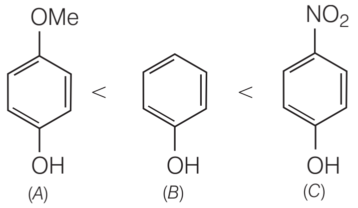
43. *trans*-2-butene reacts with Br_2 to produce *meso*-2,3- dibromobutane but it does not involve *syn* addition of Br_2.

44. Anilinium chloride is more acidic than NH_4Cl because it forms salt with water and liberate amine when treated with strong base.

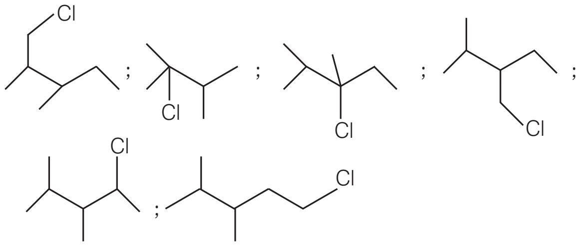
$$C_6H_5\overset{+}{N}H_3Cl^- + NaOH \longrightarrow C_6H_5NH_2 + H_2O + NaCl$$

Anilinium ion does not show resonance because charge dispersion at ring may involve pentavalent nitrogen structure.

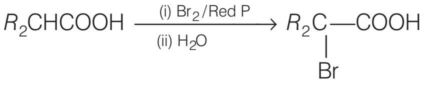
45. According to Lewis, electron acceptor compounds are called acids. Therefore, compounds having tendency to accept electrons will be more acidic. The correct order of acidic character is as follows :



46. Six isomers (only constitutional)



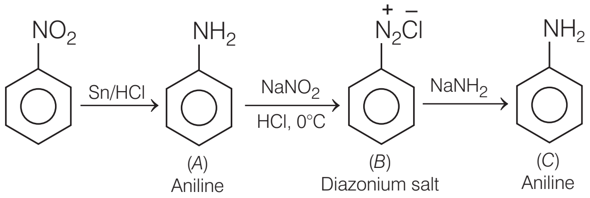
47. When aliphatic carboxylic acids react with bromine in the presence of red phosphorus, they give α-halogenated acids. This reaction is known as Hell-Volhard-Zelinsky reaction.



$$R_2CHCOOH \xrightarrow[\text{(ii) } H_2O]{\text{(i) } Br_2/\text{Red P}} R_2\underset{\substack{|\\Br}}{C}-COOH$$

48. Zeisel's method is used to estimate the methoxy group in an organic compound. In this method, organic compound having methoxy group is treated with HI and the alkyl halide thus formed as further treated with $AgNO_3$ to precipitate AgI.

49.



50. A → 2; B → 1; C → 4; D → 3