Reduction

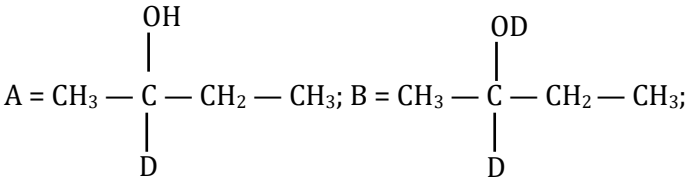
SOLUTIONS

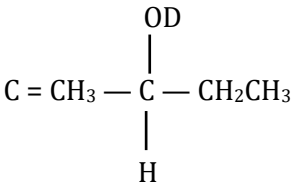
EXERCISE - O

1. Ans. (A)

$Ph_2C = O \xrightarrow[H_3O^{\oplus}]{LiAlD_4} Ph_2CD(OH)$

2. Ans. (B)





3. Ans. (A)

$$\text{Rate of Hydrogenation} \propto \frac{1}{\text{crowding across } \pi \text{ bond}}$$ (Hydrogenation follow syn addition)

4. Ans. (B)

Wilkinson's catalyst is Homogeneous.

5. Ans. (D)

Syn addition

6. Ans. (A)

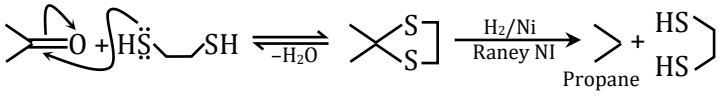
Due to less hinderation (a) undergoes catalytic hydrogenation much faster.

7. Ans. (A)

$R-C\equiv N \xrightarrow[(ii)\ H_3O^{\oplus}]{(i)\ SnCl_2/HCl} R-CHO$

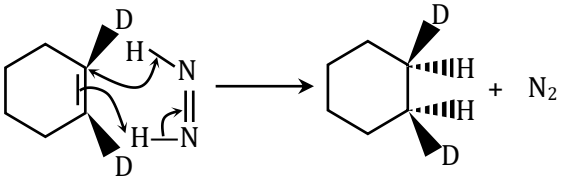
8. Ans. (D)

It is an example of mozing reduction.

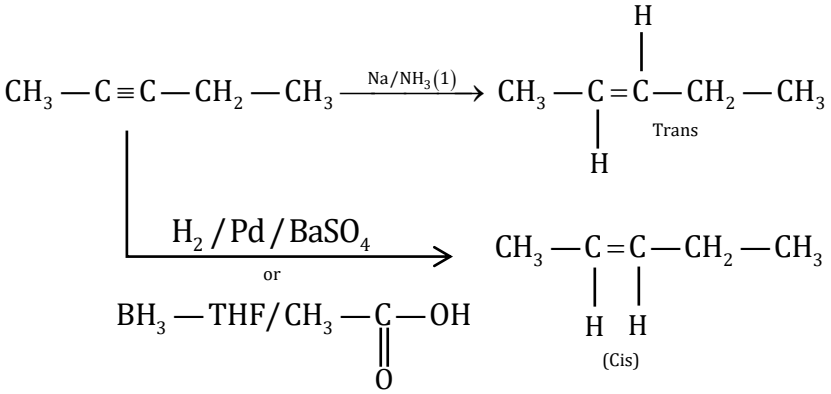


9. Ans. (C)

$N_2H_4 + H_2O_2 \longrightarrow N_2H_2$[Transfer Hydrogenation]



10. Ans. (D)



11. Ans. (A,B,C,D)

$LiAlH_4$ is strong reducing agent than $NaBH_4$.

12. Ans. (A,B,C)

LAH reduces alkynes to alkenes.

Acids and alkenes are not reduced by $NABH_4$.

Lactams are not reduced to diols by Na + ROH.

13. Ans. (A,B,C)

X can be $NaBH_4$/EtOH or $LiAlH_4$/THF or

$Al(OiPr)_3/CH_3 — \underset{\underset{OH}{|}}{CH} — CH_3$

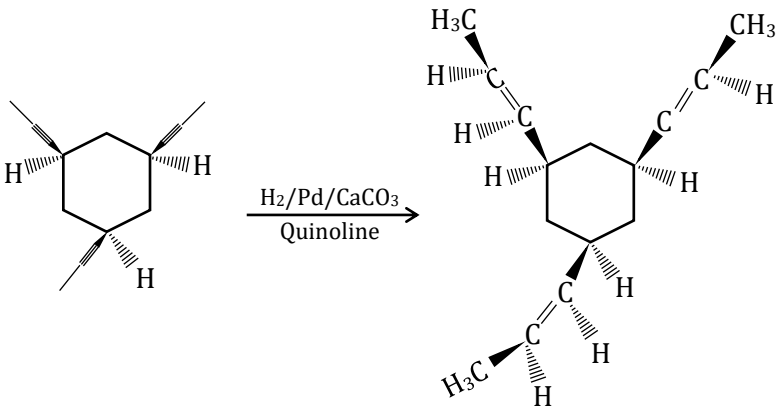
14. Ans. (A,B,C)

–COCl covers into –CHO by H_2/Pd-$BaSO_4$ (Rosenmund reduction)

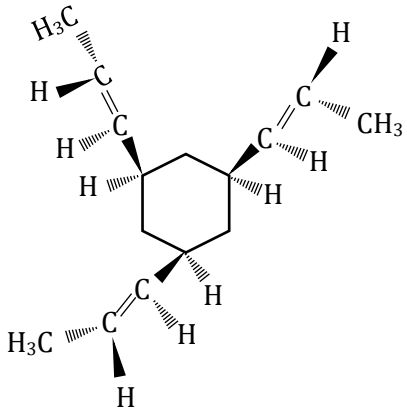
15. Ans. (A,B,D)

$NaBH_4$ can't able to reduce CN.

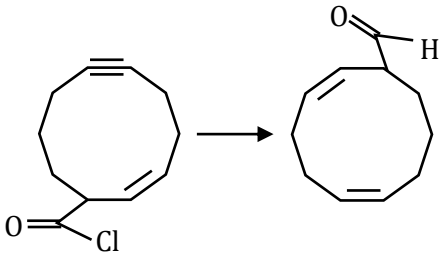
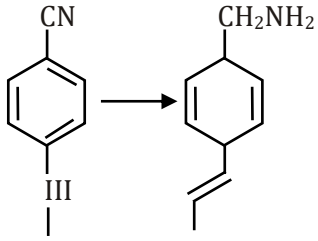
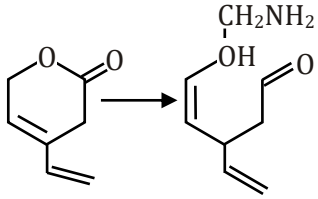
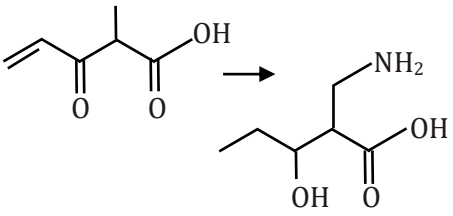
16. Ans. (A)



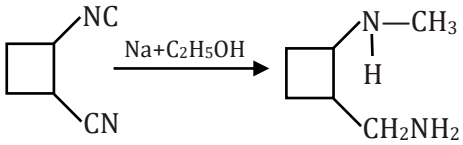
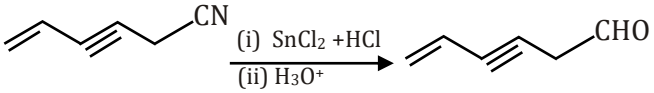
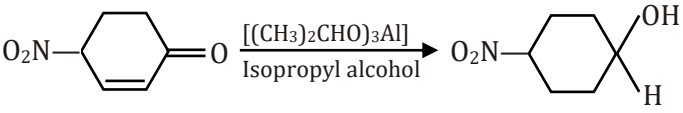
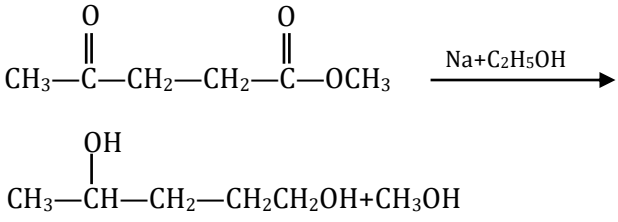
17. Ans. (C)



18. Ans. (A→ S), (B→ R), (C→ P), (D→ Q)

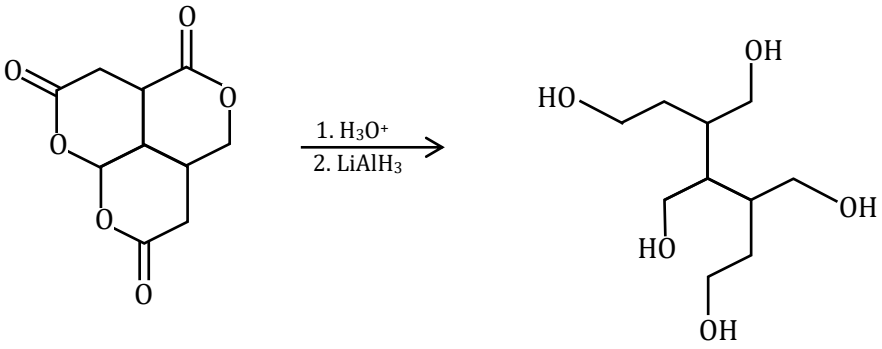
Column I		Column II	
a.		s.	H_2/Pd/ $BaSO_4$/quinoline
b.		r.	Na/$NH_3(l)$/ C_2H_5OH
c.		p.	DIBAL – H
d.		q.	H_2/Ni, (25°/C)

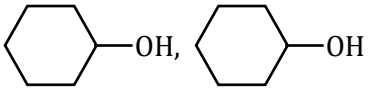
19. **Ans. (A→ R), (B→ P), (C→ S), (D→ Q)**

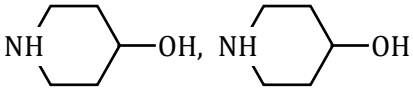
Column I		Column II	
a.		r.	Mendius reduction
b.		p.	Stephen's reduction
c.		s.	Meerwein-Ponndorf–Verley reduction
d.		q.	Bouveault Blanc reduction

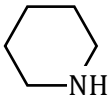
EXERCISE - S

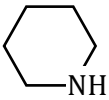
1. **Ans. (5)**

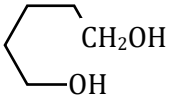


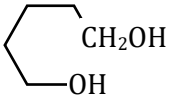
2. **Ans.** (i) 

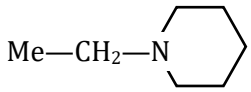
(ii) 

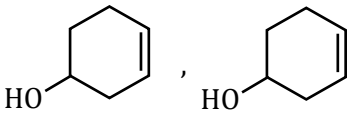
(iii) No reaction, 

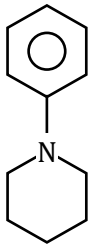
(iv) 

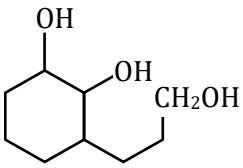
(v) No reaction, 

(vi) No reaction, 

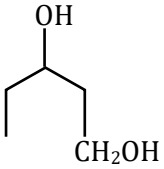
(vii) No reaction, 

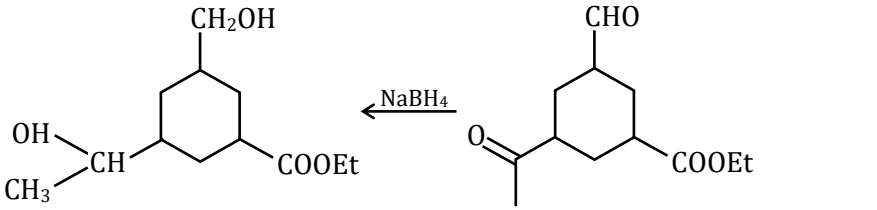
(viii) 

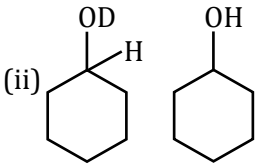
3. **Ans.** (i) 

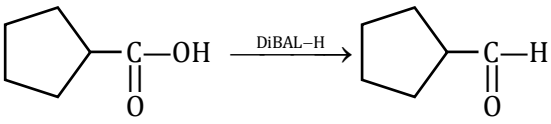
(ii) 

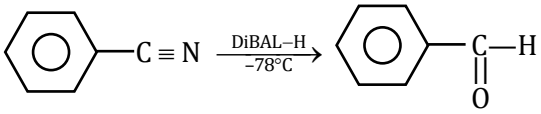
(iii) $CH_3—\underset{\underset{OH}{|}}{CH}—CH_3$, $CH_3—CH_2—CH_2OH$

(iv) 

4. **Ans.** (i) 

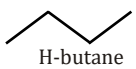
(ii) 

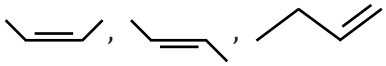
5. **Ans. (a)** 

(b) 

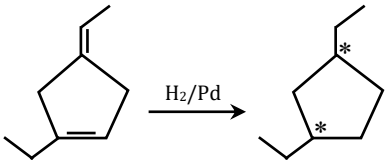
(c) CH_3 – CHO

6. **Ans. (3)**

(x) $\xrightarrow{H_2/Pt}$  H-butane

(x) may be → 

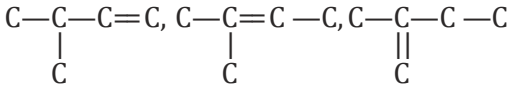
7. **Ans. (3)**



Total no. of stereo = $2^{n-1} + 2^{n/2}$

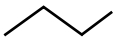
isomer = n = 2

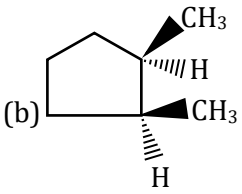
Ans. 3

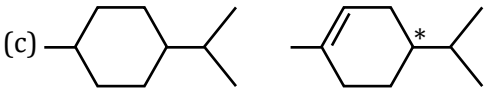
8. **Ans.** (i) 

(ii) Zero (Neo-pentane can not be prepared by catalytic hydrogenation of alkene) ;

(iii) One

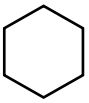
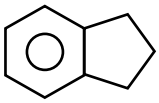
9. **Ans.** (a) 

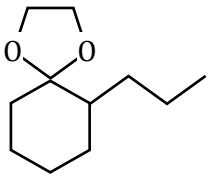
(b) 

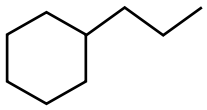
(c) 

2G.I.

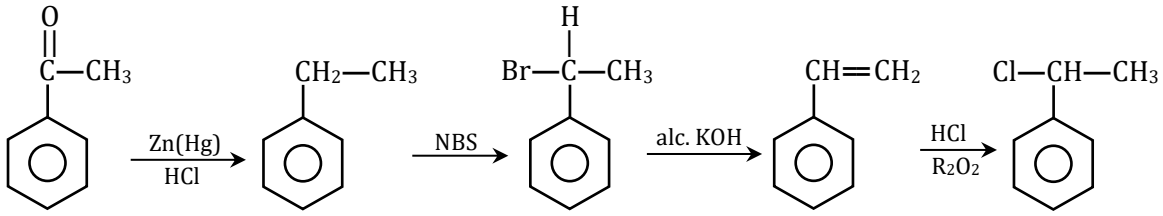
10. **Ans.** $P_2 = CH_3–CH_2–CH_2–CH_2–NH_2$

11. **Ans.** (a)  (b) $Ph–CH_2–CH_3$ (c)  (d) 

(e) 

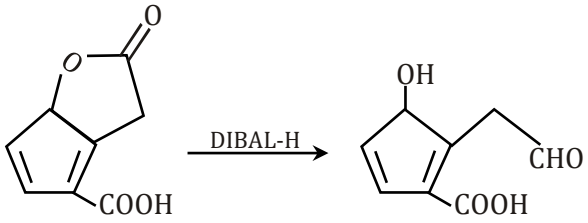
, 

12. **Ans.**



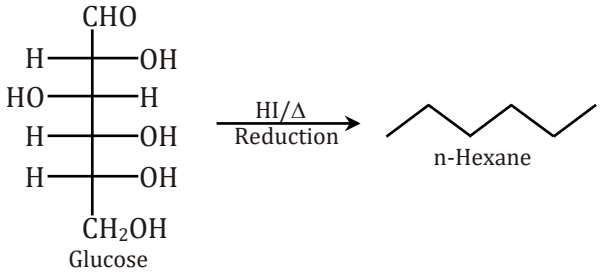
EXERCISE - JEE (Main) PYQ

1. Ans. (1)

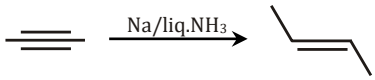


DIBAL-H is selective reducing agent it cannot reduce –COOH group, but reduces ester.

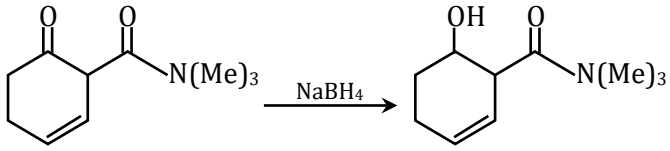
2. Ans. (4)



3. Ans. (2)



4. Ans. (2)

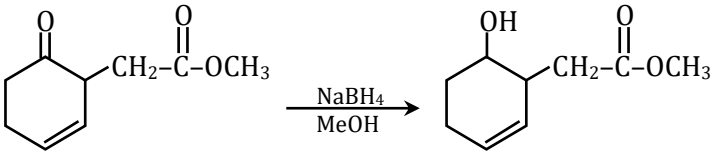


$NaBH_4$ is weak reducing agent cannot reduce  .

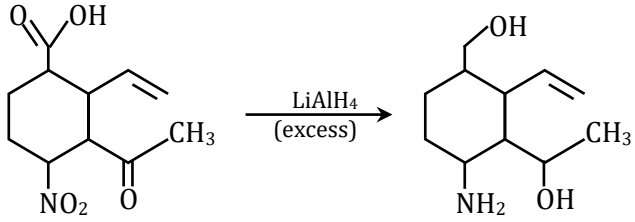
5. Ans. (1)

Wilkinson catalyst $\rightarrow [(Ph_3P)_3RhCl]$

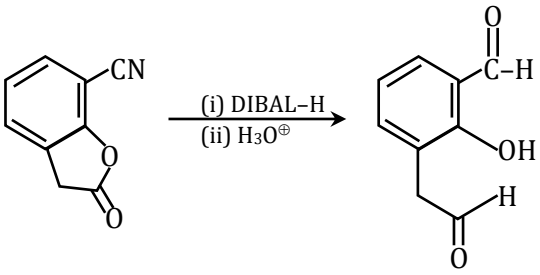
6. Ans. (4)



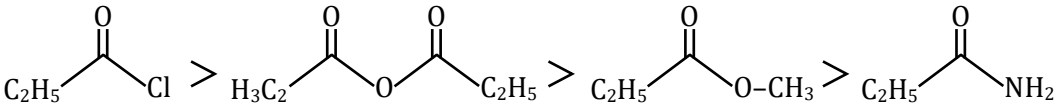
7. Ans. (2)



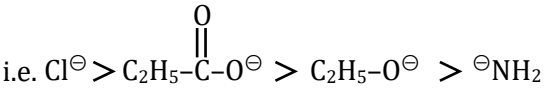
8. Ans. (3)



9. Ans. (1)

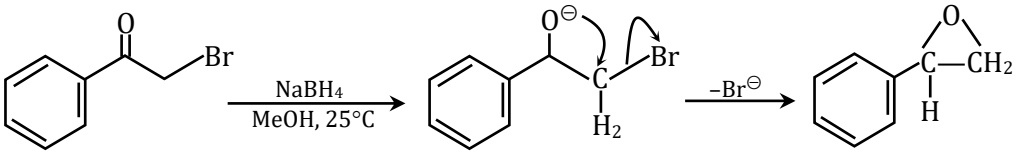


The reactiving depend on leaving order

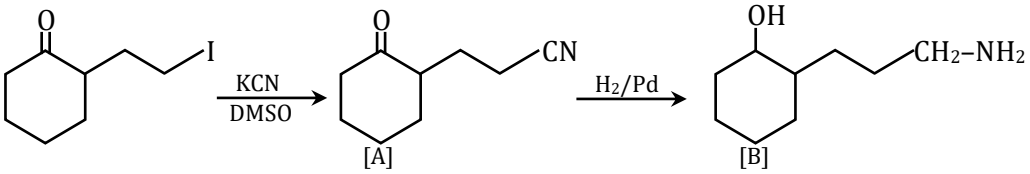


Leaving power $\propto \frac{1}{\text{Basicity}}$

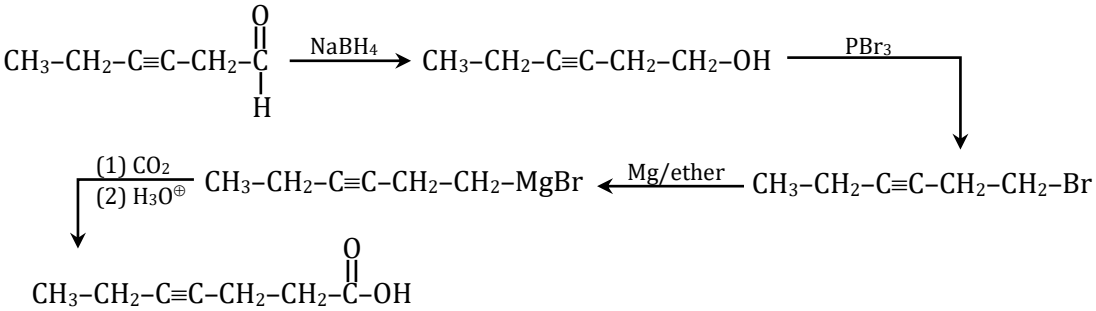
10. Ans. (4)



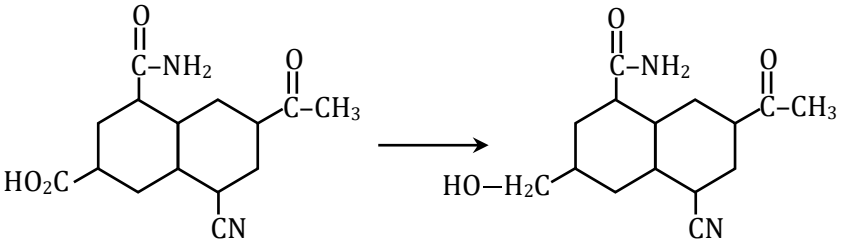
11. Ans. (2)



12. Ans. (3)



13. Ans. (4)

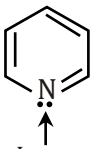


Most suitable reagent for given conversion is B_2H_6 (electrophilic reducing agent)

14. Ans. (3)

Sodium hydride can be used as Reducing agent.

So, statement I is false.



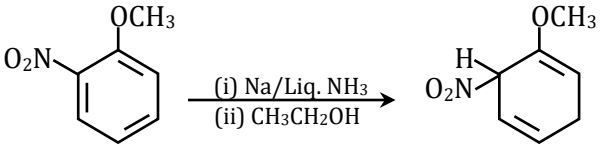
Lone pair of electrons makes it basic

So, statement II is true.

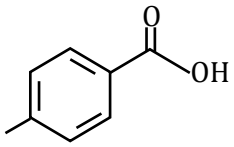
15. Ans. (2)

$NH_2–NH_2/C_2H_5O^{\ominus}Na^{\oplus}$ is suitable because. it will reduce only $-\overset{\overset{O}{\|}}{C}-$ without affecting other functional groups.

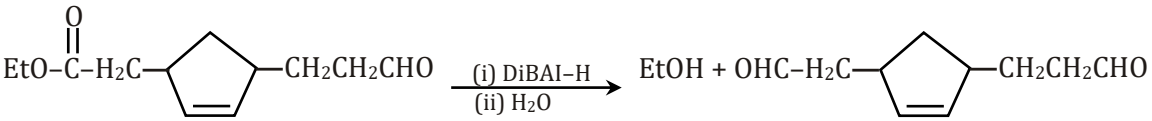
16. Ans. (1)



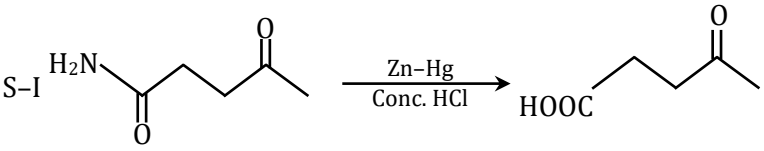
17. Ans. (4)


is formed.

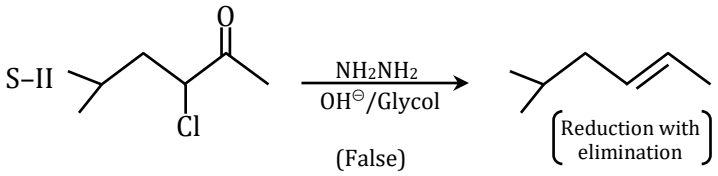
18. Ans. (1)



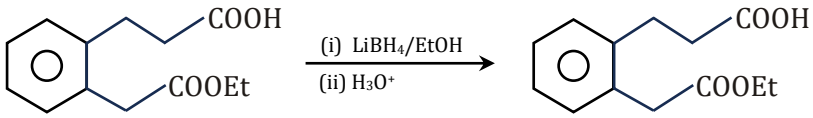
19. Ans. (3)



(True)



20. Ans. (3)

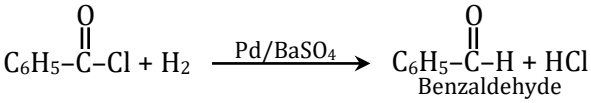


$LiBH_4$ can reduce ester selectively but not carboxylic acids.

Hence correct answer is option (3).

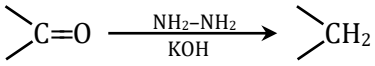
EXERCISE - JEE (Advanced) PYQ

1. Ans. (B)

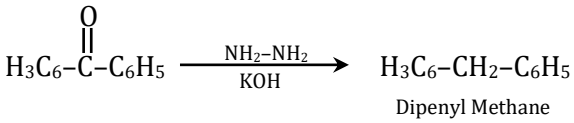


2. Ans. (D)

In Wolff kishner reduction



So,



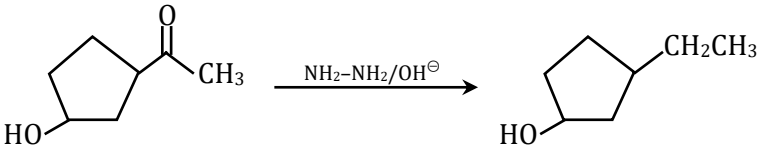
3. Ans. (A)

Stability of Alkane $\propto \frac{1}{\text{Heat of Hydrogenation}}$

Hence, Reactivity of alkene $\propto$ Heat of Hydrogenation of alkenes.

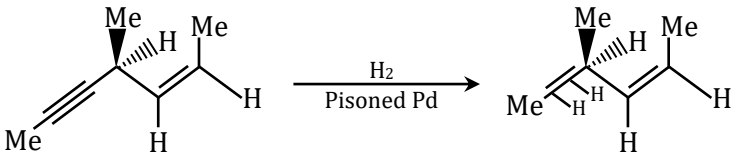
In there, Cis alkene are more reactive because of greater strain at the double bond.

4. Ans. (B)



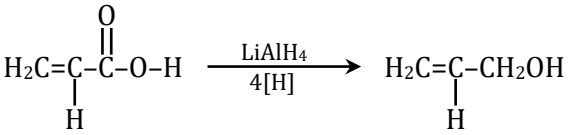
Because –OH is retain in produce.

5. Ans. (B)



By their reagent partially hydrogenation of –C≡C– and –C=C– is formed.] → It is an optically Inactive compound.

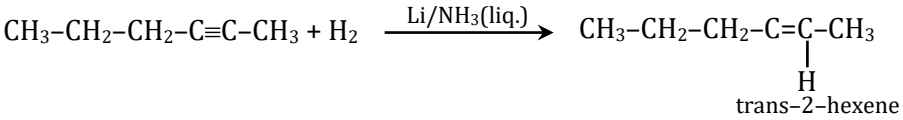
6. Ans. (D)



[$LiAlH_4$ reduce only polar compounds]

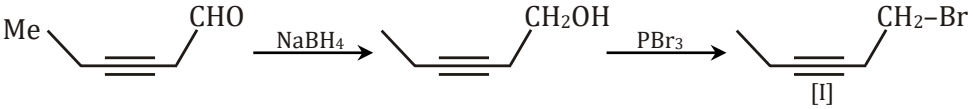
7. Ans. (B)

2-Hexyne gives trans-2-hexene on treatment with Li/NH_3(liq.)



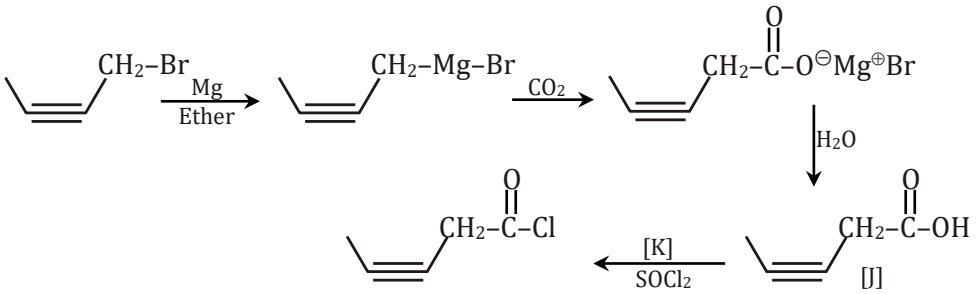
8. Ans. (D)

$NaBH_4$, reduces –CHO reflectively into $–CH_2–OH$, which is further conserted into corresponding bromide by PBr_3, without affecting the triple Bond.



9. Ans. (A)

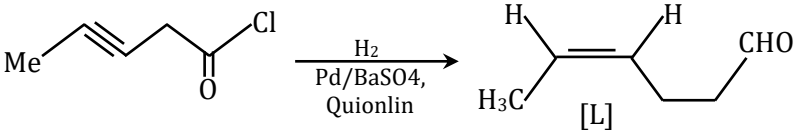
Bromide is converted into conigrand Reagent and further carbonation [(i) CO_2 (ii) H_2O] produces - carboxylic acid [J], which on further reaction with $\underset{\underset{[K]}{\downarrow}}{SoCl_2}$ convert into $\left(\begin{matrix}O\\ \|\\ -C-Cl\end{matrix}\right)$



10. Ans. (C)

H_2, $Pd/BaSO_4$, Quinoline is well known Reagent.

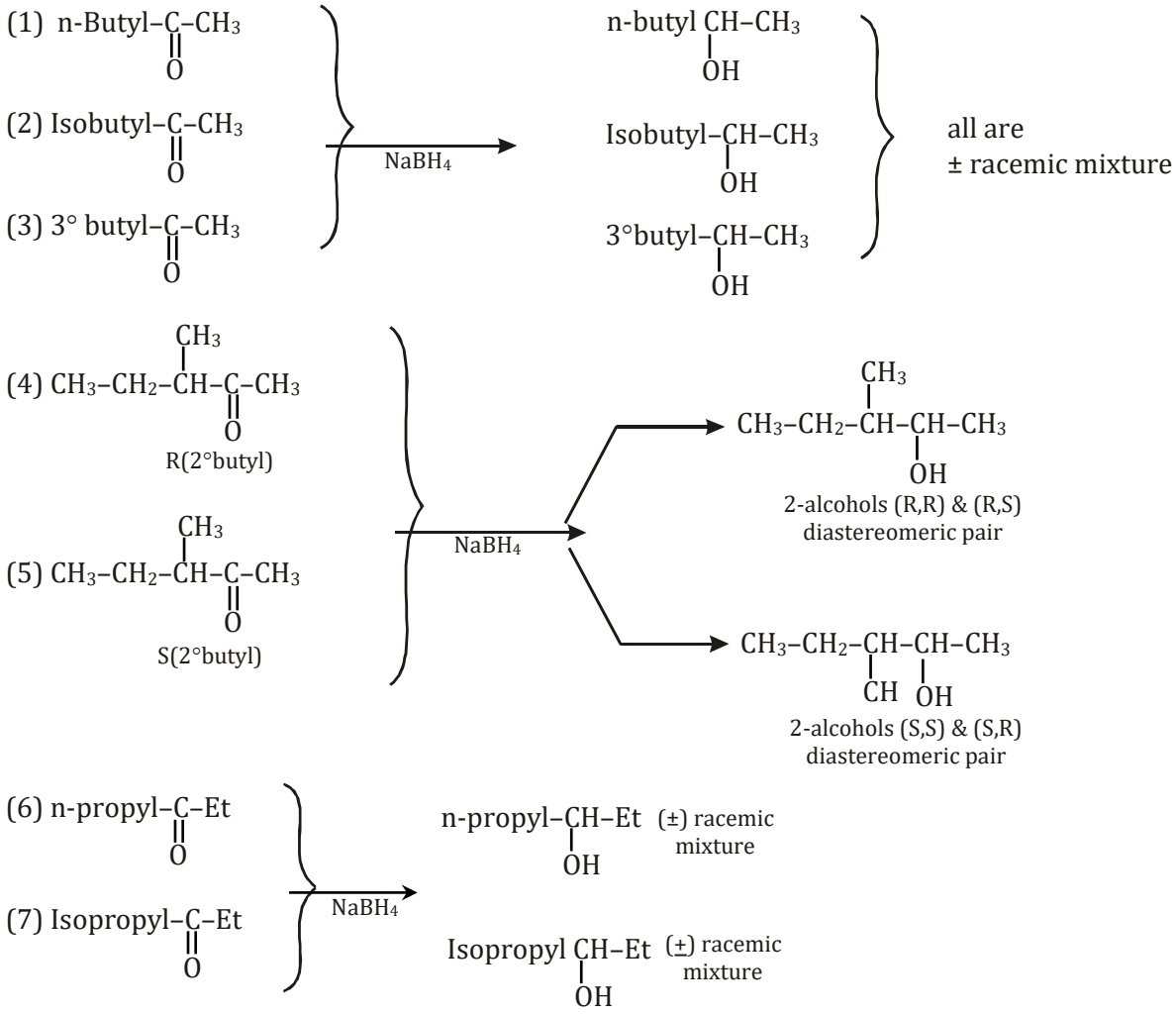
Rosermunds Reaction [Conversion of acyl halide to aldehyde] H_2, $Pd/BaSO_4$ is known as Lindlar is Reagent and Reduces triple bond to double bond (syn addition) giving cis produce.



11. Ans. (5)

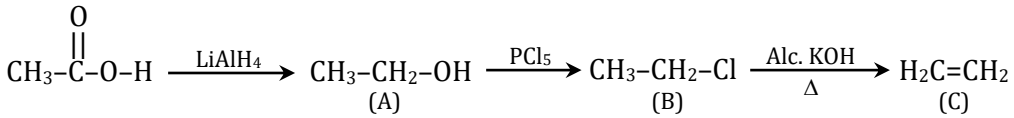
M. wt 100 of ketone

So, m. formula = $C_6H_{12}O$



(1 ; 2 ; 3 ; 6 ; 7)

12. Ans. (A)



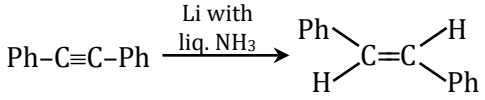
Reduction of CH_3COOH will produce $CH_3–CH_2–OH$(A)

Now reaction of $CH_3–CH_2–OH$(A) with PCl_5 will produce $CH_3–CH_2–Cl$(B).

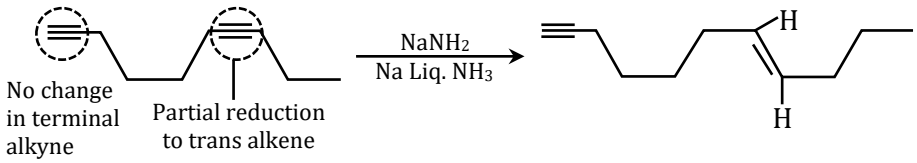
Now alcoholic KOH with Et–Cl will produce $CH_2=CH_2$(C) Ethylene by E_2 elimination.

Thus is (1) Ethylene.

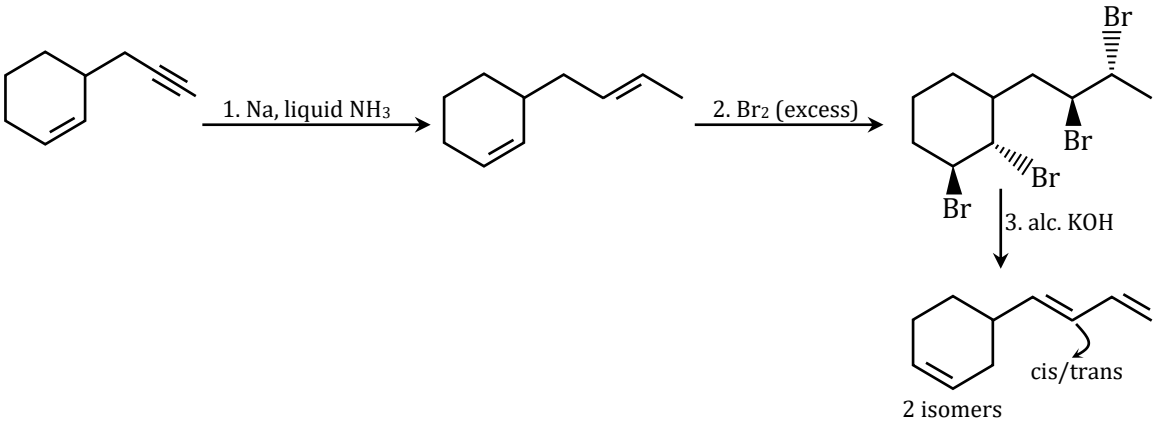
13. Ans. (D)



14. Ans. (B)



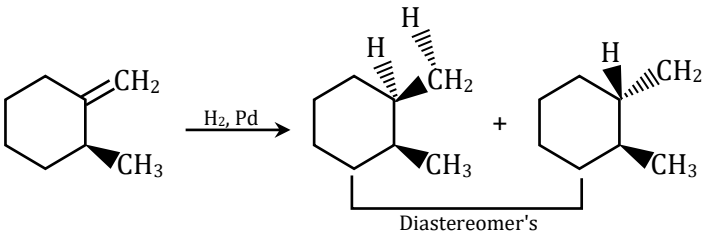
15. Ans. (2)



JEE (Main) Practice Paper

SECTION–A

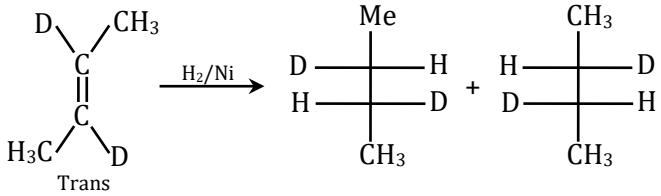
1. Ans. (2)



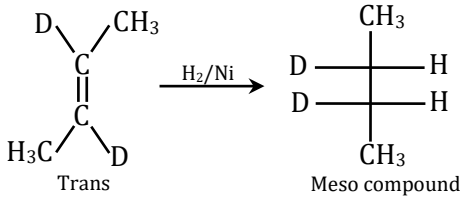
Catalytic hydrogenation is a surface phenomena :
That why both hydrogen is either attack from front side or from back side result information of two product.

2. Ans. (1)

Catalytic hydrogenation is "Syn addition"



3. Ans. (3)



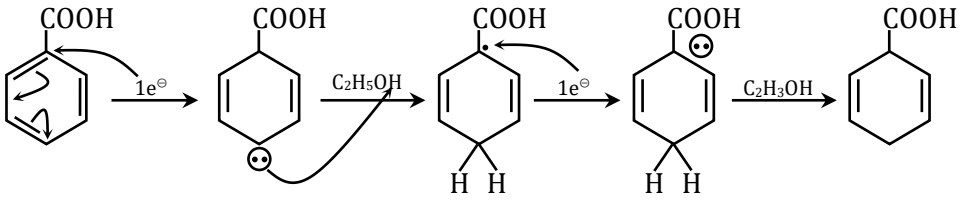
4. Ans. (2)

H_2; Pd–$CaCO_3$ → Lindlar catalyst
This reducing agent reduces only alkyne into alkene by "syn" addition of thydrogen : that's why the alkene obtained is mainly "as".
Alkyne $\xrightarrow[\text{Convert}]{}$ Cis-Alkene.
Without affecting other functional group.

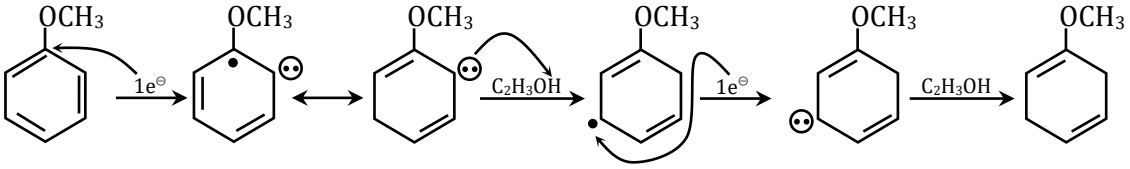
5. Ans. (2)

Birch Reduction :

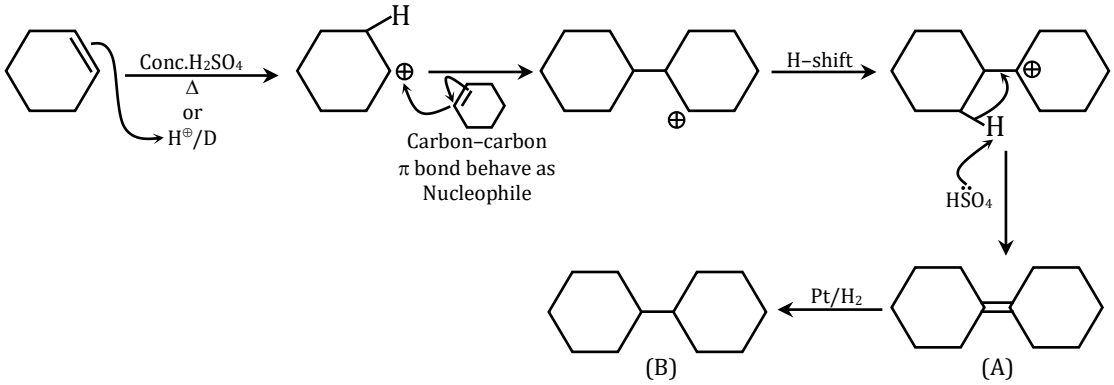
$2\,Li \longrightarrow 2Li^{\oplus} + 2C^{\ominus}$



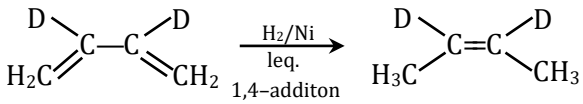
6. Ans. (3)



7. Ans. (2)

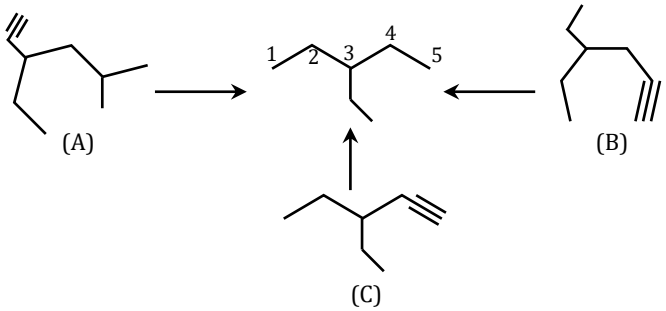


8. Ans. (3)



9. Ans. (4)

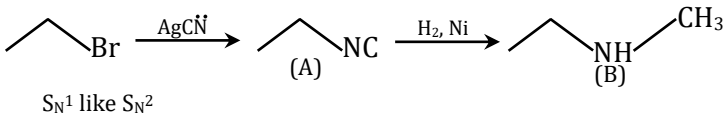
All structure on reduction (catalytic hydrogenation) gives 3-ethyl hexane.



10. Ans. (4)

$NaBH_4$–Reduces only $-\overset{O}{\overset{\|}{C}}-Cl$/–CHO/ketone and $\diagup C{=}NH \diagdown$

11. Ans. (2)



S_N1 like S_N2

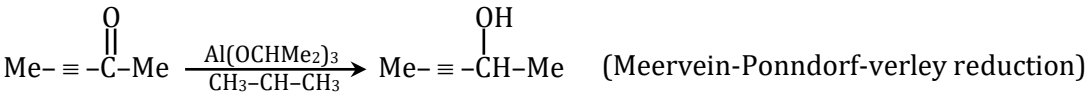
12. Ans. (4)

Syn addition of H_2 on double bond and racemic mixture obtained

13. Ans. (2)

$$Ph–COOH \xrightarrow[\text{Reduction}]{LiAlH_4} Ph–CH_2OH$$

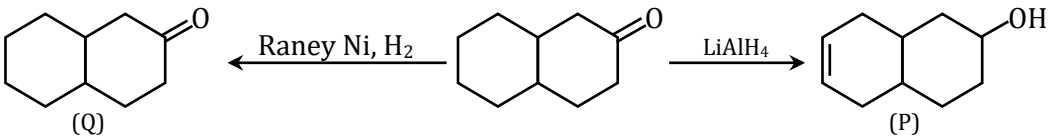
14. Ans. (1)



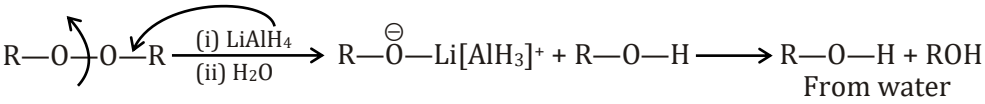
15. Ans. (1)

$$C_2H_5OC_2H_5 + 4H \xrightarrow{\text{Red P+HI}} 2C_2H_6 + H_2O$$

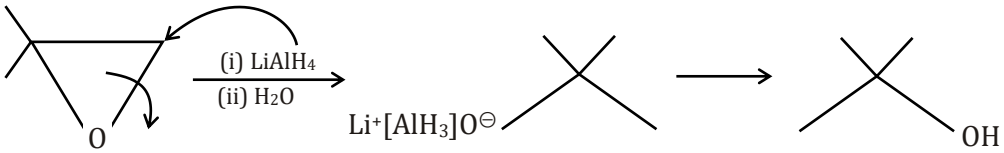
16. Ans. (4)



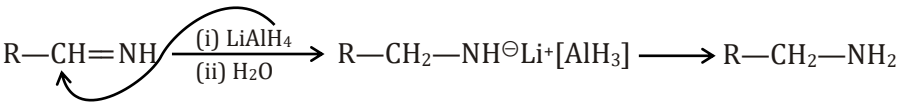
17. Ans. (4)



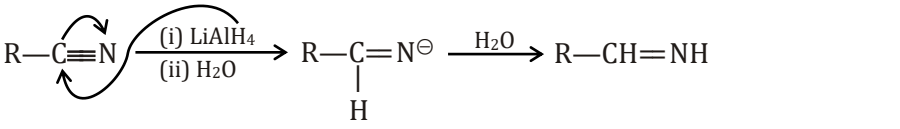
18. Ans. (1)

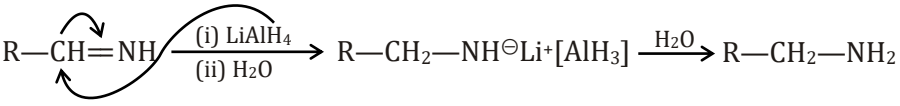


19. Ans. (3)



20. Ans. (3)

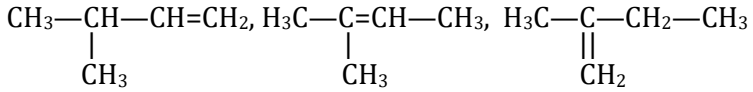




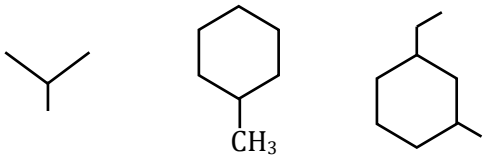
SECTION-B

1. Ans. (3)

Number of possible alkene

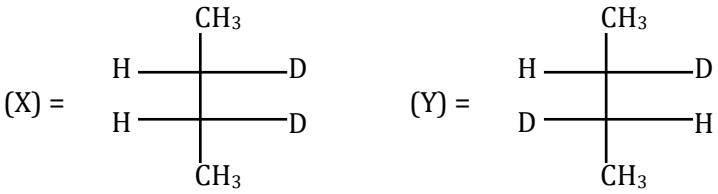


2. Ans. (2)



(a) (b) (c)

3. Ans. (3)



4. Ans. (3)

(a), (c), (d) on treatment with the respective reagent as shown above will give alcohol as product.

5. Ans. (3)

(i) $Na/NH_3(\ell)$,

(ii) Ni_2B or P-2catalyst

(iii) Lindlar catalyst

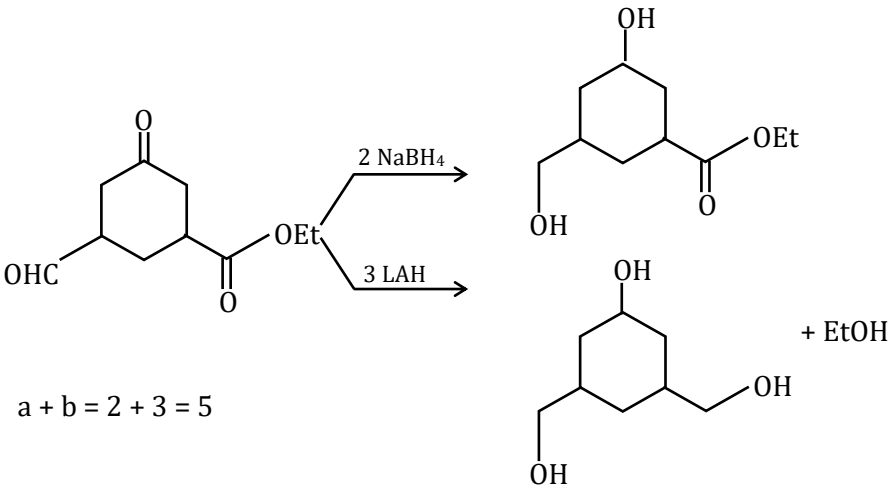
6. Ans. (6)

(i) LAH reduces aldehyde, ketone acid and ester. (4 groups)

(ii) SBH can't reduce ester and acid reduces only aldehyde and ketone. (2 groups).

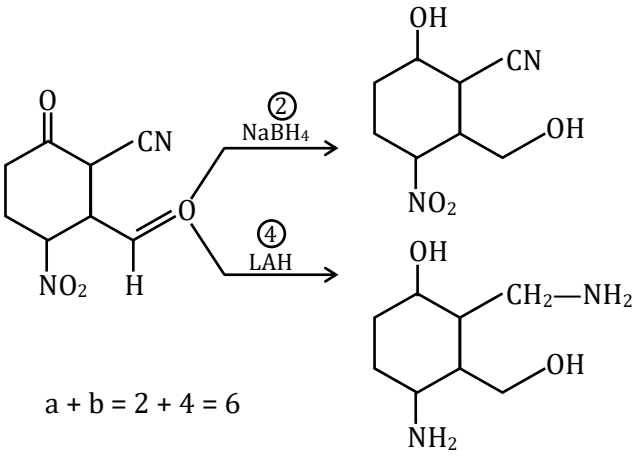
So total group = 4 + 2 = 6

7. Ans. (5)



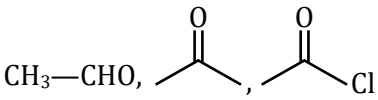
a + b = 2 + 3 = 5

8. **Ans. (6)**



a + b = 2 + 4 = 6

9. **Ans. (3)**

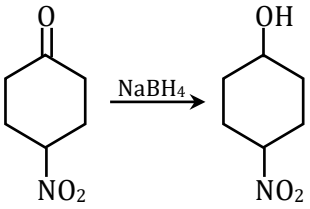


10. **Ans. (5)**

Five compounds (I, II, IV, VI and VII) Esters (III, VIII) and amide (V) and inside (IX) are not reduced by $NaBH_4$.

JEE (Advanced) Practice Paper

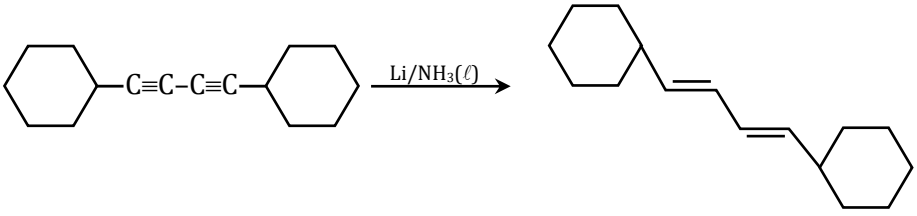
1. **Ans. (C)**



2. **Ans. (C)**

$CH_3–CH_2–CH_2–CH_2–OH$

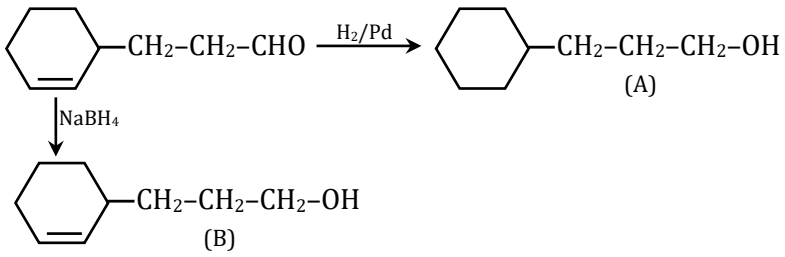
3. **Ans. (B)**



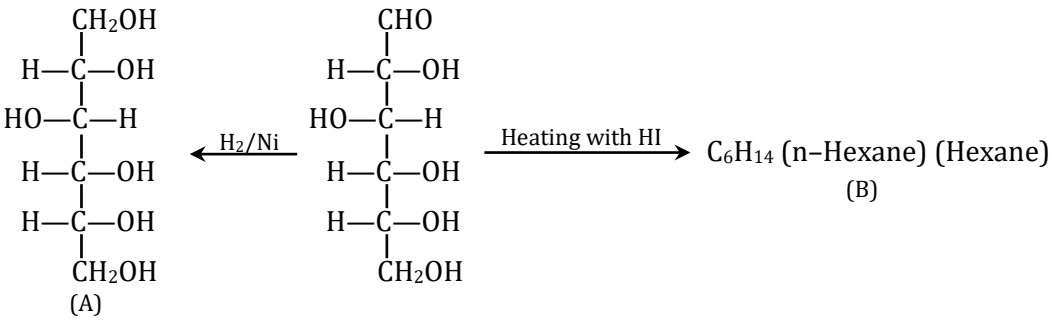
4. **Ans. (D)**

Zn–Hg/conc.HCl

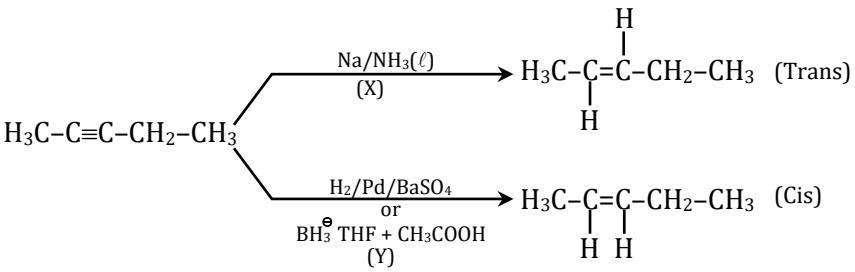
5. Ans. (B)



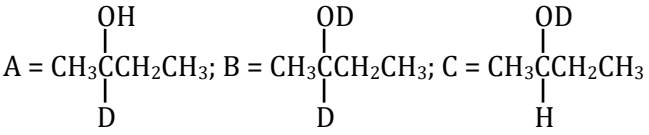
6. Ans. (D)



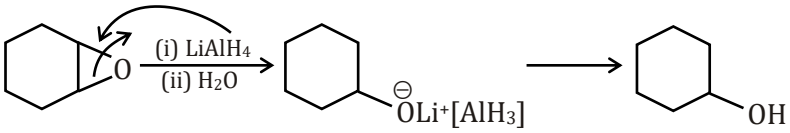
7. Ans. (D)



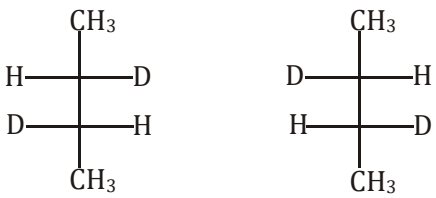
8. Ans. (B)



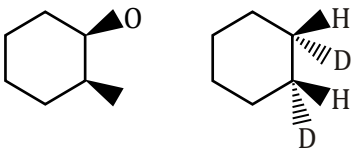
9. Ans. (B)



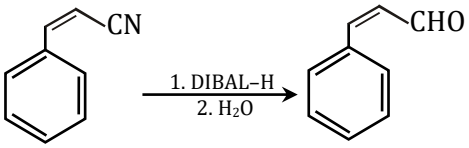
10. Ans. (A,B)

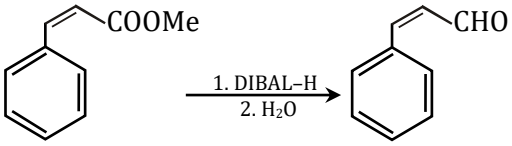


11. Ans. (A,D)



12. Ans. (A,B)





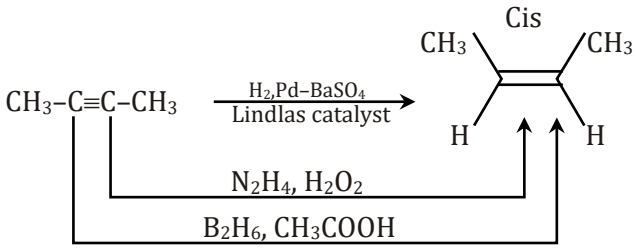
13. Ans. (B,C)

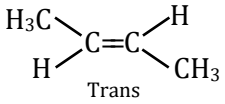
$$Ph-C\equiv Ph \xrightarrow[(1)]{H_2/Pd/BaSO_4/Quinoline}$$

$$Ph-\underset{trans}{CH=CH}-Ph \xrightarrow[(2)]{D_2/Ni} Ph-CHD-\underset{meso}{CHD}-Ph$$

14. Ans. (B)

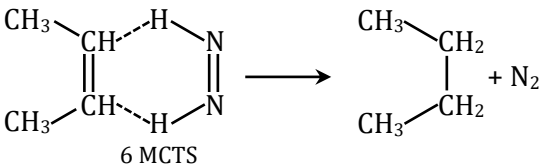
(A)



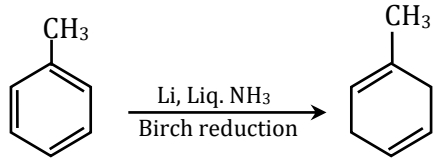
(B) $H_3C-C\equiv C-CH_3 \xrightarrow[\text{Birch Reduction}]{Li,\ LiNH_3}$  Trans

(C) $H_3C-C\equiv C-CH_3 \xrightarrow{N_2H_4,\ H_2O_2} H_3C-CH_2-CH_2-CH_3$

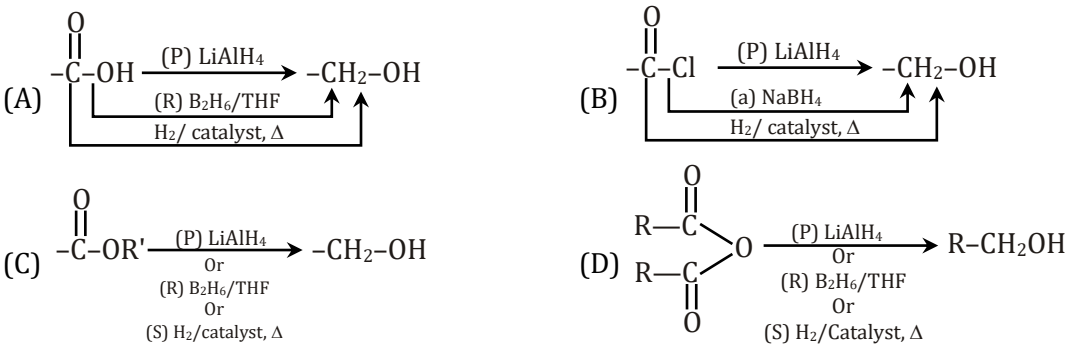
$H_2N-NH_2 + H_2O_2 \longrightarrow HN=NH$



(D)



15. Ans. (A)



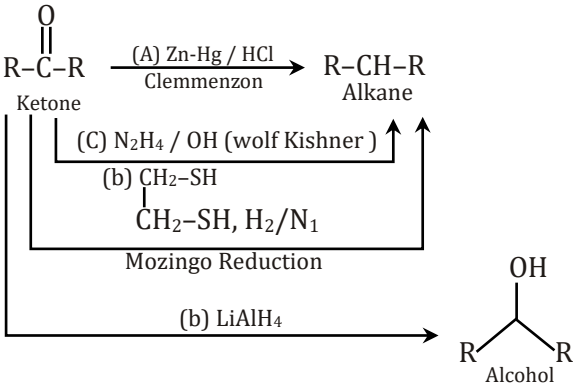
16. Ans. (D)

$LiAlH_4$ reduces aldehydes, ketones as well as esters. Pd/H_2 reduces aldehyde & ketone, but ester is practically left behind. Hence (D).

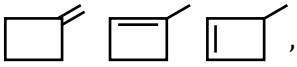
17. Ans. (C)

$NaBD_4$ can reduce aldehyde and ketone, but not ester. Hence ester remains unchanged.

18. Ans. (3)



19. Ans. (4)

Including optical = 4  , Excluding optical = 3.

20. Ans. (1)