1.

$$\underset{0°C}{\overset{PCl_5}{\longrightarrow}} \underset{70\text{-}80\%}{(A)} \xrightarrow[\substack{(1)\ 3NaNH_2,\\ \text{mineral oil}\\ (2)\ H^\oplus}]{} \underset{46\%}{(B)} \text{ ; Product } (B) \text{ is :}$$

(a) [cyclohexene with CH=CH₂ substituent]

(b) [cyclohexane with C≡CH substituent]

(c) [methylcyclohexadiene]

(d) [cyclohexane with =CH₂ substituent]

2. [CH₃CH=CHCH₃ structure] $\xrightarrow[CCl_4]{Br_2}$ $\xrightarrow[\substack{(i)\ alc.KOH\\ (ii)\ NaNH_2}]{}$ $\underset{major}{(A)}$; Product (A) is :

(a) $H_2C=CH-CH=CH_2$

(b) $CH_3-C\equiv C-CH_3$

(c) $CH_3-CH_2-C\equiv CH$

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

3. $CH_3CH_2C\equiv CH \xrightarrow[\text{liq. }NH_3]{NaNH_2} I \xrightarrow[Et_2O]{\text{[cyclopentanone]}} J \xrightarrow{H^\oplus} (K)$

Product (K) of the above reaction is :

(a) [cyclopentanone with C≡C-Et substituent]

(b) [cyclopentane with OH and C≡C-Et substituents]

(c) [structure: cyclopentane with OH and $C \equiv C - CH_2 - CH_3$]

(d) [structure: cyclopentane with OH and $C \equiv C - CH_3$]

4. $CH_3 - CH_2 - CH_2 - C \equiv CH + LiNH_2 \xrightarrow{\quad} (A) \xrightarrow{(CH_3)_2SO_4} (B)$
Lithium amide
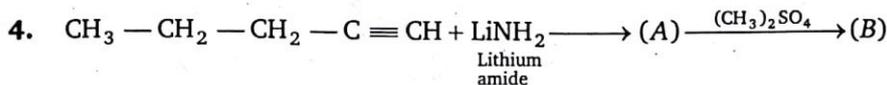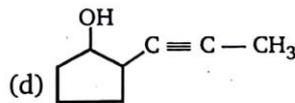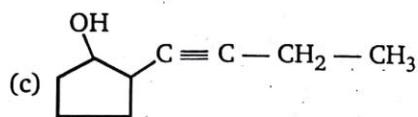
Give the structural formula of compound (B) :

(a) $CH_3 - (CH_2)_2 - C \equiv C - SO_3H$

(b) $CH_3 - (CH_2)_2 - C \equiv C - CH_3$

(c) $CH_3 - (CH_2)_2 - C \equiv C - CH_2 - O - \underset{\underset{O}{\|}}{\overset{\overset{O}{\|}}{S}} - H$

(d) $CH_3 - CH_2 - C \equiv C - CH_2$
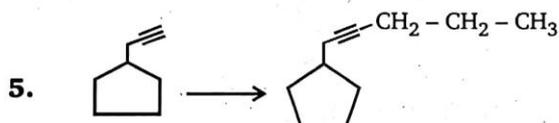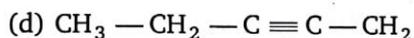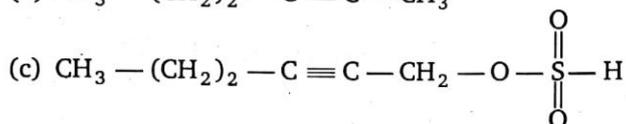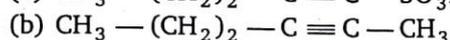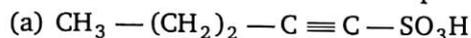
5. [structure: cyclopentane with ethynyl group] $\longrightarrow$ [structure: cyclopentane with $-CH_2 - CH_2 - CH_3$ alkyne group] ; This conversion can be acheived by :

(a) $NaNH_2$, CH_3CHO

(b) $NaNH_2$, $CH_3 - CH_2 - CH_2 - Br$

(c) KOH, $CH_3 - CH_2 - Br$

(d) KOH, $\underset{Br}{CH_2} - \underset{Br}{CH_2}$
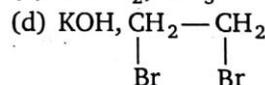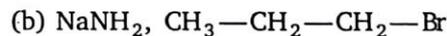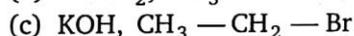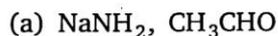
6. Which alkyne will give 3-ethylhexane on catalytic hydrogenation ?
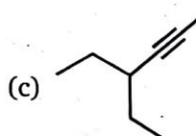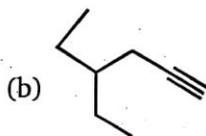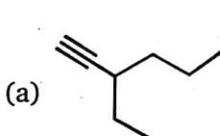
(a) [structure] (b) [structure] (c) [structure] (d) All of these

7. Reactant P gives products Q or R.

[structures: P cyclooctyne → Q cis-cyclooctene or R trans-cyclooctene]
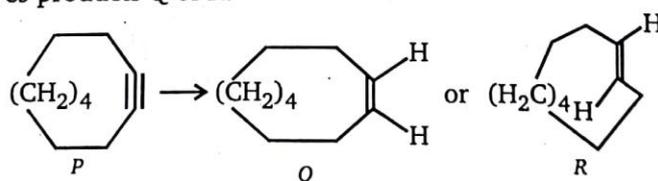
The possible reagents are :

(I) $2Na/liq. NH_3$ (II) $H_2/Pd/CaCO_3$ (quinoline)   (III) $2H_2/Pd/C$
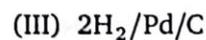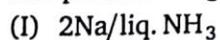
The correct statement with respect to the above conversion is/are :

(a) Q is obtained on treatment with reagent (I)

(b) R and Q are obtained on treatment with reagent (II)

(c) R is obtained on treatment with reagent (I)

(d) R is obtained on treatment with reagent (II)

8. $Br — (CH_2)_{12} — C \equiv CH \xrightarrow{NaNH_2} (A) \xrightarrow[Catalyst]{Lindlar} (B)$; Product (B) is :

(a)

(b)

(c)

(d) $Br — (CH_2) — CH = CH_2$

9. $Ph — C \equiv CH \xrightarrow[MeOH]{MeO^-}$ Major product of the reaction is :

(a) $\underset{H}{\overset{Ph}{>}}C = C\underset{H}{\overset{H}{<}}$

(b) $\underset{H}{\overset{Ph}{>}}C = C\underset{H}{\overset{OMe}{<}}$

(c) $Ph — C \equiv C — OMe$

(d) $Ph - \underset{OMe}{\overset{|}{C}} = CH_2$

10. $Ph — \underset{\underset{Cl}{|}}{\overset{\overset{Cl}{|}}{C}} — CH_3 \xrightarrow[Product]{3NaNH_2} (A)$; Product (A) is :

(a) $Ph—CH=CH_2$ (b) $Ph—C\equiv CH$ (c) $Ph—CH_2—CH_3$ (d) $Ph—C\equiv C\overset{\ominus}{}N\overset{\oplus}{a}$
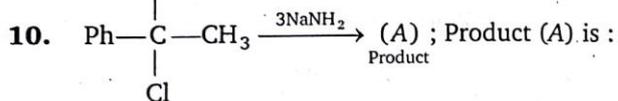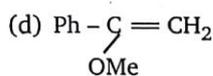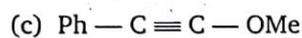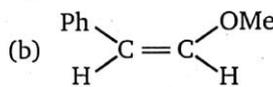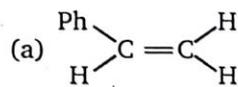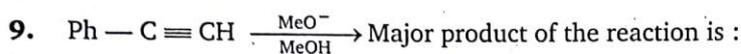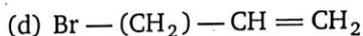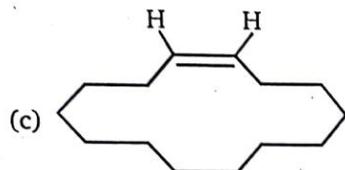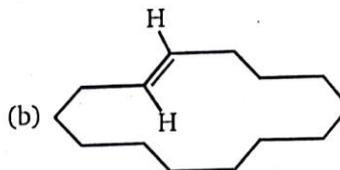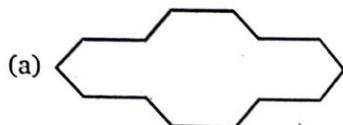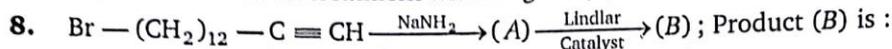
11. Which combination is best for preparation of the compound (A) shown below ?

$$H \blacktriangleright \underset{CH_3CH_2 \ (A)}{\overset{\overset{CH_3}{\text{\tiny{||||}}}}{C}} — CH_2CH_2CH_2C \equiv CH$$

(a) $H_3C \blacktriangleright \underset{CH_3CH_2}{\overset{\overset{H}{\text{\tiny{||||}}}}{C}} — CH_2CH_2CH_2Br \xrightarrow{NaC \equiv CH} (A)$

(b) $H \blacktriangleright \underset{CH_3CH_2}{\overset{\overset{CH_3}{\text{\tiny{||||}}}}{C}} — CH_2CH_2CH_2Br \xrightarrow{NaC \equiv CH} (A)$

(c) $H_3C \blacktriangleright \underset{CH_3CH_2}{\overset{\overset{H}{\text{\tiny{||||}}}}{C}} — Br \xrightarrow[2.\ BrCH_2CH_2CH_2C\equiv CH]{1.\ NaNH_2,\ NH_3} (A)$

(d) $H \blacktriangleright \underset{CH_3CH_2}{\overset{\overset{CH_3}{\text{\tiny{||||}}}}{C}} — Br \xrightarrow[2.\ BrCH_2CH_2CH_2C\equiv CH]{1.\ NaNH_2,\ NH_3} (A)$
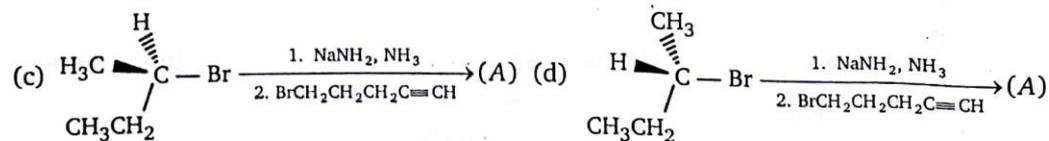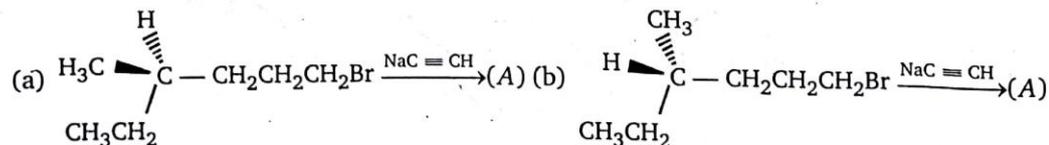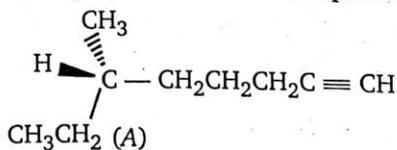
12. Which one of the following is the intermediate in the preparation of a ketone by hydration of an alkyne in the presence of sulfuric acid and mercury (II) sulphate ?

(a) HO⟍⟍⟍⟍   (b) ⟍⟍⟍ OH   (c) ⟍⟍⟍ OH   (d) ⟍⟍⟍ OH

13. (structure) $\xrightarrow{A}$ $\xrightarrow{B}$ (structure) $O-CH_2-C\equiv C-CH_2-CH_2-CH_2-Br$
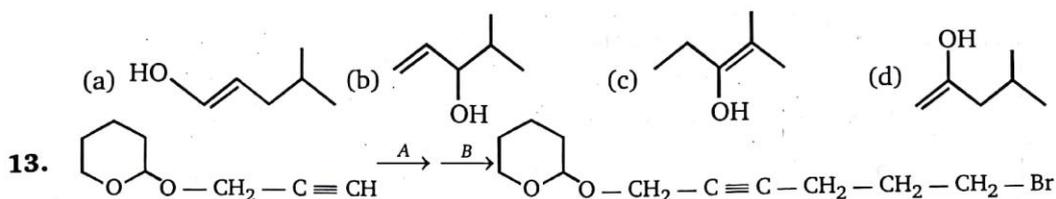
To carry out above conversion, (A) and (B) respectively, are :
(a) $NaNH_2, Cl-CH_2-CH_2-CH_2-Br$
(b) $NaNH_2, F-CH_2-CH_2-CH_2-Br$
(c) $NaNH_2, I-CH_2-CH_2-CH_2-Br$
(d) $NaNH_2, I-CH_2-CH_2-CH_2-I$

14. $H-C\equiv C-Ph \xrightarrow[\substack{H-N\bigcirc O}]{I_2}$ Product; Product obtained in this reaction is :

(a) $Ph-\underset{\underset{I}{|}}{C}=CH-I$ (b) $Ph-\underset{\underset{I}{|}}{CH}-CH_2-I$

(c) $Ph-C\equiv C-I$ (d) $I-C\equiv C-H$

15. (cyclohexene)$-C\equiv CH \xrightarrow[\text{(ii) } CH_3Br]{\text{(i) } NaNH_2, NH_3}$ (A) $\xrightarrow[\text{Lindlar catalyst}]{H_2}$ (B) ; Product (B) is :

(a) (cyclohexane)$-C\equiv C-CH_3$

(b) (cyclohexene)$-\underset{\underset{H}{|}}{C}=\overset{CH_3}{\underset{H}{C}}$

(c) (cyclohexene)$-\underset{\underset{CH_3}{|}}{\overset{-H}{C}}=\underset{-H}{C}$

(d) (cyclohexene)$-\underset{H}{\overset{H}{C}}=\underset{H}{\overset{H}{C}}$
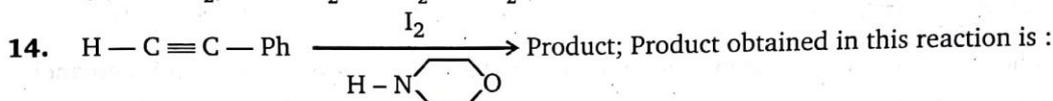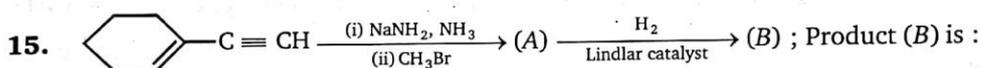
16. Which of the following alkyne on treatment with H_2 (2 mole)/Pt gives an optically inactive compound ?
(a) 3-Methyl-1-pentyne   (b) 4-Methyl-1-hexyne
(c) 3-Methyl-1-heptyne   (d) None of the above
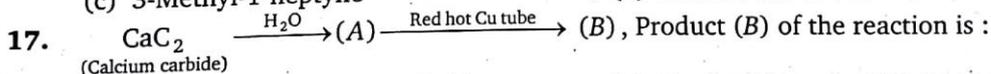
17. $\underset{\text{(Calcium carbide)}}{CaC_2} \xrightarrow{H_2O} (A) \xrightarrow{\text{Red hot Cu tube}} (B)$, Product (B) of the reaction is :
(a) Toluene   (b) Ethyl-benzene   (c) Benzene   (d) Butyne

18. What is the final product, C, of the following reaction sequence ?

$\equiv-H \xrightarrow[\text{2. } CH_3CH_2Br]{\text{1. } NaNH_2} A$

$A \xrightarrow{Na, NH_3 (liq.)} B$

$B \xrightarrow[CH_2Cl_2]{Br_2} C$

(a) ⟍⟍⟍ Br Br   (b) ⟍⟍⟍ Br Br   (c) ⟍⟍⟍ Br NH₂   (d) ⟍⟍⟍ Br Br

19. Compound $(X) \xrightarrow[Pt]{5H_2}$ ⬡$-CH_2-CH_2-CH_2-CH_3$

$\xrightarrow{AgNO_3}$ Precipitate

$\xrightarrow[Me_2S]{O_3}$ $H-\overset{O}{\underset{\|}{C}}-CH_2-CH_2-\overset{O}{\underset{\|}{C}}-\overset{O}{\underset{\|}{C}}-H + H-\overset{O}{\underset{\|}{C}}-\overset{O}{\underset{\|}{C}}-O-H + H-\overset{O}{\underset{\|}{C}}-O-H + \overset{CHO}{\underset{CHO}{|}}$

Compound (X) will be :

(a) ⬡$-CH=CH-C\equiv CH$

(b) ⬡$=CH-CH_2-C\equiv CH$

(c) ⬡$=CH-CH_2-C\equiv CH$

(d) ⬡$=C=CH-C\equiv CH$
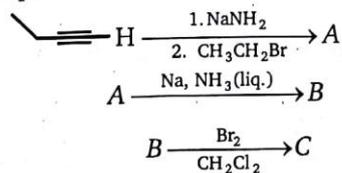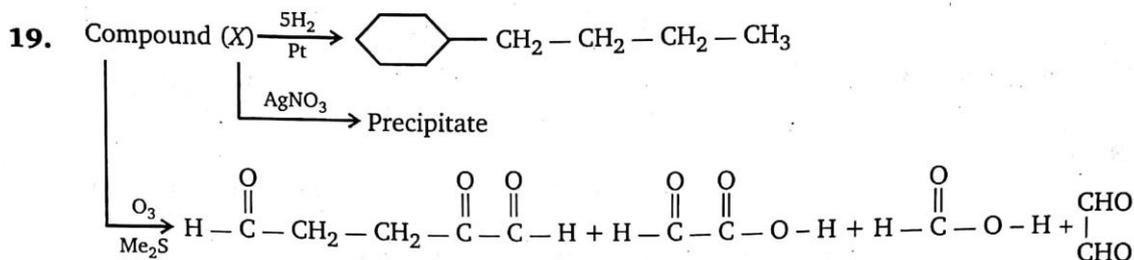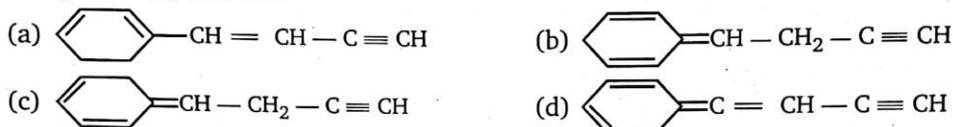
20. Choose the sequence of steps that describes the best synthesis of 1-butene from ethanol :
(a) (1) $NaC\equiv CH$; (2) H_2, Lindlar Pd
(b) (1) $NaC\equiv CH$; (2) Na, NH_3
(c) (1) HBr, heat ; (2) $NaC\equiv CH$; (3) H_2, Lindlar Pd
(d) (1) HBr, heat ; (2) $KOC(CH_3)_3$, DMSO ; (3) $NaC\equiv CH$; (4) H_2, Lindlar catalyst

21. Which alkyne yields butanoic acid $(CH_3CH_2CH_2CO_2H)$ as the only organic product on treatment with ozone followed by the hydrolysis ?
(a) 1-Butyne   (b) 4-Octyne   (c) 1-Pentyne   (d) 2-Hexyne
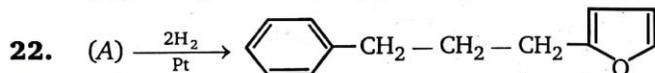
22. $(A) \xrightarrow[Pt]{2H_2}$ ⬡$-CH_2-CH_2-CH_2-$⬠$_O$
Carlina oxide
Unit of unsaturation in compound (A) ?
(a) 7   (b) 8   (c) 9   (d) 10

23. ⬠ $\xrightarrow{H_3O^\oplus} (A) \xrightarrow{NaOH} (B) \xrightarrow{Kolbe\ electrolysis} (C)$
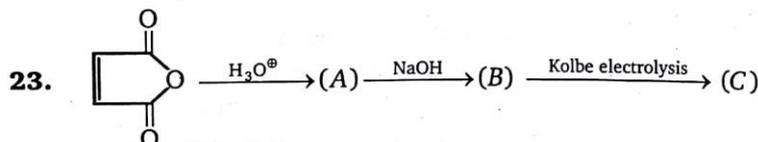
Product (C) of above reaction is:
(a) $H_2C=CH_2$
(c) $HC\equiv CH$
(b) $CH_3-C\equiv C-CH_3$
(d) $CH_3-CH=CH-CH_3$

24. To convert 1-butyne to 1-D-butanal, one would carry out the following steps :
(I) Sodium amide, then D_2O
(II) Disiamy lborane, then hydrogen peroxide/sodium hydroxide
(III) The transformation can not be carried out with the indicated reagents.
(a) I, followed by II   (b) II, followed by I   (c) III   (d) II

25. An unknown compound (A) has a molecular formula C_4H_6. When (A) is treated with excess of Br_2 a new substance (B) with formula $C_4H_6Br_4$ is formed. (A) forms a white ppt. with ammonical silver nitrate solution. (A) may be :

(a) But-1-yne   (b) But-2-yne

(c) But-1-ene   (d) But-2-ene

26. One mole of 1,2-dibromopropane on treatment with X moles of $NaNH_2$ followed by treatment with ethyl bromide gave a pentyne. The value of X is :

(a) One   (b) Two   (c) Three   (d) Four

27.
$$CH_3-\overset{\overset{\displaystyle CH_3}{|}}{CH}-C\equiv CH \xrightarrow{\text{excess HBr}}$$

The product of the above reaction is :
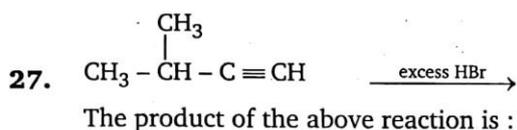
(a) $CH_3-\overset{\overset{\displaystyle CH_3}{|}}{CH}-\overset{\overset{\displaystyle Br}{|}}{CH}-\overset{\overset{\displaystyle Br}{|}}{CH_2}$ (b) $CH_3-\overset{\overset{\displaystyle CH_3}{|}}{CH}-\overset{\overset{\displaystyle Br}{|}}{C}=CH_2$

(c) $CH_3-\overset{\overset{\displaystyle CH_3}{|}}{CH}-\underset{\underset{\displaystyle Br}{|}}{\overset{\overset{\displaystyle Br}{|}}{C}}-CH_3$ (d) $CH_3-\overset{\overset{\displaystyle CH_3}{|}}{CH}-CH_2-\underset{\underset{\displaystyle Br}{|}}{CH}$

28. $CH_3-C\equiv C-CH_3 \xrightarrow{\text{Cold KMnO}_4} (A)$

Product (A) is:
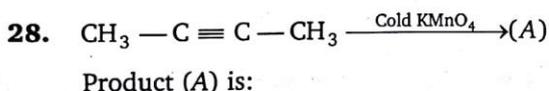
(a) $CH_3-CH_2-\overset{\overset{\displaystyle O}{||}}{C}-\overset{\overset{\displaystyle O}{||}}{C}-H$ (b) $CH_3-\overset{\overset{\displaystyle O}{||}}{C}-\overset{\overset{\displaystyle O}{||}}{C}-CH_3$

(c) $CH_3-\overset{\overset{\displaystyle OH}{|}}{CH}-\overset{\overset{\displaystyle OH}{|}}{CH}-CH_3$ (d) $O=CH-CH_2-CH_2CH=O$

29. In which reaction last product is $Ph-C\equiv CH$?

(a) $C_6H_5-\underset{\underset{\displaystyle Br}{|}}{\overset{\overset{\displaystyle Br}{|}}{C}}-CH_3 \xrightarrow[\text{Mineral oil, heat}]{\text{3NaNH}_2} \xrightarrow{\text{NH}_4\text{Cl}}$

(b) $C_6H_5CH=CH_2 \xrightarrow[\text{CCl}_4]{\text{Br}_2} \xrightarrow[\text{Mineral oil, heat}]{\text{3NaNH}_2} \xrightarrow{\text{NH}_4\text{Cl}}$

(c) $C_6H_5-\overset{\overset{\displaystyle O}{||}}{C}-CH_3 \xrightarrow{\text{PCl}_5} \xrightarrow[\text{Mineral oil, heat}]{\text{3NaNH}_2} \xrightarrow{\text{NH}_4\text{Cl}}$

(d) All
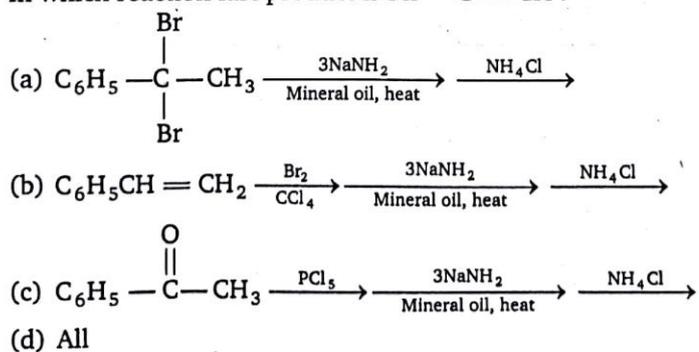
30. Predict the product of the following reaction sequence.

$$\text{ethyne} \xrightarrow[\substack{(2)\ \text{excess I—CH}_2\text{—(CH}_2)_2\text{—CH}_3 \\ (3)\ \text{H}^\oplus}]{(1)\ \text{excess NaNH}_2}$$
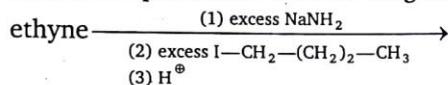
   (a) 6-iodo-1-hexyne   (b) 1-hexyne

   (c) 5-decyne   (d) 1-iodo-1-hexene

31. The best sequence of reactions to prepare 2-heptanone is

   (a) $\text{propyne} \xrightarrow{\text{NaNH}_2} X \xrightarrow{n\text{-C}_4\text{H}_9\text{Br}} Y \xrightarrow[\text{H}_2\text{SO}_4]{\text{H}_2\text{O, Hg}^{2+}}$

   (b) $\text{ethyne} \xrightarrow{\text{NaNH}_2} X \xrightarrow{n\text{-C}_5\text{H}_{12}\text{Br}} Y \xrightarrow[\text{H}_2\text{SO}_4]{\text{H}_2\text{O, Hg}^{2+}}$

   (c) $1-\text{hexyne} \xrightarrow{\text{NaNH}_2} X \xrightarrow{\text{CH}_2\text{Br}} Y \xrightarrow[\text{H}_2\text{SO}_4]{\text{H}_2\text{O. Hg}^{2+}}$

   (d) $1-\text{pentyne} \xrightarrow{\text{NaNH}_2} X \xrightarrow{\text{C}_2\text{H}_5\text{Br}} Y \xrightarrow[\text{H}_2\text{SO}_4]{\text{H}_2\text{O, Hg}^{2+}}$
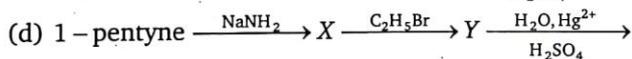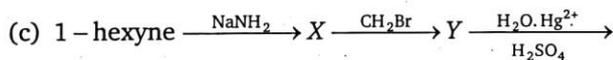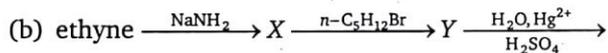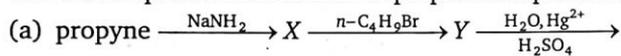
32. The major product of the reaction of 2-butene with cold alkaline $KMnO_4$, is

   (a)   (b)   (c)   (d)
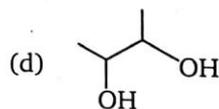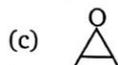
ANSWERS — LEVEL 1															
1.	(b)	**2.**	(b)	**3.**	(b)	**4.**	(b)	**5.**	(b)	**6.**	(d)	**7.**	(c)	**8.**	(c)
9.	(b)	**10.**	(d)	**11.**	(b)	**12.**	(d)	**13.**	(c)	**14.**	(c)	**15.**	(c)	**16.**	(a)
17.	(c)	**18.**	(a)	**19.**	(a)	**20.**	(c)	**21.**	(b)	**22.**	(c)	**23.**	'(c)	**24.**	(c)
25.	(a)	**26.**	(c)	**27.**	(c)	**28.**	(b)	**29.**	(d)	**30.**	(c)	**31.**	(b)	**32.**	(d)