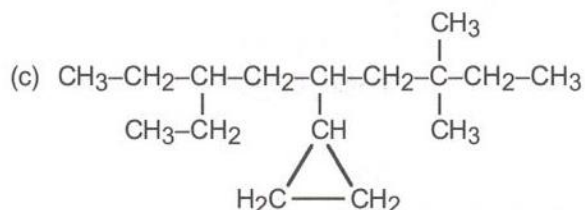


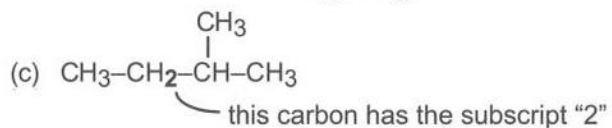
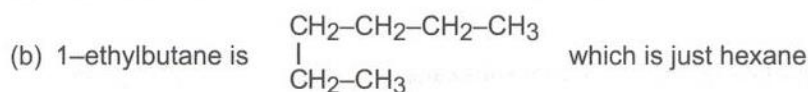
ANSWERS TO UNIT X : ORGANIC CHEMISTRY

1. C_nH_{2n+2}
2. (a) 7 carbons; heptane (c) 8 carbons; octane
(b) 7 carbons; heptane (d) 10 carbons; decane
3. (a) 3-methylhexane (d) 2-methylhexane
(b) 4-ethylheptane (e) 4-methylnonane
(c) 3-ethyloctane (f) 3-methylheptane



5. (a)
$$\begin{array}{ccccccc} \text{CH}_3 & - & \text{CH}_2 & - & \text{CH} & - & \text{CH}_2 & - & \text{CH}_2 & - & \text{CH}_3 \\ & & & & | & & & & & & \\ & & & & \text{CH}_3 & & & & & & \end{array}$$
- (b)
$$\begin{array}{ccccccccccc} \text{CH}_3 & - & \text{CH}_2 & - & \text{CH}_2 & - & \text{CH} & - & \text{CH}_2 & - & \text{CH}_2 & - & \text{CH}_2 & - & \text{CH}_3 \\ & & & & & & | & & & & & & & & \\ & & & & & & \text{CH}_3 & - & \text{CH}_2 & & & & & & \end{array}$$
- (c)
$$\begin{array}{ccccccc} \text{CH}_3 & - & \text{CH} & - & \text{CH}_2 & - & \text{CH}_2 & - & \text{CH}_3 \\ & & | & & & & & & \\ & & \text{CH}_3 & & & & & & \end{array}$$
- (d)
$$\begin{array}{ccccccccccc} \text{CH}_3 & - & \text{CH}_2 & - & \text{CH}_2 & - & \text{CH} & - & \text{CH}_2 & - & \text{CH}_2 & - & \text{CH}_2 & - & \text{CH}_2 & - & \text{CH}_3 \\ & & & & & & | & & & & & & & & & \\ & & & & & & \text{CH}_3 & - & \text{CH}_2 & - & \text{CH}_2 & & & & & \end{array}$$
- (e)
$$\begin{array}{ccccccccccc} \text{CH}_3 & - & \text{CH}_2 & - & \text{CH} & - & \text{CH}_2 & - & \text{CH}_2 & - & \text{CH}_2 & - & \text{CH}_3 \\ & & & & | & & & & & & & & \\ & & & & \text{CH}_3 & - & \text{CH}_2 & & & & & & \end{array}$$
- (f)
$$\begin{array}{ccccccccccccccc} \text{CH}_3 & \text{CH}_2 & \text{CH}_2 & \text{CH}_2 & \text{CH}_2 & \text{CH} & \text{CH}_2 & \text{CH}_2 & \text{CH}_2 & \text{CH}_2 & \text{CH}_3 \\ & & & & & | & & & & & \\ & & & & & \text{CH}_3 & \text{CH}_2 & \text{CH}_2 & & & \end{array}$$

6. (a) the molecule is numbered from the wrong end; it should be 2-methylheptane



- (d) the carbon at the 2-position of the propane chain should have NO hydrogens

7. C_nH_{2n+2} (unchanged from straight-chain alkanes)

8. (a) 3,4-dimethylheptane (g) 4,6-dimethylnonane
(b) 3,4,4,5-tetraethylheptane (h) decane
(c) 2,2,7,7-tetramethyloctane (i) 4,5-diethyl-3,7-dimethylnonane
(d) 5-ethyl-3,4-dimethylheptane (j) 3,3,4,5-tetramethyloctane
or 3-ethyl-4,5-dimethylheptane (k) 4-ethyl-3-methyl-5-propyloctane
(e) 4-methyl-4-ethyloctane (l) 3,6-diethyl-5,8-dimethyldecane
or 5,8-diethyl-3,6-dimethyldecane
(f) 2,2,5-trimethyloctane

9. (a)
$$\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3\text{CHCCH}_2\text{CH}_2\text{CH}_3 \\ | \quad | \\ \text{H}_3\text{C} \quad \text{CH}_2\text{CH}_3 \end{array}$$
- (b)
$$\begin{array}{c} \text{CH}_3 \quad \text{CH}_2\text{CH}_2\text{CH}_3 \\ | \quad | \\ \text{CH}_3\text{CCH}_2\text{CH}_2\text{CHCHCH}_2\text{CH}_2\text{CH}_3 \\ | \quad | \\ \text{CH}_3 \quad \text{CH}_2\text{CH}_2\text{CH}_3 \end{array}$$
- (c)
$$\begin{array}{c} \text{CH}_3 \quad \text{CH}_2\text{CH}_2\text{CH}_3 \\ | \quad | \\ \text{CH}_3\text{CH}_2\text{CHCHCHCH}_2\text{CH}_2\text{CH}_3 \\ | \\ \text{CH}_2\text{CH}_3 \end{array}$$
- (d)
$$\begin{array}{c} \text{H}_3\text{C} \quad \text{CH}_3 \\ | \quad | \\ \text{CH}_3\text{C}-\text{CCH}_2\text{CH}_3 \\ | \quad | \\ \text{H}_3\text{C} \quad \text{CH}_3 \end{array}$$
- (e)
$$\begin{array}{c} \text{CH}_3\text{CH}_2\text{CH}-\text{CHCH}_2\text{CH}_3 \\ | \quad | \\ \text{CH}_3\text{CH}_2 \quad \text{CH}_2\text{CH}_3 \end{array}$$
- (f)
$$\begin{array}{c} \text{CH}_3 \quad \text{CH}_3\text{CH}_2 \quad \text{CH}_3 \\ | \quad | \quad | \\ \text{CH}_3\text{CH}_2\text{CCH}_2\text{CH}-\text{C}-\text{CHCH}_2\text{CH}_2\text{CH}_3 \\ | \quad | \quad | \\ \text{CH}_3 \quad \text{CH}_2\text{CH}_3 \quad \text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3 \end{array}$$
- (g)
$$\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3\text{CCH}_3 \\ | \\ \text{CH}_3 \end{array}$$
- (h)
$$\begin{array}{c} \text{CH}_2\text{CH}_3 \\ | \\ \text{CH}_3\text{CHCH}_2\text{CHCH}_2\text{CH}_2\text{CH}_2\text{CH}_3 \\ | \\ \text{CH}_3 \end{array}$$
- (i)
$$\begin{array}{c} \text{CH}_3 \quad \text{CH}_3 \quad \text{CH}_3 \\ | \quad | \quad | \\ \text{CH}_3-\text{C}-\text{C}-\text{C}-\text{CH}_3 \\ | \quad | \quad | \\ \text{CH}_3 \quad \text{CH}_3 \quad \text{CH}_3 \end{array}$$
- (j)
$$\begin{array}{c} \text{H}_3\text{C} \quad \text{CH}_2\text{CH}_2\text{CH}_3 \\ | \quad | \\ \text{CH}_3\text{CH}_2\text{CHCHCHCHCH}_2\text{CH}_3 \\ | \quad | \\ \text{CH}_2\text{CH}_3 \quad \text{CH}_2\text{CH}_3 \end{array}$$
10. pentane = $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$
 methylbutane =
$$\begin{array}{c} \text{CH}_3\text{CHCH}_2\text{CH}_3 \\ | \\ \text{CH}_3 \end{array}$$

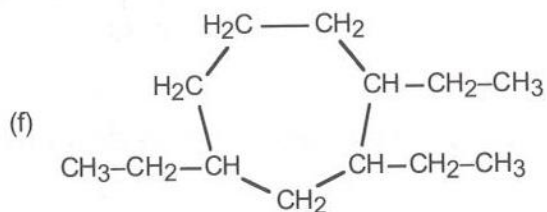
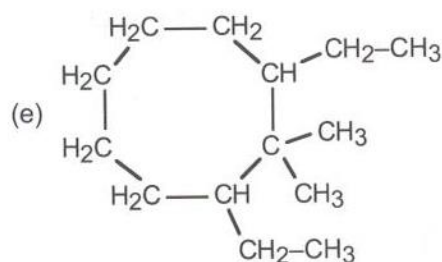
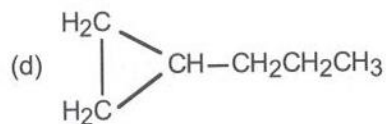
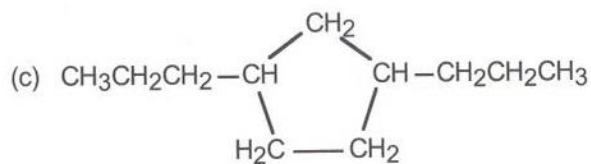
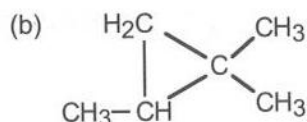
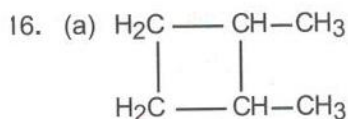
 dimethylpropane =
$$\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3\text{CCH}_3 \\ | \\ \text{CH}_3 \end{array}$$
11. 2-methylhexane =
$$\begin{array}{c} \text{CH}_3\text{CHCH}_2\text{CH}_2\text{CH}_2\text{CH}_3 \\ | \\ \text{CH}_3 \end{array}$$

 3-methylhexane =
$$\begin{array}{c} \text{CH}_3\text{CH}_2\text{CHCH}_2\text{CH}_2\text{CH}_3 \\ | \\ \text{CH}_3 \end{array}$$
12. 2,2-dimethylpentane =
$$\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3\text{CCH}_2\text{CH}_2\text{CH}_3 \\ | \\ \text{CH}_3 \end{array}$$

 2,3-dimethylpentane =
$$\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3\text{CHCHCH}_2\text{CH}_3 \\ | \\ \text{CH}_3 \end{array}$$

 2,4-dimethylpentane =
$$\begin{array}{c} \text{CH}_3\text{CHCH}_2\text{CHCH}_3 \\ | \quad | \\ \text{CH}_3 \quad \text{CH}_3 \end{array}$$

 3,3-dimethylpentane =
$$\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3\text{CH}_2\text{CCH}_2\text{CH}_3 \\ | \\ \text{CH}_3 \end{array}$$
13. 3 - having methyl groups at the 2, 3 or 4 position
14. C_4H_{10}
15. (a) ethylcyclohexane
 (b) 1,3-dimethylcyclobutane
 (c) methylcyclopropane
 (d) 1-ethyl-1,3-dimethylcyclopentane
 (e) 2-ethyl-1,3-dimethylcyclooctane

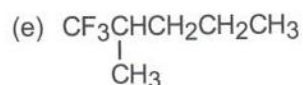
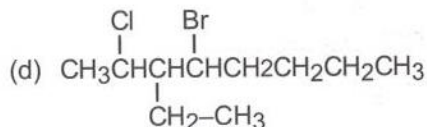
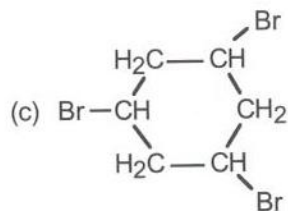


17. (a) chloroethane
(b) 1,3-dibromopropane
(c) 1-iodo-4-methylpentane

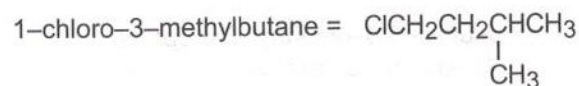
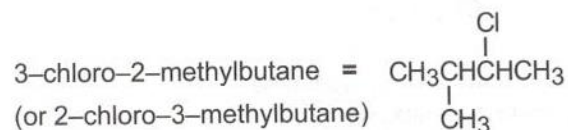
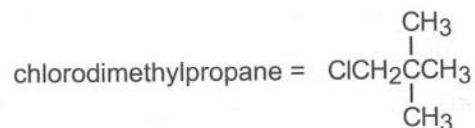
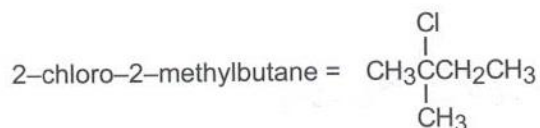
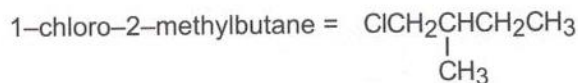
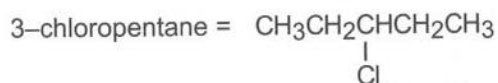
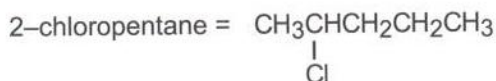
- (d) 1,1-dichloro-2-fluoroethane
(e) 1,1-dichloro-2-ethylcyclohexane

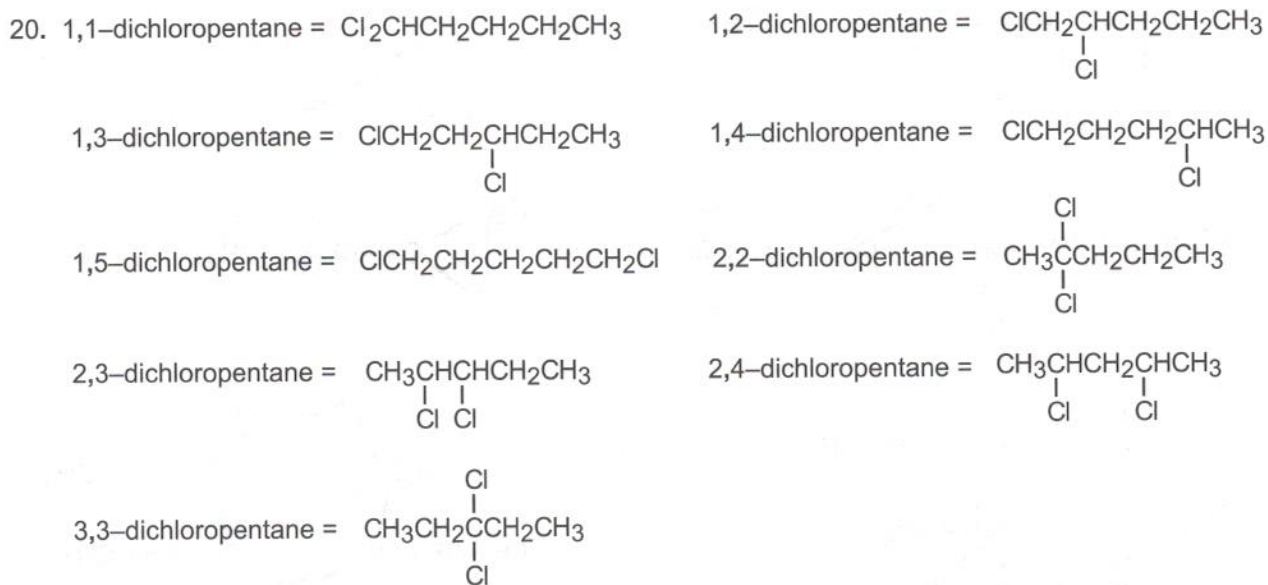
18. (a) CHCl_3

- (b) $\text{ClCH}_2\text{CH}_2\text{Cl}$

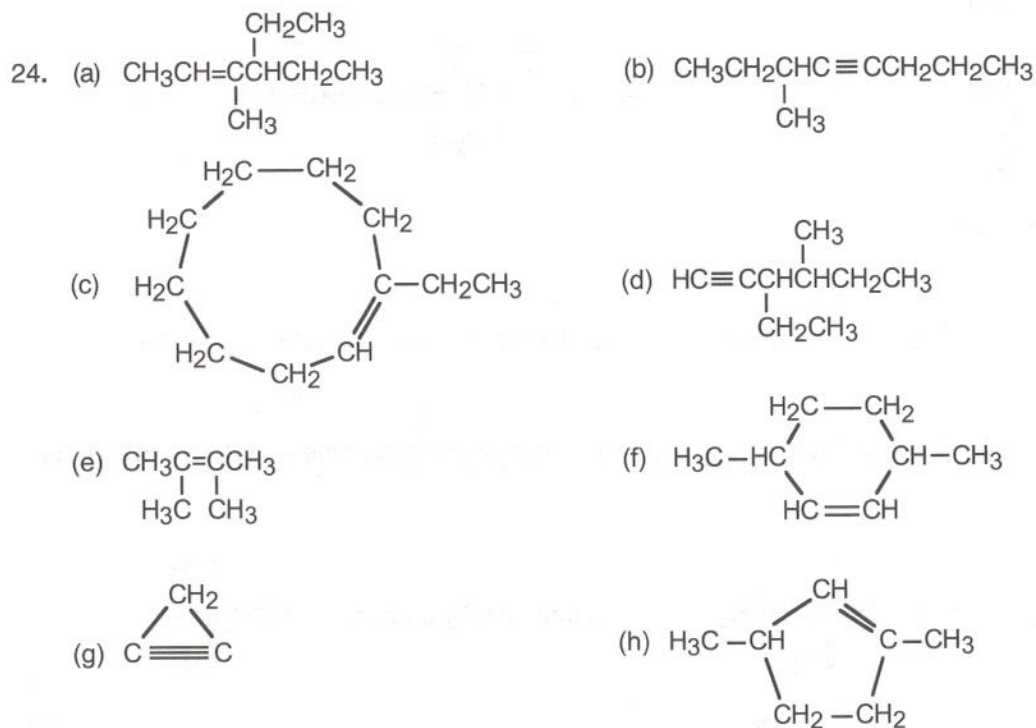


19. 1-chloropentane = $\text{Cl}-\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$

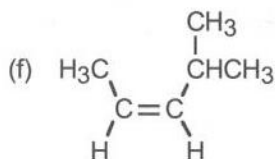
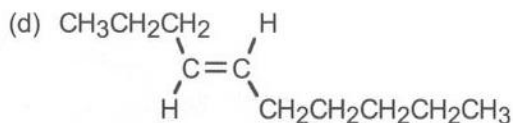
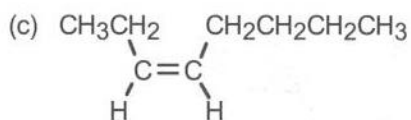
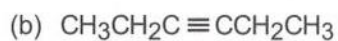
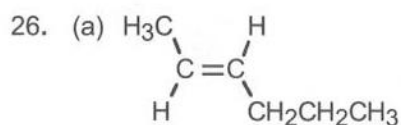




21. (a) alkene = C_nH_{2n} (same as cycloalkane) (b) alkyne = $\text{C}_n\text{H}_{2n-2}$
22. (a) $\text{CH}_2=\text{CHCH}_2\text{CH}_2\text{CH}_2\text{CH}_3$ (b) $\text{CH}_3\text{CH}_2\text{CH}_2\text{C}\equiv\text{CCH}_2\text{CH}_2\text{CH}_2\text{CH}_3$
- (c) $\text{CH}_3\text{CH}_2\text{CH}=\text{CHCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$ (d) $\text{CH}_3\text{C}\equiv\text{CCH}_2\text{CH}_2\text{CH}_2\text{CH}_3$
- (e) $\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$ (f) $\text{HC}\equiv\text{CCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$
23. (a) 3-hexene (b) 1-heptyne (c) 4-decyne (d) 3-heptene

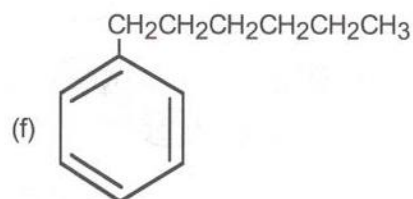
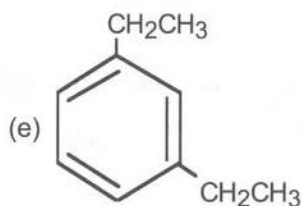
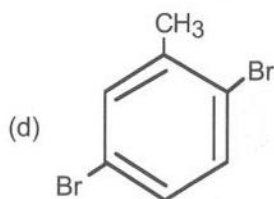
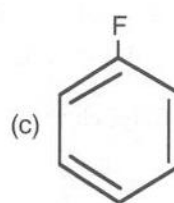
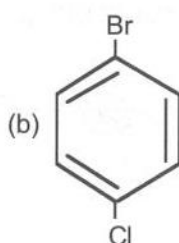
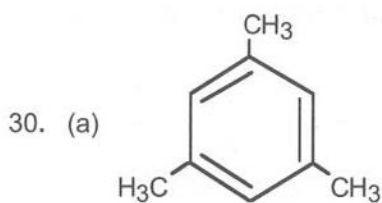
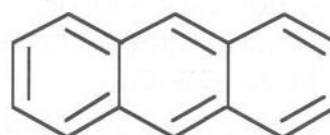
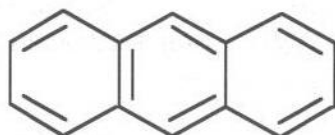
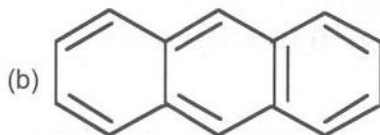
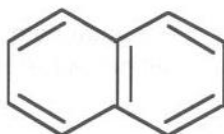
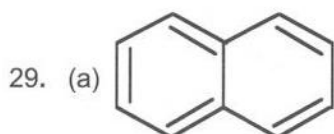


25. (a) 5-ethyl-6,6-dimethyl-3-heptene (d) 5,6-dimethyl-1-cyclooctyne
- (b) 3,6-diethyl-2-methyl-4-octyne (e) 3-methyl-3-hexene
- (c) 1,3,4-trimethyl-1-cyclobutene (f) 3-methyl-1-cyclohexene



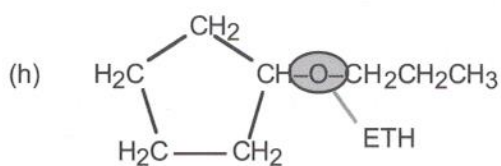
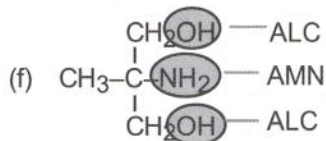
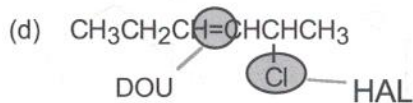
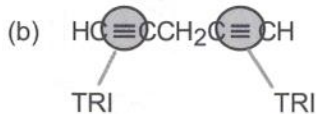
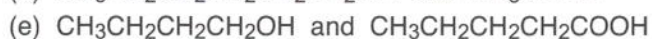
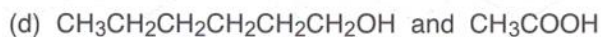
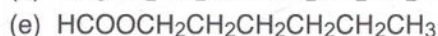
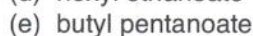
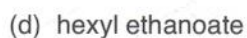
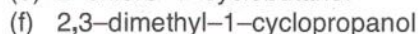
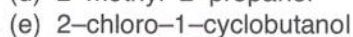
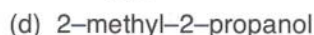
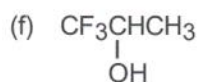
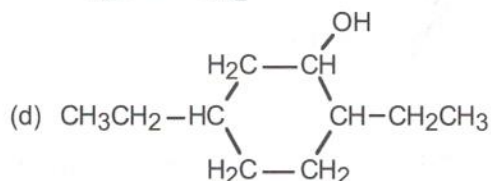
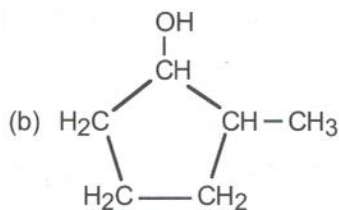
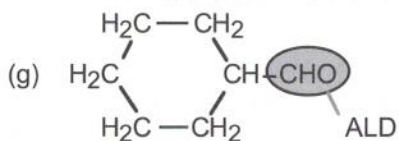
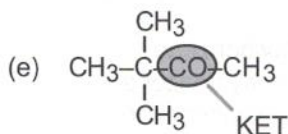
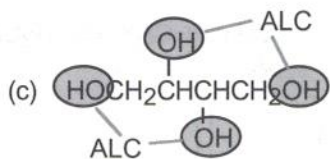
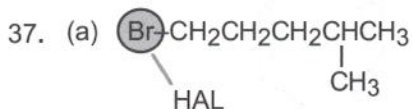
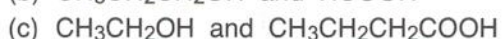
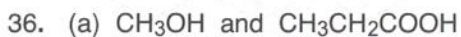
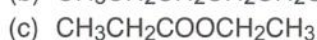
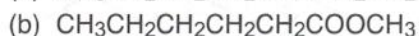
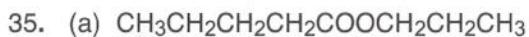
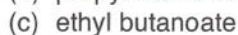
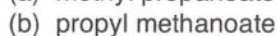
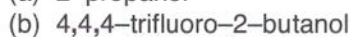
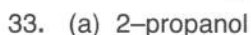
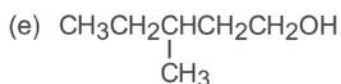
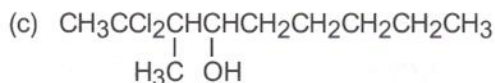
27. (a) no (b) yes (c) no (d) yes (e) no (f) no

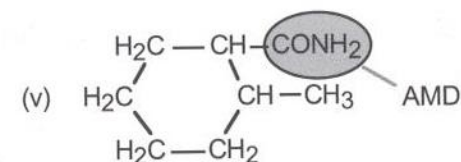
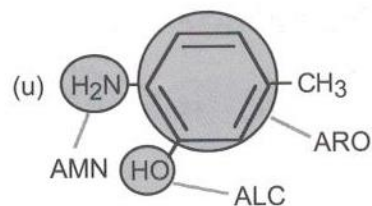
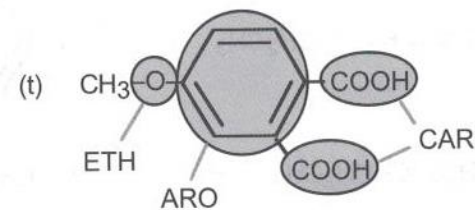
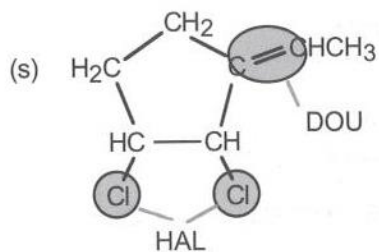
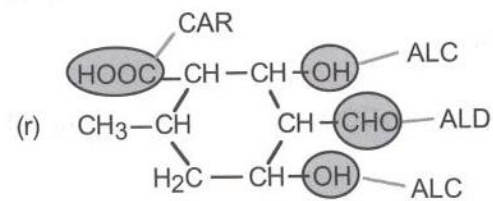
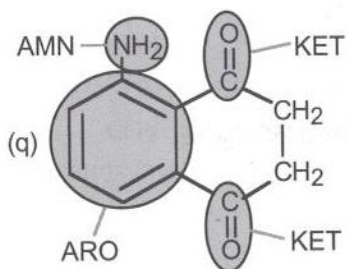
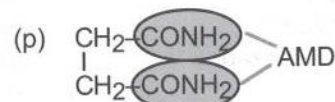
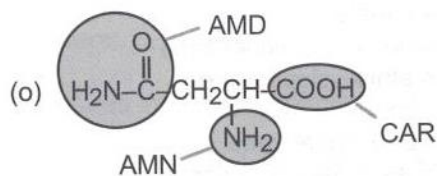
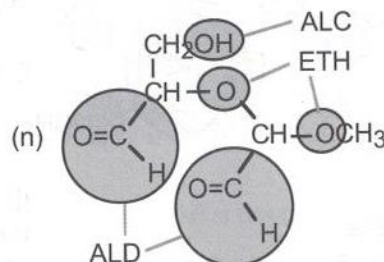
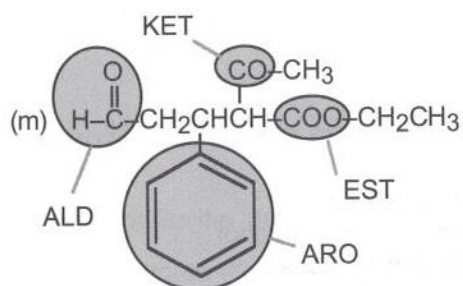
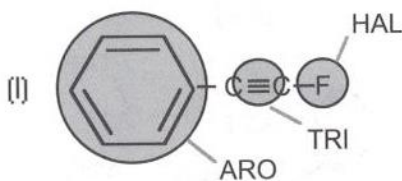
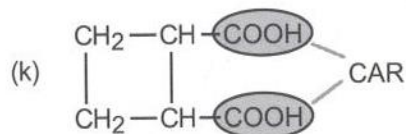
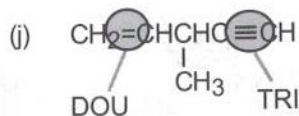
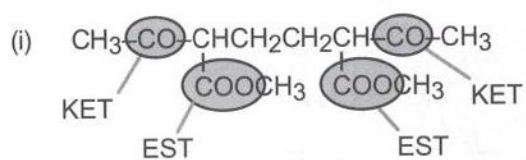
28. (a) cis-3-hexene (b) trans-3-octene (c) trans-2-heptene (d) cis-4-octene

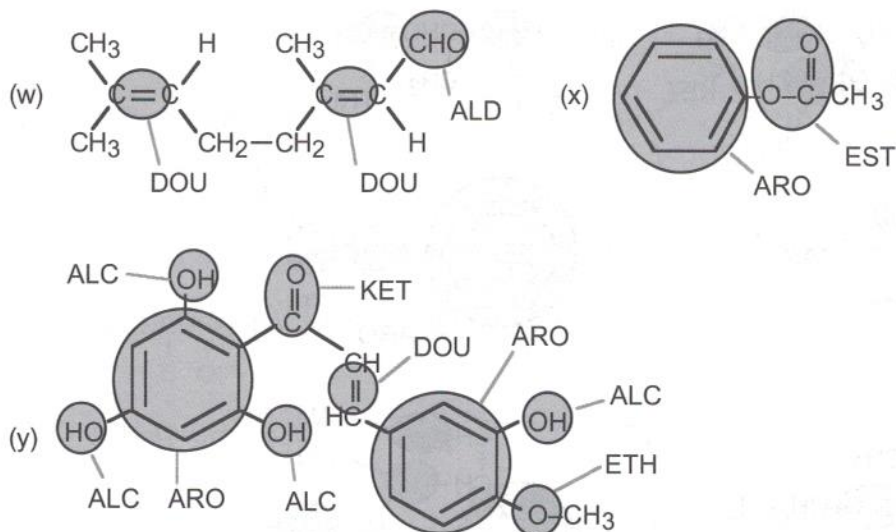


31. (a) ethylbenzene
(b) 1-bromo-4-methylbenzene
or 4-bromo-1-methylbenzene
(c) hexachlorobenzene
(d) 1,2-dimethylbenzene

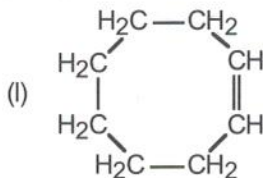
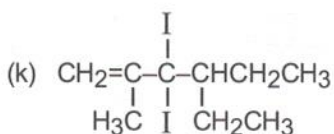
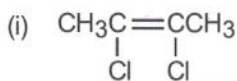
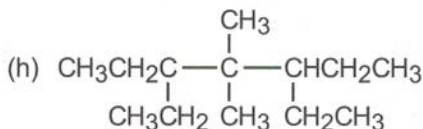
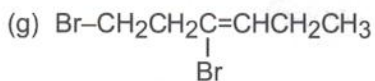
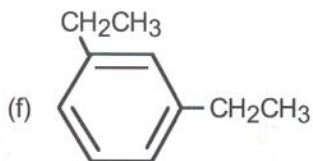
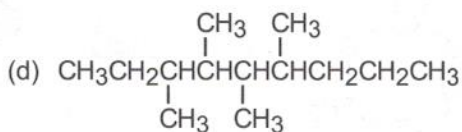
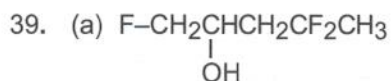
(e) 1-ethyl-3,5-dimethylbenzene
or 3-ethyl-1,5-dimethylbenzene
or 5-ethyl-1,3-dimethylbenzene
(f) 1-ethyl-4-methylbenzene
or 4-ethyl-1-methylbenzene

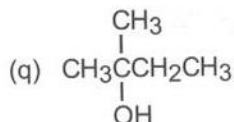
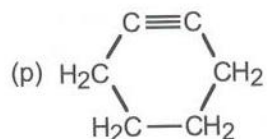
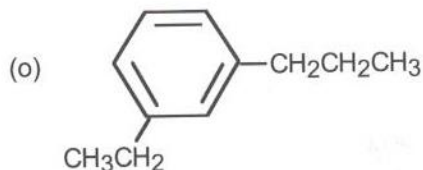
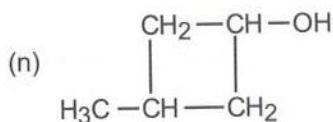
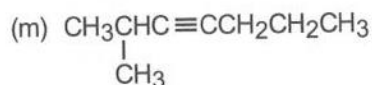






38. (a) 2-fluoropentane
 (b) 3-chloro-3-hexene
 (c) 1,4-diiodo-2-butyne
 (d) pentyl methanoate
 (e) 3-bromo-3,5,5-trimethyloctane
 (f) 1,3-dichlorocyclobutane
 (g) 1-fluoro-4-propylbenzene
 or 4-fluoro-1-propylbenzene
 (h) 2,6-dimethyloctane
 (i) 4-bromo-5-chloro-1-iodo-2-pentyne
 (j) 4-iodo-2-butanol
 (k) 3-methyl-1-cyclopentanol
 (l) 1,3,5-triethylbenzene
 (m) 3-bromo-1-propene
 (n) pentyl ethanoate
 (o) 2,4-dibromo-1-methylbenzene
 (p) 1,2,3-trimethylcyclopropane
 (q) cyclopropanol
 (r) 1-chloro-2-ethylbenzene
 or 2-chloro-1-ethylbenzene





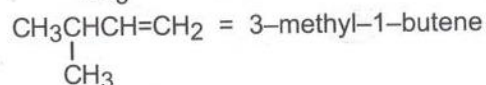
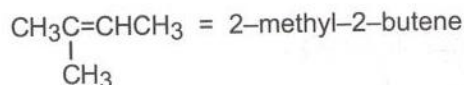
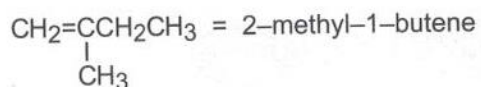
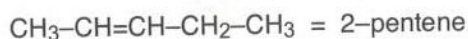
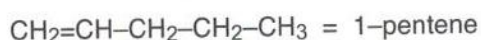
40. $\text{C}_n\text{H}_{2n+2}$ implies no loss of H's (no multiple bonds; no ring present which joins one end of a chain back onto itself).

C_nH_{2n} implies the loss of 2 H's due to either a ring present **OR** a double bond.

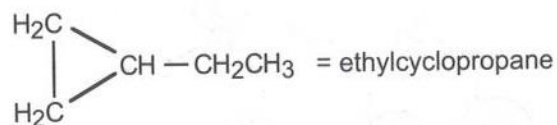
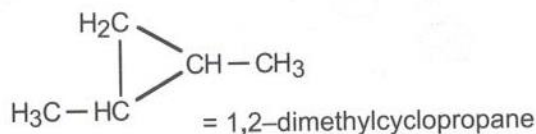
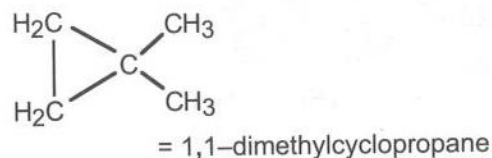
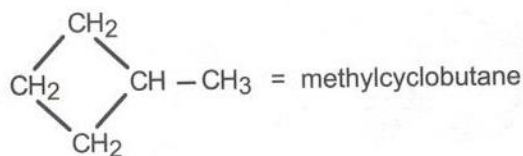
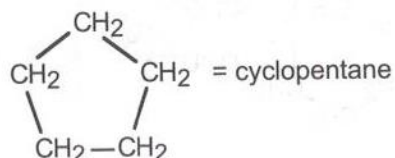
$\text{C}_n\text{H}_{2n-2}$ implies the loss of 4 H's due to either a triple bond **OR** two double bonds **OR** two rings present **OR** a double bond AND a ring present.

Answers: c, e, g, i

41. Structures involving a double bond:



Structures involving a ring:



42. (a) carboxylic acids, amino acids
(b) amines
(c) esters

- (d) alkanes
(e) amino acids
(f) esters

