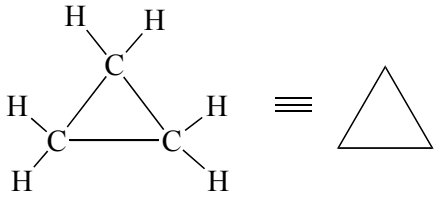
Ring Structures and Naming:

- Prefix with "cyclo".
- Start with numbering at point of maximum branches/most important functional group.
- Number so as to give next branch/functional group lowest number.

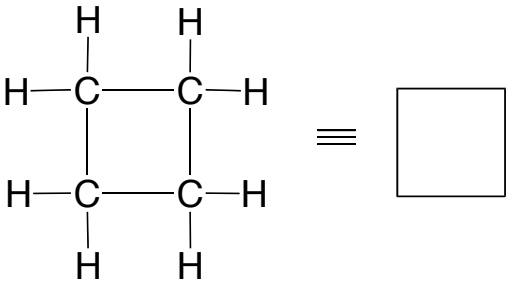
Cycloalkanes

Ex #1) Cyclopropane, C_3H_6

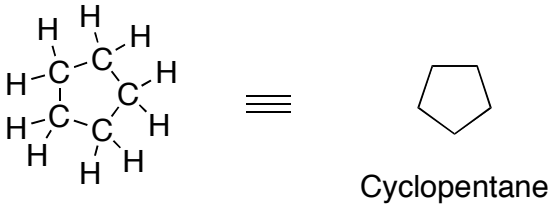


- C-C-C Bond angle (^{o}60)
- Highly reactive due to angle strain.

Ex #2) Cyclobutane, C_4H_8

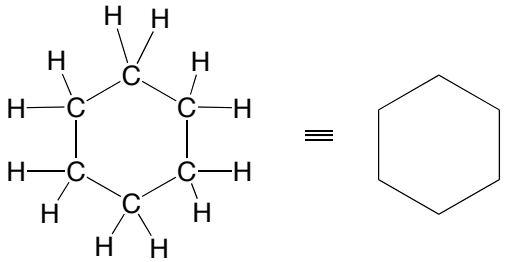


Ex #3) Cyclopentane, C_5H_{10}

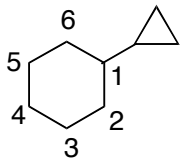


Cyclopentane

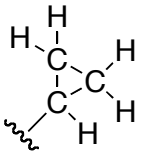
Ex #4) Cyclohexane, C_6H_{12}



Ex#5)

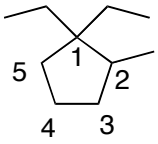


1-cyclopropylcyclohexane



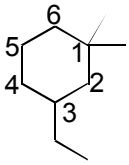
Cyclopropyl

Ex#6)



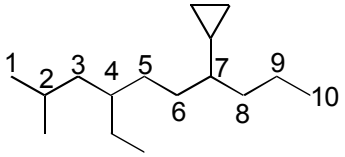
1,1-diethyl-2-methylcyclopentane

Ex#7)



1,1-Dimethyl-3-ethylcyclohexane

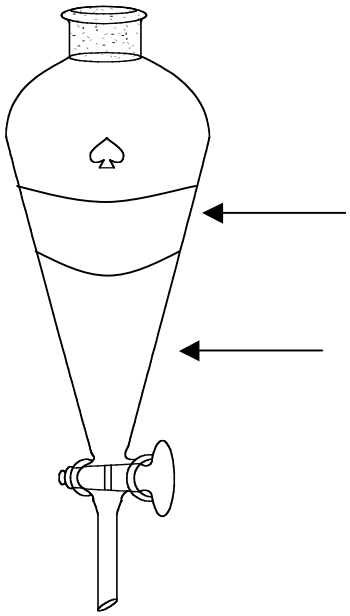
Ex#8)



7-cyclopropyl-4-ethyl-2-methyldecane

Physical Properties:

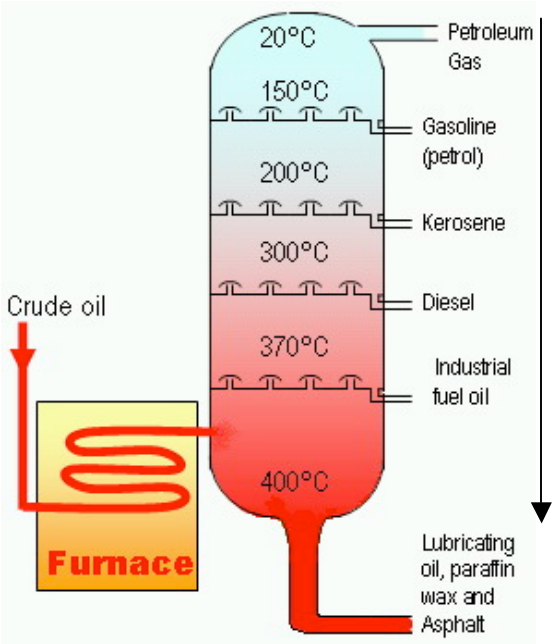
- hydrocarbons – alkanes are non-polar – H and C have similar electronegativity therefore there is no permanent dipole
- soluble in other organic solvents (like dissolves like)
- immiscible with water (not infinitely soluble in water)



Alkanes are less dense than water (0.65-0.75 g/mL)

Water (1.0 g/mL)

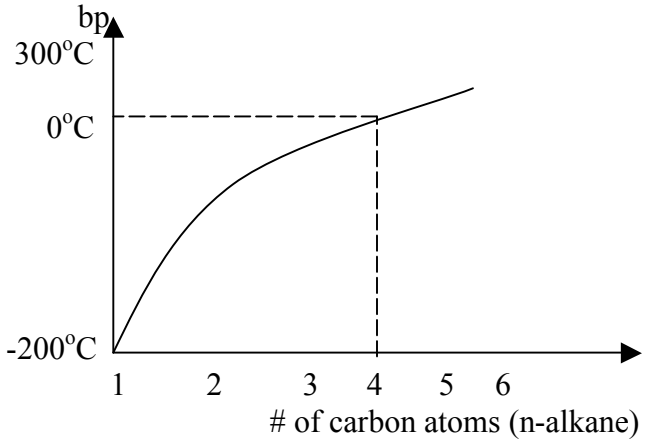
Distillation of Petroleum



cold

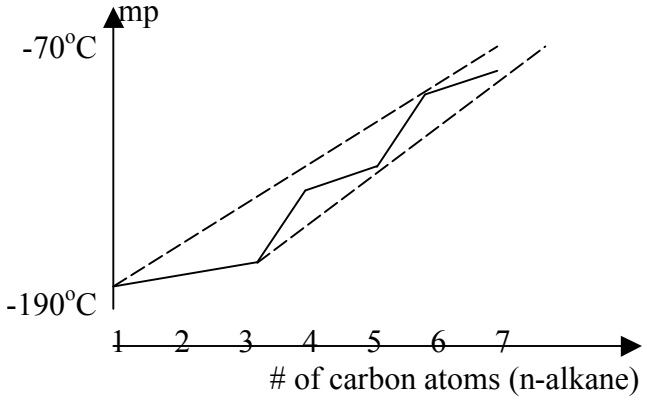
hot

Boiling point trend:



- increasing the straight chain length, increases the bp. This is due to London forces (hydrophobic forces) between the adjacent molecules.

Melting point trend:



- melting points are related to the crystal structure packing efficiency

eg. Pentane

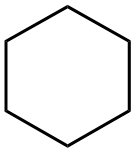
	mp (°C)	bp (°C)	
n-Pentane	-129	36	well packed
isopentane	-160	28	less well packed
neopentane	-13	9	"ball-like" shape, so B.P. comes down

- n-pentane has high bp due to multiple contacts of straight chains (London Forces)
- melting point of neopentane determined by good crystal packing of spherical shape

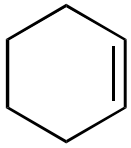
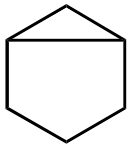
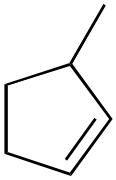
General Molecular Formula of Alkanes

- No rings: general formula is C_NH_{2N+2}
- Each deviation of 2 hydrogens from the C_NH_{2N+2} formula is a **degree of unsaturation**
- 1 Degree of unsaturation : C_NH_{2N}
- 2 Degrees of unsaturation : C_NH_{2N-2}

Ex.



C_6H_{12} 1 degree of unsaturation

C_6H_{10} 2 Degrees of unsaturation

The above three are structural (constitutional) isomers

Conformations

- Different 3-D shapes a molecule can assume by rotation around single bonds.

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