

Office Hours: M 1:30pm - 3:00pm
(in Park 169) W 11:00am - 12:00pm
or by appointment (email me)
or just email me with questions!

TA Hours w/ Sodtugs: T&Th 7:00pm - 8:00pm
(in Park )

Q-center: <https://www.brynmawr.edu/inside/offices-services/q-center/q-center-schedule>

Polarity and Intermolecular Forces

Drawing Organic Molecules

9/4/2026

No recitation this afternoon.

Molecular vs electron geometry

Molecular geometry – describes shape formed by the atoms

Electron geometry – describes shape formed by the electron groups (including the lone pairs!)

Molecule polarity

A molecule is polar if it has a *net dipole moment* – or exhibits permanent, partial charges on atoms due to polar bonds.

A molecule can have polar bonds, but be nonpolar overall!

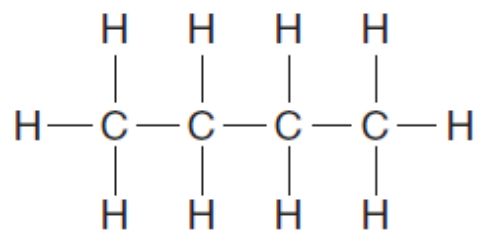
Intermolecular forces (IMF)

- Inter - molecular - forces -
- Forces that _____ a molecule _____
>> Its neighbor could be a different molecule than itself <<
- Determine many important physical properties of molecules!
 - Melting point, boiling point, solubility, affinity for SiO_2 (for chromatography)
- Crucial to biochemistry!
 - Protein folding, DNA helixes, epigenetic control of DNA, enzyme binding affinity, etc.
- IMF is always based on

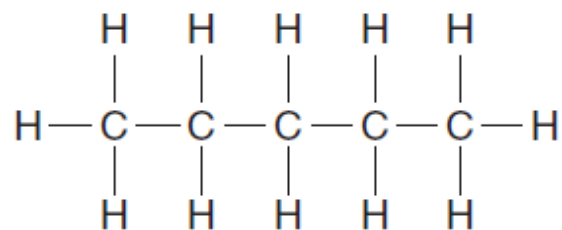
Common types of IMF, from strongest (top) to weakest (bottom)

Force	Cartoon	Energy (kJ/mol)	Example
Ionic (electrostatic)		400-4000	
H-bond		10-40	
Dipole-dipole		5-25	
Induced dipole- induced dipole (London Dispersion or just “Dispersion”)		0.05-40	

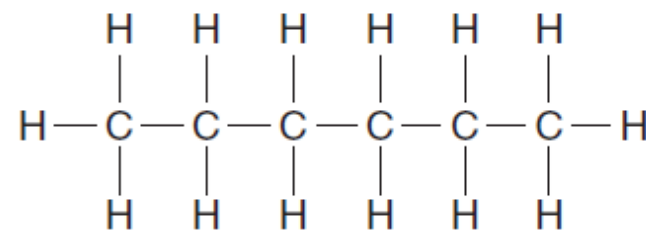
London Dispersion & Molecule Size



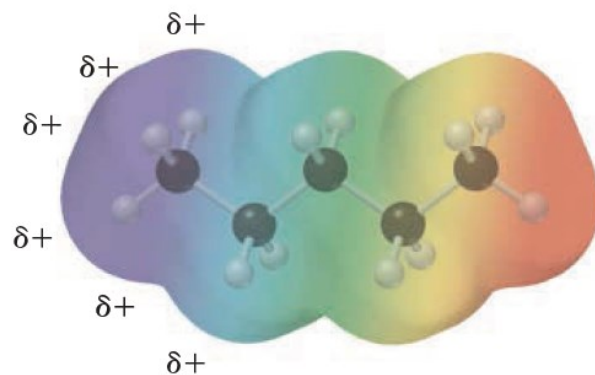
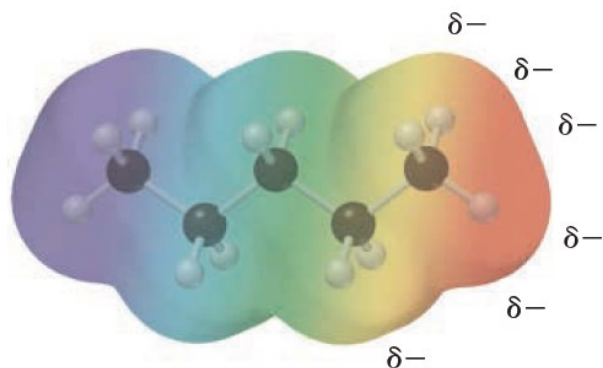
Butane
(C₄H₁₀)
Boiling point = 0°C



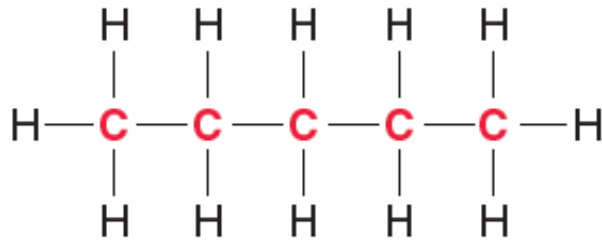
Pentane
(C₅H₁₂)
Boiling point = 36°C



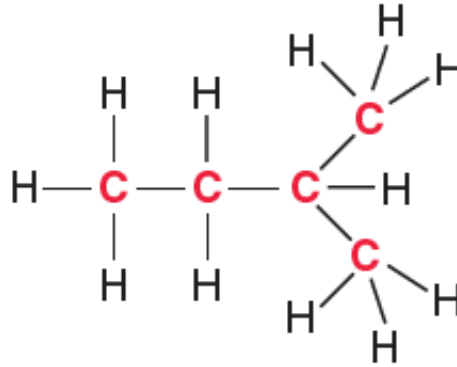
Hexane
(C₆H₁₄)
Boiling point = 69°C



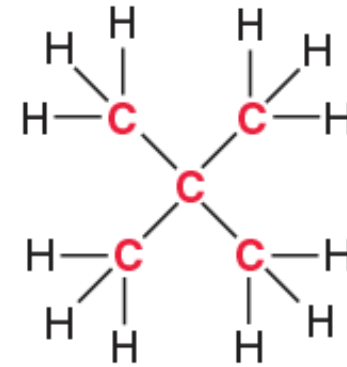
London Dispersion & Molecule Shape



Pentane
Boiling point = 36°C



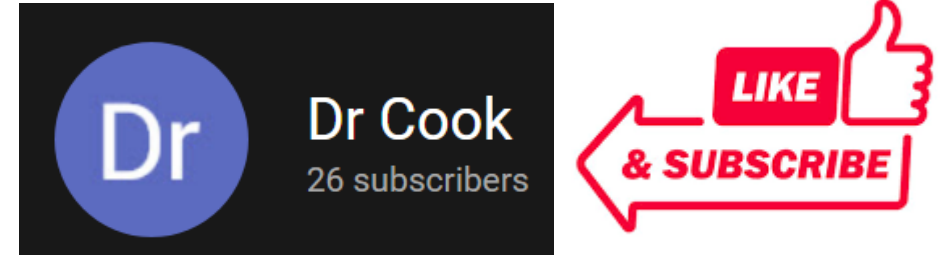
2-Methylbutane
Boiling point = 28°C



2,2-Dimethylpropane
Boiling point = 10°C

IMF & Physical properties

- Solubility – “like dissolves like”
- Melting point/boiling point
- Affinity for SiO_2 – in lab this week



Poll

Which molecule has the highest melting point?

A. CH_4

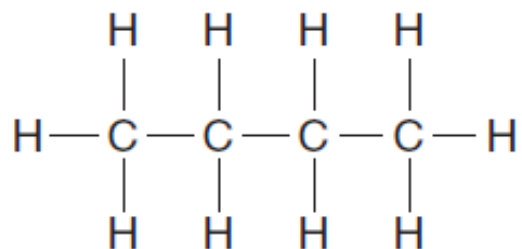
B. CCl_4

C. CH_3OH

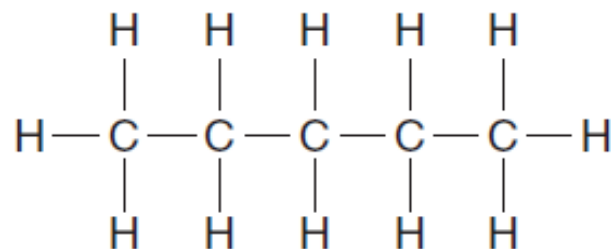
D. CH_3Cl

Extra practice: rank all 4 choices from lowest to highest boiling point.

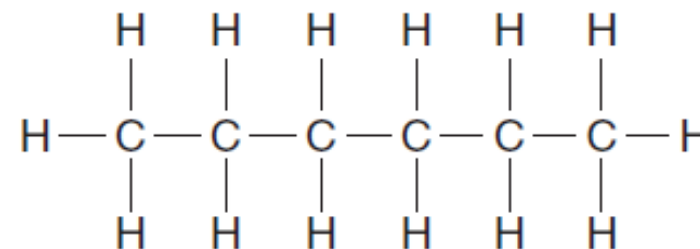
Drawing Molecules: Bond-Line Structures



Butane
(C₄H₁₀)



Pentane
(C₅H₁₂)



Hexane
(C₆H₁₄)

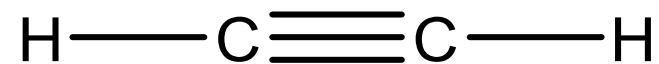
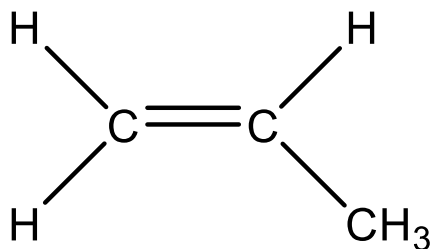
The longest Carbon chain is drawn in a “zig-zag” format

Carbons are represented as _____ or _____ of lines.

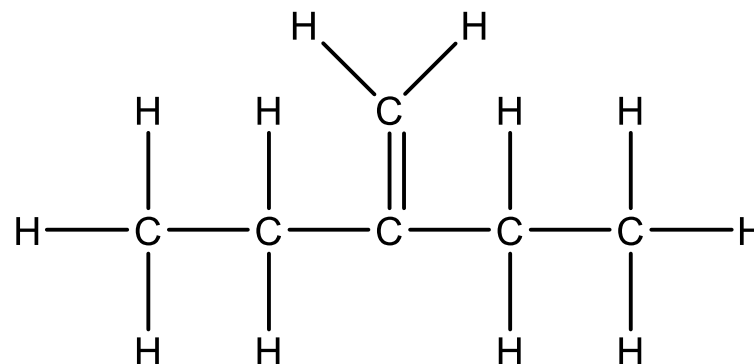
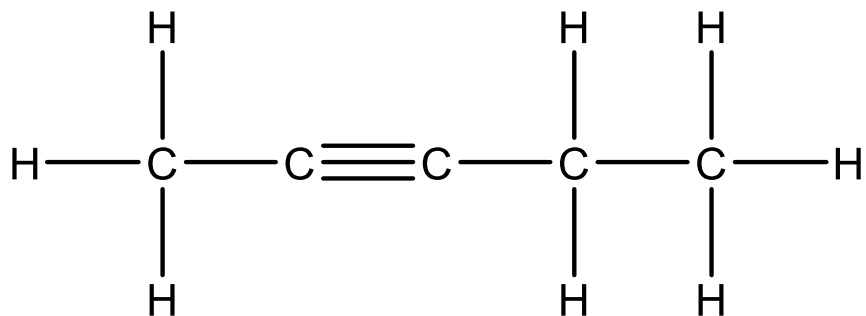
Hydrogens attached to Carbons are _____

[Assume each Carbon makes a total of _____ bonds to determine the number of implied Hydrogens]

Carbon-Carbon multiple bonds are shown with multiple lines

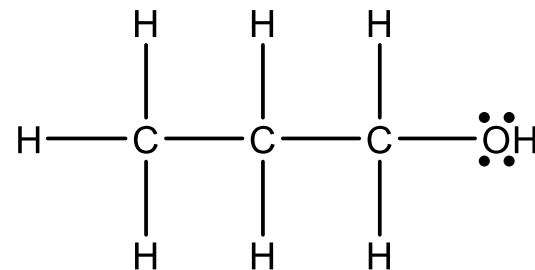
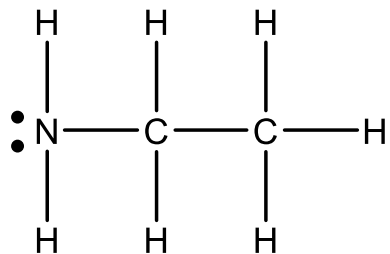


The [geometry](#) of the bond-line structure should reflect the [hybridization](#) of each carbon! (VSEPR)



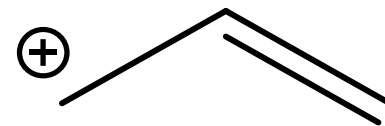
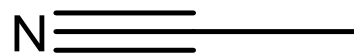
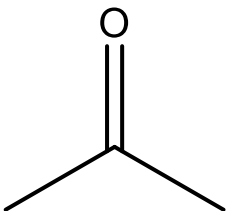
Heteroatoms (not C or H) are always drawn

Heteroatoms always have their number of H's labeled clearly



Lone pairs are not shown in bond-line structures, but

Formal charges are always shown.



Nonzero formal charges: Carbon

Carbon never makes more than 4 bonds, but sometimes it makes fewer:

Nonzero formal charges: Nitrogen

Nonzero formal charges: Oxygen