

Announcements

- Turn on the Clicker (the red LED comes on).
- Push “Join” button followed by “20” followed by the “Send” button (switches to flashing green LED if successful).
- Everyone is signed up for E-mail discussion. Yea!
- Quiz tomorrow on sections 11.9-12.3.
- If you've got questions please come see me. Reminder: my office hours are: 11:30-12:30 MW, 9:30-10:30 TThF or by appointment.
- First Exam on chapters 11 and 12, one week from Thursday.

Review

- ΔH_f° to calculate ΔH_{RXN}
 - Key relationship: $\Delta H_{RXN}^\circ = \sum \Delta H_f^\circ(\text{prod}) - \sum \Delta H_f^\circ(\text{react})$
- Turning ΔH_{RXN} into molar ΔH_{RXN} .
- Fuel values = kJ/g (get by dividing molar ΔH_{RXN} by molar mass)
- CO₂ efficiency (contribution to greenhouse effect) quantified by kJ/mol CO₂ released.
- Hess's law:
 - $\Delta H_{RXN} (A \rightarrow C) = \Delta H_{RXN} (A \rightarrow B) + \Delta H_{RXN} (B \rightarrow C)$

Chapter 12-Energy and Organic Chemistry

- Petroleum Refining (Raoult's law-9.6)
- Gasoline (Isomerism, Octane Rating, Nomenclature)
- Aromatic Hydrocarbons
- Reformulated gasoline (alcohols & ethers).
- Carbohydrates (Sugars, Condensation RXNs, Starch, Cellulose)
- Biomass fuels (Carboxylic acids and amines)
- Coal
- Hydrogen as a fuel
- Elemental analysis by combustion
- Alkenes and Alkynes (more organic nomenclature)

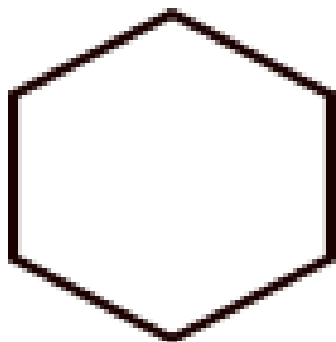
Figure 12.1

12_01.jpg

Cycloalkanes

- Named as **cyclo** + **prefix for # of C** + **ane**
- Formula: C_nH_{2n}

	normal (n-alkane) Bp	cycloalkane Bp
pentane	36.1 °C	49.3 °C
hexane	68.8 °C	80.8 °C



Cyclohexane



Cyclopentane

Naming Branched Alkanes

- 1) Find the longest chain (backbone).
- 2) Find the largest side group and number the backbone from the end nearest this side chain.
- 3) Use the numbers to indicate the positions of the side groups.
- 4) Alphabetize the side groups.

Fuel Values

Compound	Combustion Eq	Molar ΔH (kJ/mol)	Molar Mass (g)	Fuel Value (kJ/g)
CH_4 (Methane)	$\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{g})$	-802.3	16.04	50.02
C_2H_6 (Ethane)	$2\text{CH}_3\text{CH}_3(\text{g}) + 7\text{O}_2(\text{g}) \rightarrow 4\text{CO}_2(\text{g}) + 6\text{H}_2\text{O}(\text{g})$	-1428	30.07	47.49
$\text{C}_2\text{H}_5\text{O}$ (Ethanol)	$\text{CH}_3\text{CH}_2\text{OH}(\text{l}) + 3\text{O}_2(\text{g}) \rightarrow 2\text{CO}_2(\text{g}) + 3\text{H}_2\text{O}(\text{g})$	-1234.8	46.07	26.8
C_8H_{18} (Octane)	$2\text{C}_8\text{H}_{18}(\text{l}) + 25\text{O}_2(\text{g}) \rightarrow 16\text{CO}_2(\text{g}) + 18\text{H}_2\text{O}(\text{g})$	-4678	114.23	40.95
$\text{C}_6\text{H}_{12}\text{O}_6$ (glucose)	$\text{C}_6\text{H}_{12}\text{O}_6(\text{s}) + 6\text{O}_2(\text{g}) \rightarrow 6\text{CO}_2(\text{g}) + 6\text{H}_2\text{O}(\text{g})$	-2537	180.16	14.08
H_2	$2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{H}_2\text{O}(\text{g})$	-241.8	2.02	120

Alcohols and Ethers

- Alcohols (C-O-H)
 - Name by replacing -ane of the corresponding alkane with -ol.
- Examples:
 - CH_3OH = methanol
 - $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ = propanol

- Ethers (C-O-C)
 - Name by placing the names of the two alkyl groups in alphabetical order before the word ether.
 - Ignore the prefixes tert-, iso- and sec-.
- Examples
 - tert-butyl methyl ether
 - $(\text{CH}_3)_3\text{COCH}_3$