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).

- Some still need to sign up for e-mail list. You are required to do it to pass the course.
- Some private tutors are now available. I have posted contact info on class web site.

- Quiz tomorrow includes: ΔH_{RXN} from bond energies & ΔH^{o}_{f}, comparison of fuels (fuel values), Hess's Law calculations, from today's lecture petroleum refining and naming of branched alkanes.
- First Exam on first two sections one week from Thursday. I will post a sample exam and its answer key in the near future.
  - Still need to sign up for e-mail list: Adam,Jason R.; Aguirre,Deseray E.; Borgwardt,Amanda M.; Chang,Vang H.; Conti,Alyssa L.; Ebben,Louise E; Ignaczak,Theresa S.; Jeffrey,Brad M.; Koepke,Jacqueline L.; Larson,Charlee R.; Marshall,Melissa C.; Mueller,Peter S.; Parker,Jennifer M; Robson Domin,Ashley J.; Tilque,Kayla L.; Vorpahl,Kyle A
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Review

- ΔH^o_f to calculate ΔH_{RXN}
  - Key relationship: $\Delta H^o_{RXN} = \sum \Delta H^o_f(prod) - \sum \Delta H^o_f(react)$
- Turning ΔH_{RXN} into molar ΔH_{RXN}.
- Fuel values = kJ/g (get by dividing molar ΔH_{RXN} by molar mass)-also kJ/mL.
- CO_2 efficiency (contribution to greenhouse effect)
  - quantified by kJ/mol CO_2 released
  - Sometimes see intensity = mol CO_2/kJ.
- Hess's law:
  - ΔH_{RXN} (A --> C) = ΔH_{RXN} (A --> B)+ ΔH_{RXN} (B --> C)

Energy and Organic Chemistry

- Petroleum Refining (Raoult's Law 13.6)
- Gasoline (isomerism, octane rating, nomenclature)
- Aromatic Hydrocarbons
- Reformulated Gasoline (alcohols and ethers)
- Carbohydrates (sugars, starch, cellulose, condensation RXNs).
- Biomass fuels (carboxylic acids and amines)
- Coal
- Review of Hydrogen as fuel
- Alkenes and Alkynes

Fossil Fuels Handout
Figure 1.

Naming “Normal” Alkanes (>10)

Named systematically using Greek prefixes:

Greek Prefix for (#C-10) + decane

# C -10	Prefix
1	Un-
2	Do-
3	Tri-
4	Tetra-
5	Penta-
6	Hexa-
7	Hepta-
8	Octa-
9	Nona-

- 20 carbon chain is called eicosane

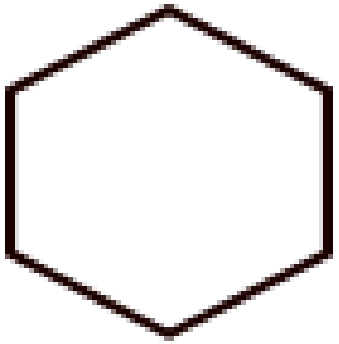
Example: hexadecane or n-hexadecane

$H_3CCH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_3$

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

Chang table 11.2

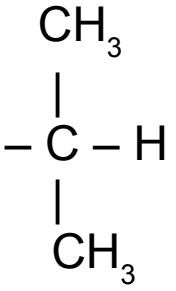
1) Find the longest chain (backbone).
2) Find the largest side group and number the backbone from the end nearest this side chain.
3) Use the numbers to indicate the positions of the side groups.
4) Alphabetize the side groups.

Methyl $-CH_3$

Ethyl $-CH_2CH_3$

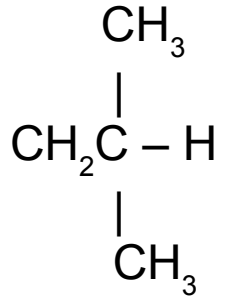
n-Propyl $-CH_2CH_2CH_3$

Isopropyl



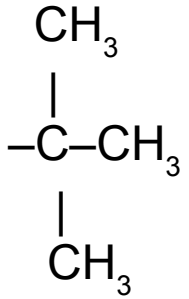
n-Butyl $-CH_2CH_2CH_2CH_3$

Isobutyl



secondary-Butyl (sec-Butyl)

tertiary-Butyl (t-Butyl)



Fuel Values

Compound	Combustion Eq	Molar ΔH (kJ/mol)	Molar Mass (g)	Fuel Value (kJ/g)
CH_4 (Methane)	$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$	-802.3	16.04	50.02
C_2H_6 (Ethane)	$2CH_3CH_3(g) + 7O_2(g) \rightarrow 4CO_2(g) + 6H_2O(g)$	-1428	30.07	47.49
C_2H_6O (Ethanol)	$CH_3CH_2OH(l) + 3O_2(g) \rightarrow 2CO_2(g) + 3H_2O(g$	-1234.8	46.07	26.8
C_8H_{18} (Octane)	$2C_8H_{18}(l) + 25O_2(g) \rightarrow 16CO_2(g) + 18H_2O(g$	-4678	114.23	40.95
$C_6H_{12}O_6$ (glucose)	$C_6H_{12}O_6(s) + 6O_2(g) \rightarrow 6CO_2(g) + 6H_2O(g)$	-2537	180.16	14.08
H_2	$2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$	-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
  - $CH_3CH_2CH_2OH$ = 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
  - $(CH_3)_3COCH_3$