HEMISTRY DAILY PLAN

Class: **Date:**

Subject: ***Physical Properties of Alkanes*** **Time:**

The alkanes are insoluble in water. The reason is that water molecules are polar and attract one another. Alkanes are non-polar. There are only Van Der Waals forces between alkane molecules. Therefore, 'the attractive forces between molecules are weak.

Alkanes have lower boiling points for a given molecular weight than most other organic compounds because of weak Van Der Waals forces. The boiling point is directly related to the molecular weight. The boiling points of linear alkanes increase regularly with an increasing number of carbon atoms. Branching of the carbon chain lowers the boiling point of the alkane.

The lower molecular weight alkanes, methane through butane, are gases at ordinary temperatures and pressures. The C_5 to C_{17} alkanes are liquids at room temperature, and alkanes containing more than C_{17} are solids at room temperature.

Extra for Students:

Petroleum Refining

The first step in refining petroleum is usually distillation. The crude oil is heated to about 400 ^oC and the vapors rise through a tall fraction column. The lower boiling fractions rise faster and higher in the column before condensing to liquids, higher boiling fractions do not rise so high. By drawing off liquid at various column level, technicians separate crude oil roughly into the fractions.

Boiling Range of Fractions ^oC	Number of Carbon Atoms Per Molecule	Use
Below 20^o	$C_1 - C_4$	Natural gas, bottled gas, petrochemicals
$20–60^o$	$C_5 - C_6$	Petroleum ether, solvents
$60–100^o$	$C_6 - C_7$	Ligroin, solvents
$40–200^o$	$C_5 - C_{10}$	Gasoline (straight-run gasoline)
$175–325^o$	$C_{12} - C_{18}$	Kerosene and jet fuel
$250–400^o$	C_{12} and higher	Gas oil, fuel oil, and diesel oil
Nonvolatile Liquids	C_{20} and higher	Refined mineral oil, lubricating oil, grease
Nonvolatile Solids	C_{20} and higher	Paraffin wax, asphalt, and tar

Octane Number

The ability of a gasoline to perform well in an engine is given by its octane number. 2,2,4-trimethylpentane ("isooctane") burns very smoothly (without knocking) in internal engines and is used as one of the standards by which the octane rating of gasoline is established. According to this scale 2,2,4- trimethylpentane has an octane rating of 100. Heptane a compound that produces much knocking when it is burned in an internal combustion engine is given an octane rating of zero. Mixtures of 2,2,4- trimethylpentane and heptane are used as standards for octane ratings in between zero and 100. A gasoline, for example, that has the mixture of 90% 2,2,4- trimethylpentane – 10% heptane would be rated as 90-octane gasoline. The addition of small amounts of tetraethyl lead, $(CH_3CH_2)_4Pb$ to gasoline improves its octane rating but it is undesirable for environmental reasons.