Name_____

AP Chemistry Review Questions

Integrating Content, Inquiry and Reasoning

1. Hydrocarbons are nonpolar compounds containing carbon and hydrogen atoms. The properties of three hydrocarbons are summarized below.

Methane	Octane	Eicosane
CH_4	C_8H_{18}	$CH_3(CH_2)_{18}CH_3$
Natural gas	Gasoline	Lubricant (grease)
Gas, bp –161 °C	Liquid, bp 126 °C	Solid, mp 37 °C

  a. How do the attractive forces between molecules change in the transition from the gas to the liquid to the solid state?

  b. Based on its properties, which compound has the strongest attractive forces? The weakest attractive forces?

  c. Write a general statement describing how the size of a molecule influences the strength of London dispersion forces between molecules.

2. Dyes are organic compounds that can be used to impart bright, permanent colors to fabrics. The affinity of a dye for a fabric depends on the chemical structures of the dye and fabric molecules and also on the interactions between them. Three common fabrics are wool, cotton and nylon. Wool is a protein, a naturally occurring polymer made up of amino acids with ionized (charged) side chains. Cotton is a naturally occurring polymer made up of glucose units with hydrophilic groups surrounding each glucose unit. Nylon is a synthetic polymer made of hydrocarbon repeating chains joined together by highly polar amide (–CONH–) functional groups.

  a. The chemical structure of methyl orange is drawn below. Identify the groups in the dye that will bind to ionic and polar sites in a fabric.
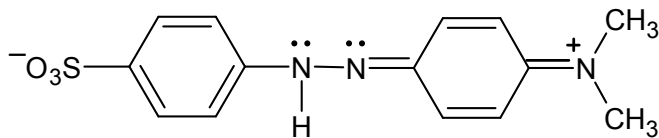
  b. Complete the following "If/then" hypothesis to explain how the structure of a fabric will influence the relative color intensity produced by methyl orange.

  "If a fabric contains more ionic and polar groups in its structure, then the intensity of the dye color due to methyl orange should (increase/decrease), because _____

_____."

  c. Using this hypothesis, predict the relative color intensity that would be produced by methyl orange on cotton, nylon and wool. Rank the fabrics from 1 = lightest color to 3 = darkest color.