KEY

Chapter 2: Alkane Test

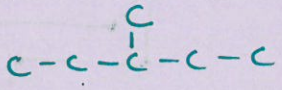
35 Questions (54pts)

1. You need to know and be able to use the generic formulas for: (2 Questions)

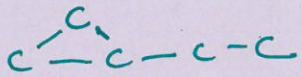
- Acyclic alkanes: $C_nH_{(2n+2)}$
- Cycloalkanes: C_nH_{2n}

2. You need to be able to name organic compounds and draw the correct structure given the name. (10 Questions)

- Name an acyclic molecule with 8 carbon atoms in its longest chain: octane
- Name a cycloalkane with 9 carbons: cyclononane
- Draw a 3-methylpentane:

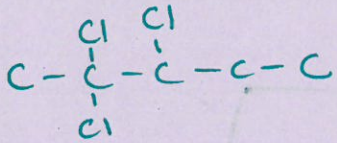


- Draw a 1-ethylcyclopropane

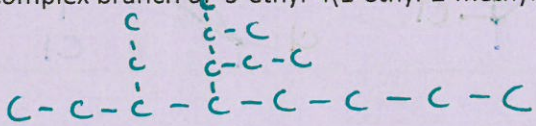


3. You need to be able to name complex branches and halogen substitutions. (7 Questions)

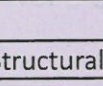
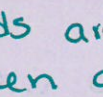
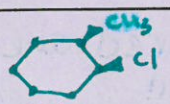
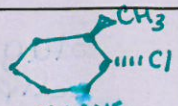
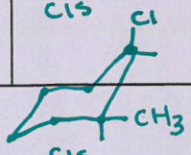
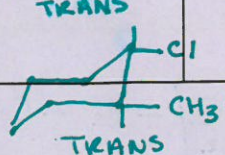
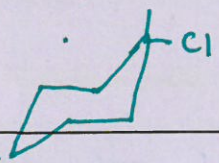
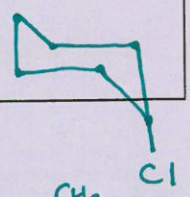
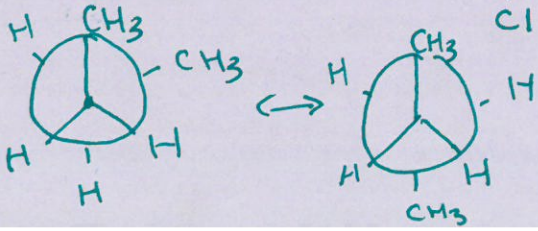
- Draw 2,2,3-trichloropentane



- Draw the complex branch of 3-ethyl-4(1-ethyl-2-methylpropyl)octane

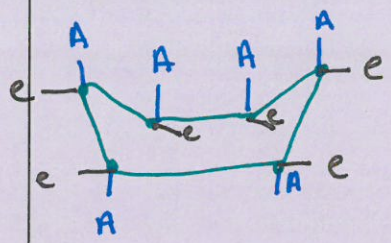
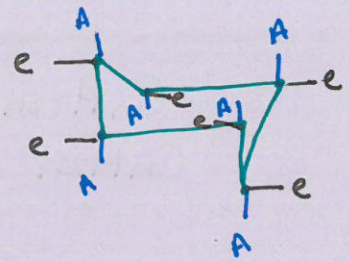
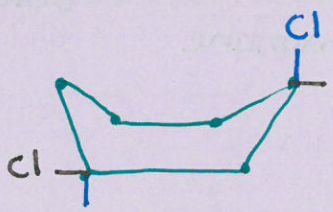
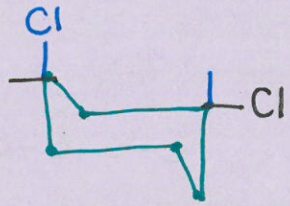
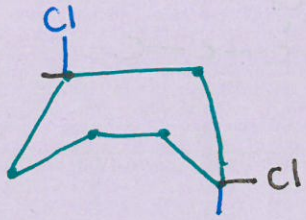
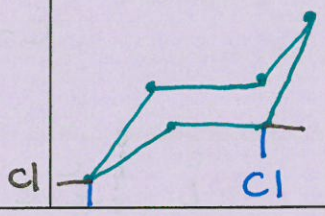


4. Fill in the table below regarding isomers: (6 Questions)

	Types of Isomers		
	Structural	Configuration	Conformer
How do these form? (How do you recognize them)	Bonds are broken and are reformed. *Different names/numbers	• cis - same - top/top, bottom/bottom • trans - opposite - top/bottom	• Axial (Extends above/below the ring). • Equitorial (lies in plane of the ring). • Rotation of Newman projection
Example	 1-iodopropane  2-iodopropane	 CIS  TRANS  CIS  TRANS	 ring flip  

5. Boiling Points: See Review Questions 5 and 6 from notes. (2 Questions)

6. Boats and Chairs (2 Questions)

	Draw a Boat	Draw a Chair
Label Each with Axial and Equatorial Markings		
Put a Chlorine atom on Carbon 1 Axial and Carbon 3 Equatorial.		
Are the molecules Cis/Trans?	CIS	TRANS
Ring flip the molecule. Does that change the initial Cis/Trans label? no!		

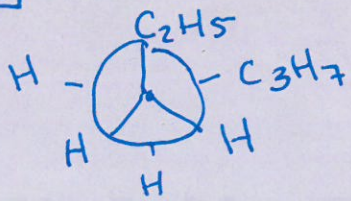
7. Hydrogen Bonding: (1 Question)

- What molecules do not engage in hydrogen bonding? Why? Alkanes - nonpolar H-C bonds
  - Is there another force at play? Van Der Waals Forces
- What molecules do engage in hydrogen bonding? Why? Polar molecules like O-H with high electronegativity differences.

8. Newman Projections:

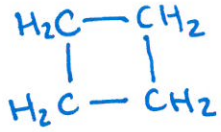
- How does stability tie into Newman projections? staggered are more stable than eclipsed
- Draw a Newman projection of heptane using Carbon 3 and 4 as a lens. (3 Questions)

$$C - C - \boxed{C_1 - C_2} - C - C - C$$



9. Combustion Reactions (1 Question)

- Write the equation for the combustion of cyclobutane using abbreviated formula.



$$+ O_2 \xrightarrow[\text{light}]{\text{heat}} CO_2 + H_2O + \text{heat}$$

10. Oxidation (1 Question)

- How do you calculate oxidation levels?

$$\frac{\#\ C-O\ \text{bonds}}{\#\ \text{Carbon}}$$

11. Halogenation (4 Questions)

- Write the overall equation for the monofluorination of butane. $CH_3(CH_2)_2CH_3 + F_2 \xrightarrow[\text{light}]{\text{heat}} HF + CH_3(CH_2)_2CH_2F$
- Show me labeling each step, initiation, propagation, and termination the monofluorination of butane.

Initiation: $F-F \xrightarrow[\text{light}]{\text{heat}} F\cdot + F\cdot$

Propogation: $F\cdot + H-CH_2(CH_2)_2CH_3 \rightarrow HF + \cdot CH_2(CH_2)_2CH_3$

$\cdot CH_2(CH_2)_2CH_3 + F-F \rightarrow CH_2F(CH_2)_2CH_3 + \cdot F$

Termination:

$\cdot F + \cdot F \rightarrow F_2$

$\cdot CH_2(CH_2)_2CH_3 + \cdot CH_2(CH_2)_2CH_3 \rightarrow CH_3(CH_2)_6CH_3$

$\cdot F + \cdot CH_2(CH_2)_2CH_3 \rightarrow CH_2F(CH_2)_2CH_3$

- Write the overall equation for the complete fluorination of butane.

$$CH_3(CH_2)_2CH_3 + F_2 \xrightarrow[\text{light}]{\text{heat}} HF + CF_3(CF_2)_2CF_3$$