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<u>1. (20 Points)</u>

(a) Draw the Lewis structures for as many isomers as you can think of for the composition $CH_2N_2.$

(b) For each Lewis structure draw as many resonance forms as you can that obey the octet rule about carbon and nitrogen and the duet rule about hydrogen. Indicate clearly the valence electrons around each C and N atom and formal charges.

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2. (20 Points)

Consider the composition C₄H₁₀.

(a) Draw all of the structures of isomers which correspond to the composition.

(b) Rank the boiling points of the substances corresponding to each structure from lowest (on the left) to highest (on the right).

Lowest boiling

Highest boiling

(c) Explain the reasoning behind your ranking of the boiling points.

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3. (20 Points)

Draw clearly the structures of each of the following cyclohexanes and identify the more stable stereoisomer in each of the following pairs by drawing a circle around the structure. Give the reason for your choice for full ecredit:

(a) cis-1-isopropyl-2-methylcyclohexane or trans-1-isopropyl-2-methylcyclohexane

(b) cis-1-isopropyl-3-methylcyclohexane or trans-1-isopropyl-3-methylcyclohexane

(c) cis-1-isopropyl-4-methylcyclohexane or trans-1-isopropyl-4-methylcyclohexane

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4. (<u>20 Points</u>)

Among the isomeric alkanes of composition $C_5H_{12,}$ identify the one that on photochemical chlorination yields:

(a) a single monochloride

(b) three isomeric monochlorides

(c) four isomeric monochlorides

(d) two isomeric dichlorides

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5. (<u>20 points</u>)

Select the compound in each of the following pairs that will be converted to the corresponding alkyl bromide more rapidly on being treated with HBr. Explain the reason for your choice in each case in terms of the mechanism you are assuming occurs for the reactions.

(a) 1-butanol or 2-butanol

(b) 2-methyl-1-butanol or 2-butanol

(c) 1-methylcyclopentanol or cyclohexanol

(d) 1-ethylcyclopentanol or 1-cyclopentylethanol