

Name Key (print) Name _____ (sign)

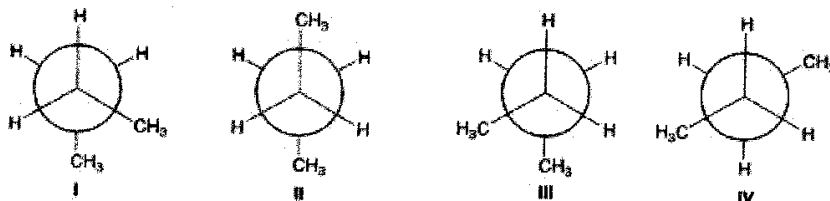
Please show work for partial credit and full credit on the Long Answers and in some of the Short Answer Questions. Multiple choice questions have no partial credit. Please write anything you want graded legibly. If you run out of space, continue on the empty back pages but clearly label where the remaining answer can be found. (If I can't find your answer or cannot read it, I obviously cannot grade it). Return your entire exam including the periodic table. (Please count your exam pages and make sure there are real pages + periodic table)

It is your responsibility **to return the entire exam package** (with periodic table assembly inside the rest of the exam) **directly into Dr. Hahn's hands**. If you do not and the exam disappears or sits around for days NOT in Dr. Hahn's possession, that exam will count as an UNEXCUSED missed exam.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (2 pts each, ' pts total)

1) Which of the following are *anti* conformers?

1) D



A) II and III

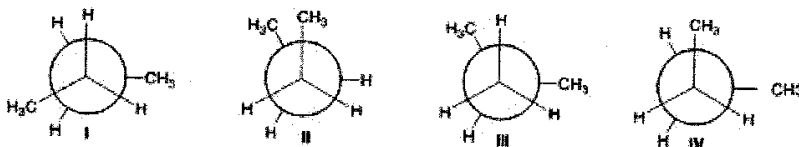
B) I and IV

C) I and II

D) II and IV

2) Which of the following conformers has the highest energy?

2) B



A) I

B) II

C) III

D) IV

3) Which of the following statements about constitutional isomers is *not* true?

3) B

A) They have different IUPAC names.

B) They always have the same functional groups.

C) They have different chemical properties.

D) They have different physical properties.

4) How many stereogenic centers are present in the following compound?

4) B



A) 1

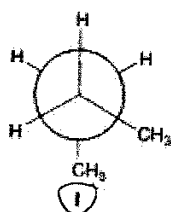
B) 2

C) 3

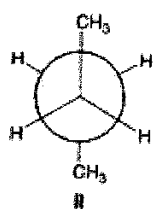
D) 4

5) Which of the following are *gauche* conformers?

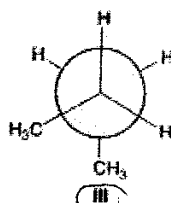
5) B



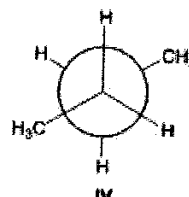
A) II and IV



B) I and III



C) I and II



D) II and III

6) What is the hybridization of a carbon atom in an alkane?

A) sp^2

B) sp

C) sp^3

D) p

6) C

7) What is the relationship between the following two compounds?

7) C



and



A) Constitutional isomers

B) Identical

C) Stereoisomers

D) Not isomers, different compounds

8) What is the relationship between the following two compounds?

8) A



and



A) Constitutional isomers

B) Identical

C) Stereoisomers

D) Not isomers, different compounds

9) If an acyclic alkane hydrocarbon contains n carbon atoms, how many hydrogen atoms must it also contain?

A) $n + 2$

B) $2n + 2$

C) $n - 2$

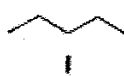
D) $2n$

E) n

9) B

10) Rank the following alkanes in order of decreasing boiling point, putting the alkane with the highest boiling point first.

10) C



A) II > III > I



B) I > II > III



C) I > III > II

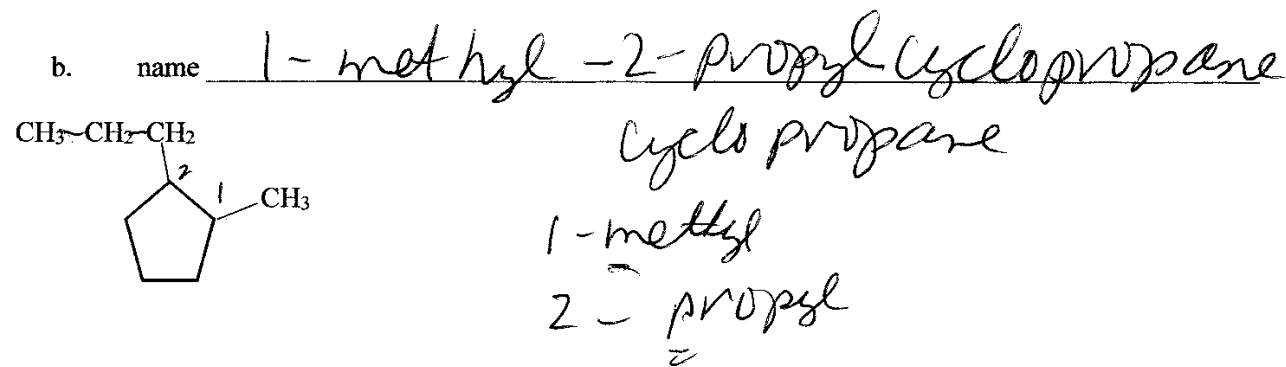
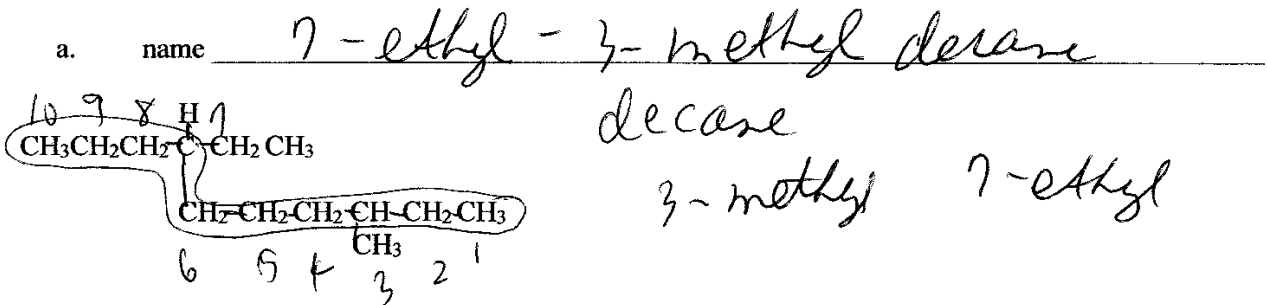
D) III > II > I

packs better - more VDW interaction

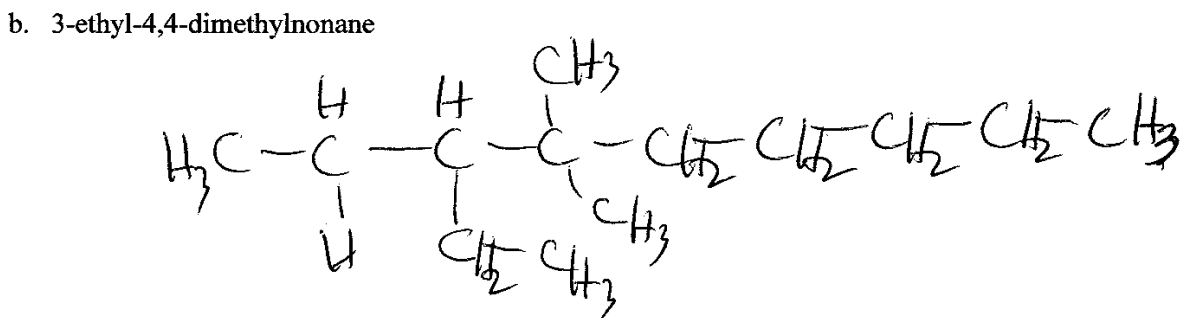
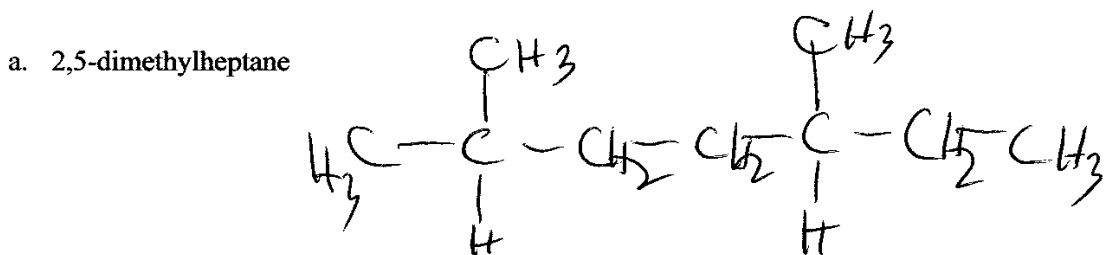
Part II: Short Answers (42 pts) Show work on all questions for partial and full credit even on questions which do not specify.

A. Nomenclature: (8 pts total, 2 pts each)

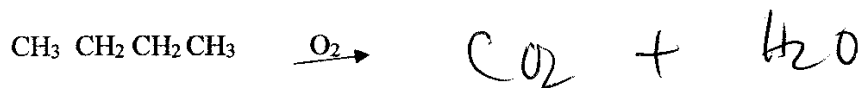
1. Given the structural formula shown below, give the IUPAC name of the molecule.



2. Given the following IUPAC name, draw a structural formula of the molecule (skeletal formula acceptable, condensed structure, Lewis Dot structure acceptable, molecular formula not acceptable - **don't forget to show the hydrogens** in your formula unless you are using the skeletal structure.)

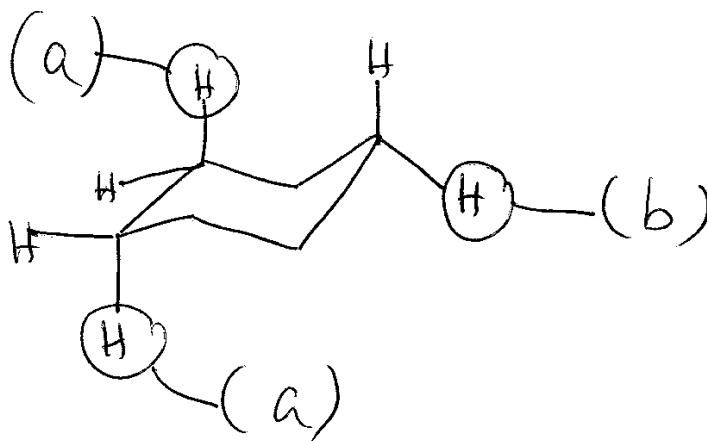


B. Reactions: Complete the following reaction by giving the product structural formula. Reaction does not need to be balanced. (6 pts)



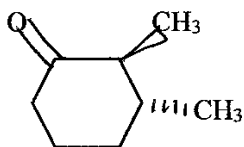
C. Short Answer: (28 pts)

1 Given the following drawing of the chair form of cyclohexane: label the blanks with either (a) or (b). (a) axial hydrogen (b) equatorial hydrogen (12 pts, 4 pts per blank)

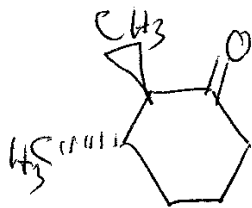


2 Given the following 3 D structure of molecules containing chiral carbon, draw the mirror image. (6 pts, 3 pts each)

a.

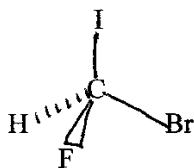


mirror

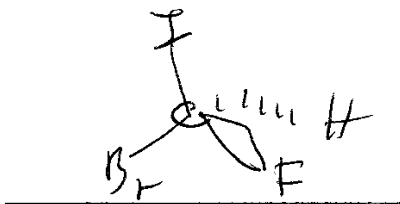


mirror image

b.

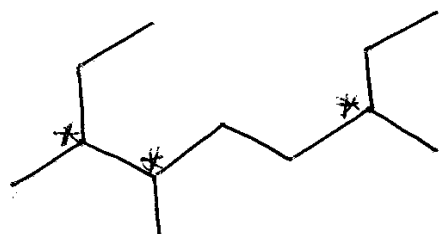


mirror



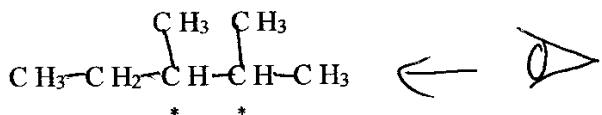
mirror image

3 Given the following molecule, put a * by all stereogenic centers (chiral center) (6 pts, 2 pts each)

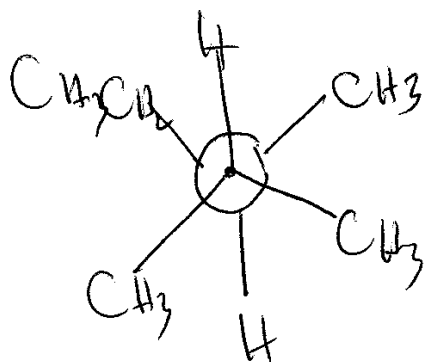


Part III: Long Answers (38 pts) Show work on all questions for partial and full credit even on questions which do not specify.

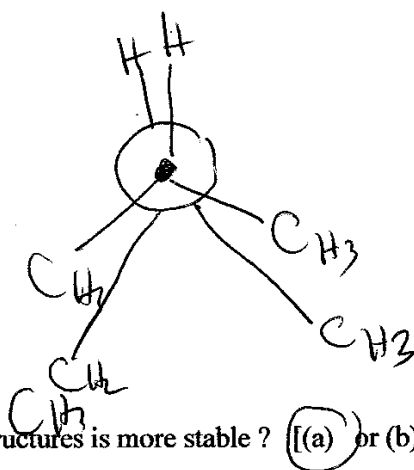
1. Given the following molecule draw the Newman projection formula for the molecule shown. Between the 2 carbons with the *. Please note the location of the eye. (18 pts)



- a. Draw a staggered form. (6 pts)



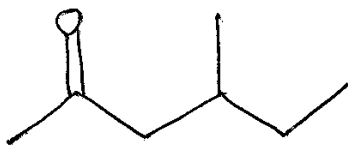
- b. Draw an eclipsed form (6 pts)



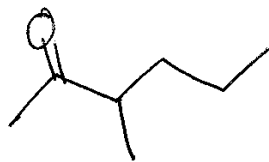
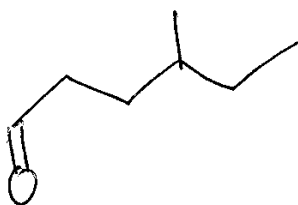
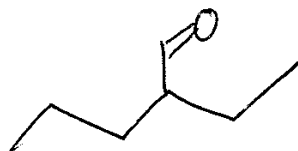
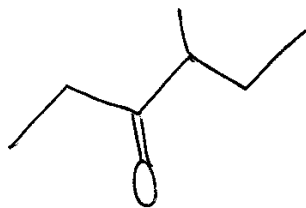
- c. Which of your two structures is more stable? [(a)] or (b) (circle one) (6 pts)

2. Given the following molecule, give 4 constitutional isomer. (20 pts, 5 pts each)

(7c)



↓ many more



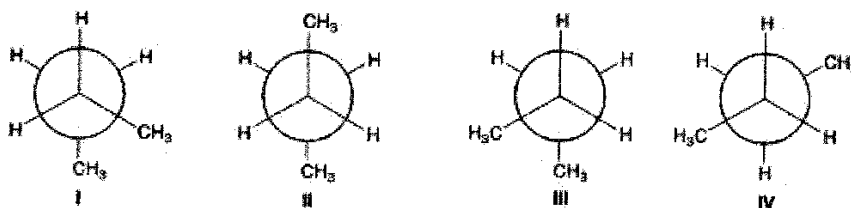
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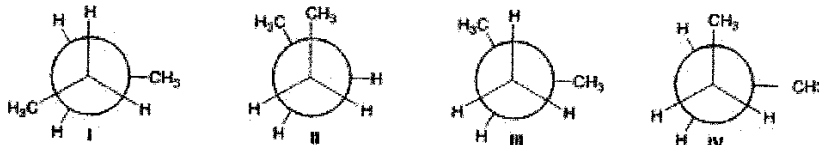
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (2 pts each, 'pts total)

1) Which of the following are *anti* conformers? _____



- A) II and III B) I and IV C) I and II D) II and IV

2) Which of the following conformers has the highest energy? _____

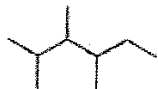


- A) I B) II C) III D) IV

3) Which of the following statements about constitutional isomers is *not* true? _____

- A) They have different IUPAC names.
 B) They always have the same functional groups.
 C) They have different chemical properties.
 D) They have different physical properties.

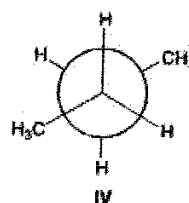
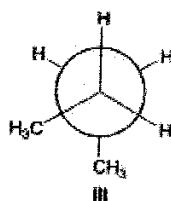
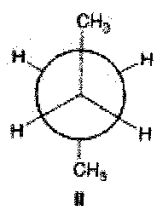
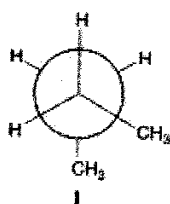
4) How many stereogenic centers are present in the following compound? _____



- A) 1 B) 2 C) 3 D) 4

5) Which of the following are *gauche* conformers?

5) _____



A) II and IV

B) I and III

C) I and II

D) II and III

6) What is the hybridization of a carbon atom in an alkane?

A) sp^2

B) sp

C) sp^3

D) p

6) _____

7) What is the relationship between the following two compounds?

7) _____



and



A) Constitutional isomers

B) Identical

C) Stereoisomers

D) Not isomers, different compounds

8) What is the relationship between the following two compounds?

8) _____



and



A) Constitutional isomers

B) Identical

C) Stereoisomers

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9) If an acyclic alkane hydrocarbon contains n carbon atoms, how many hydrogen atoms must it also contain?

9) _____

A) $n + 2$

B) $2n + 2$

C) $n - 2$

D) $2n$

E) n

10) Rank the following alkanes in order of decreasing boiling point, putting the alkane with the highest boiling point first.

10) _____



A) II > III > I

B) I > II > III

C) I > III > II

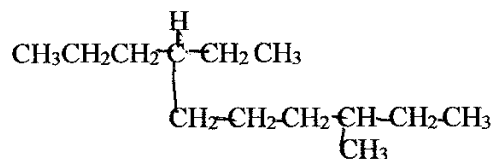
D) III > II > I

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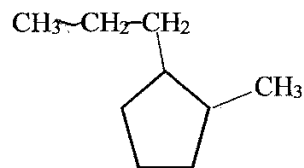
A. Nomenclature: (8 pts total, 2 pts each)

1. Given the structural formula shown below, give the IUPAC name of the molecule.

a. name _____



b. name _____

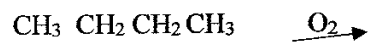


2. Given the following IUPAC name, draw a structural formula of the molecule (skeletal formula acceptable, condensed structure, Lewis Dot structure acceptable, molecular formula not acceptable - **don't forget to show the hydrogens** in your formula unless you are using the skeletal structure.)

a. 2,5-dimethylheptane

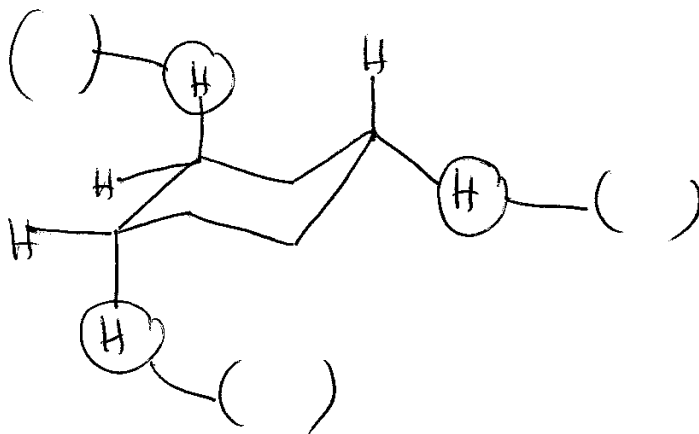
b. 3-ethyl-4,4-dimethylnonane

B. Reactions: Complete the following reaction by giving the product structural formula. Reaction does not need to be balanced. (6 pts)



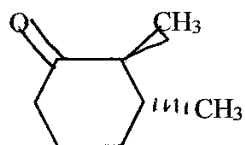
C. Short Answer: (28 pts)

1 Given the following drawing of the chair form of cyclohexane: label the blanks with either (a) or (b). (a) axial hydrogen (b) equatorial hydrogen (12 pts, 4 pts per blank)



2 Given the following 3 D structure of molecules containing chiral carbon, draw the mirror image. (6 pts, 3 pts each)

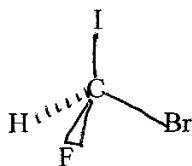
a.



mirror

mirror image

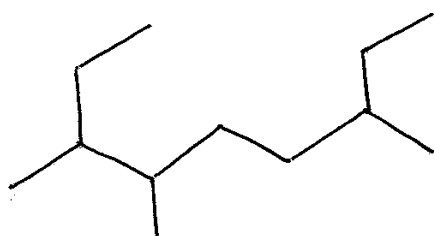
b.



mirror

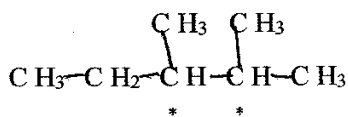
mirror image

3 Given the following molecule, put a * by all stereogenic centers (chiral center) (6 pts, 2 pts each)



Part III: Long Answers (38 pts) Show work on all questions for partial and full credit even on questions which do not specify.

1. Given the following molecule draw the Newman projection formula for the molecule shown. Between the 2 carbons with the *. Please note the location of the eye. (18 pts)



a. Draw a staggered form. (6 pts)

b. Draw an eclipsed form (6 pts)

c. Which of your two structures is more stable? [(a) or (b)] (circle one) (6 pts)

2. Given the following molecule, give 4 constitutional isomer. (20 pts, 5 pts each)

