

Seat No. _____

LAST NAME WST

Section A

FIRST NAME _____

There are 7 pages to this exam. Check to make sure you have a complete exam.

PLEASE ALSO PRINT YOUR NAME ON THE TOP OF
THE BACK OF THE LAST PAGE OF THE EXAM

CHEMISTRY 331

EXAM I

Fall 2007 (9/11/07)

I. (22 points) _____

II. (20 points) _____

III. (9 points) _____

IV. (6 points) _____

V. (6 points) _____

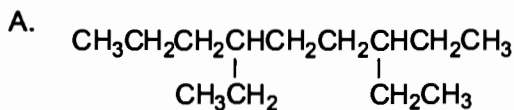
VI. (14 points) _____

VII. (23 points) _____

TOTAL (100 points) _____

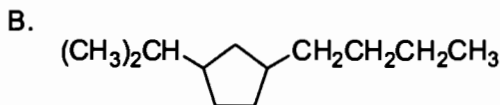
Seniors will not be excused from final.

I. (22 points). Give IUPAC names for the following compounds.

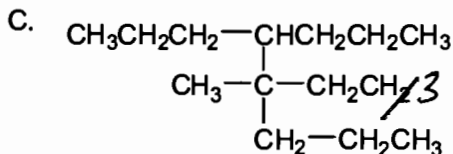


1 pt substituents
1 pt numbering
1 pt parent

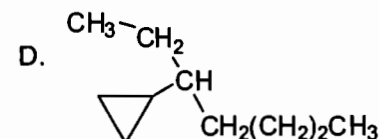
3,6-diethylnonane



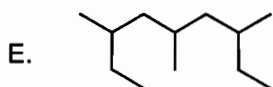
1-butyl-3-isopropylcyclopentane



4-ethyl-4-methyl-5-propyloctane



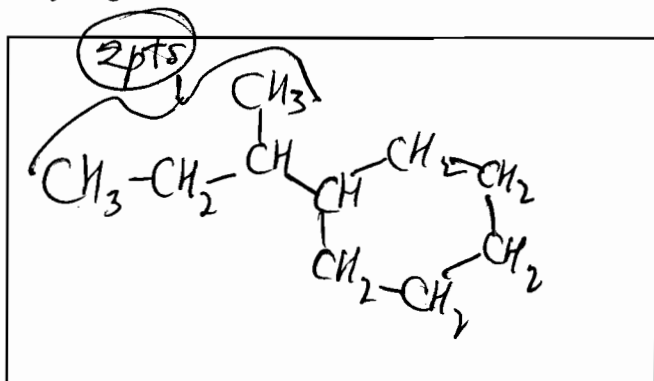
3-cyclopropylheptane



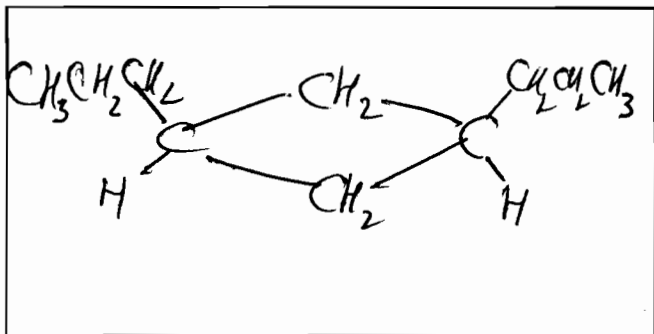
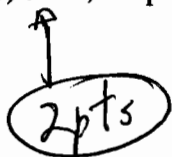
3,5,7-trimethylnonane

Draw the structures for the following names (show all hydrogens).

F. *sec*-butylcyclohexane



G. (4 pts) *cis*-1,3-dipropylcyclobutane



III. (9 points) Multiple Choice. Circle the correct answer.

A. Which of the following compounds should have the highest boiling point?

1. $\text{CH}_3(\text{CH}_2)_5\text{CH}_3$ 2. $\text{CH}_3(\text{CH}_2)_6\text{CH}_3$ 3. $(\text{CH}_3)_3\text{CC}(\text{CH}_3)_3$ 4. $(\text{CH}_3)_2\text{CH}(\text{CH}_2)_3\text{CH}_3$

B. The pK_a of CH_3COOH is 4.8 and the pK_a of HCOOH is 3.8. Given this information, one knows that:

- CH_3COOH completely ionizes in water.
- HCOOH is a weaker acid than CH_3COOH
- HCOO^- is a weaker base than CH_3COO^-
- CH_3COOH reacts with HO^- while HCOOH does not.

C. Which of the following compounds is the most hydrophilic?

- $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$
- $\text{CH}_3\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$
- $\text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}_2\text{OH}$
- $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$

IV. (6 points)

A. (6 points) give the hybridization and approximate bond angles for the atoms marked with an arrow.

| | hybridization | approximate bond angle | |
|---|-----------------------|------------------------|--------|
| $\text{CH}_2=\overset{\uparrow}{\text{C}}=\text{C}=\text{CH}_2$ | sp (2 pts) | 180° | (1 pt) |
| $\text{CH}_2=\text{C}=\overset{\uparrow}{\text{C}}=\text{CH}_2$ | sp^2 (2 pts) | 120° | (1 pt) |

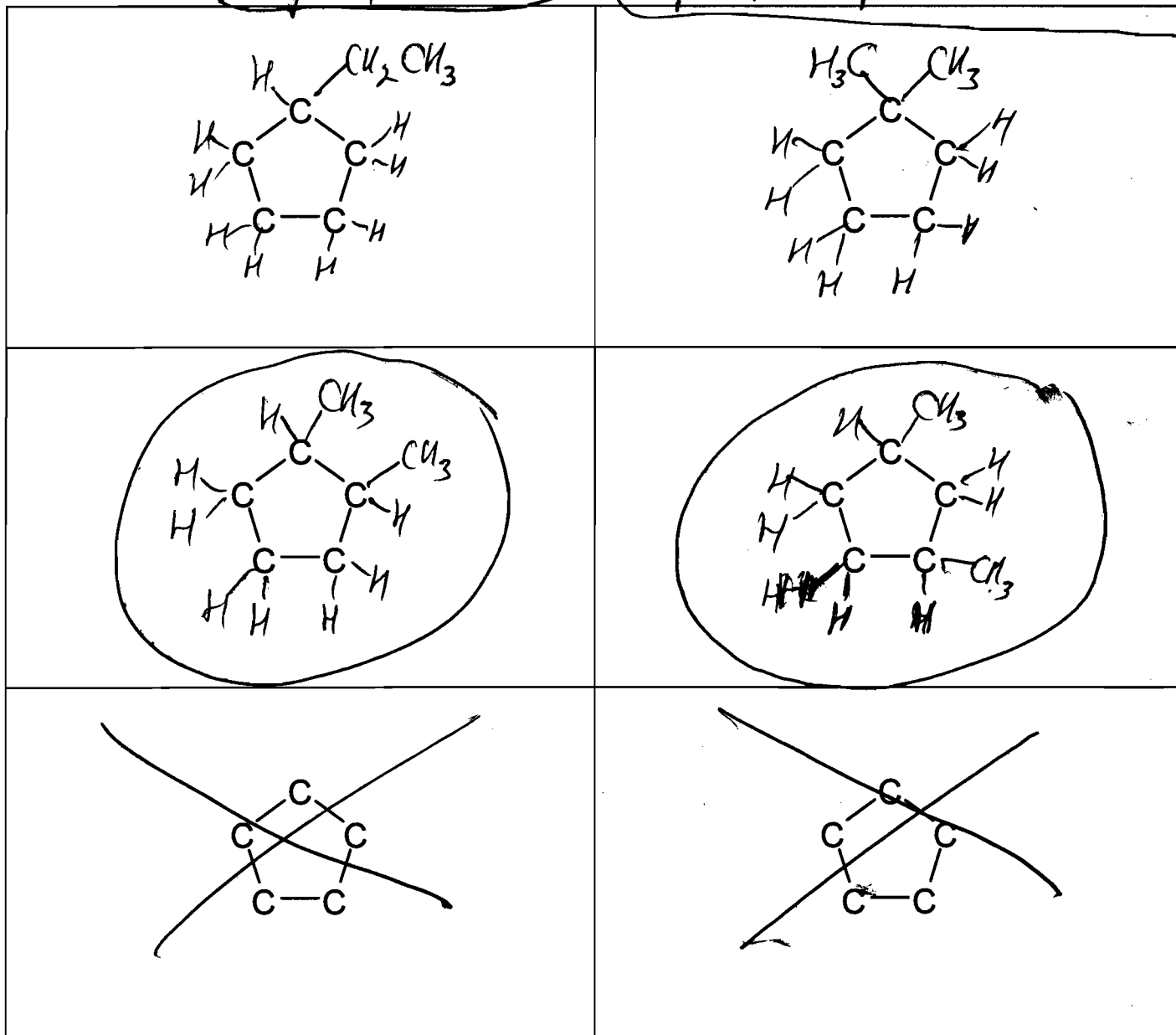
-2 pts if H₂ not shown

VI. (14 points)

A. Complete the structures below to show ALL constitutional isomers (note: constitutional isomers only, no stereoisomers) of the substituted cyclopentanes that have the formula C_7H_{14} . Be sure to show all hydrogens. There are no more than 6 constitutional isomers and there may be fewer. Cross out any boxes that are not used. Points will be deducted for duplicate or incorrect structures.

3 pts / structure

-3 pts for duplicate or incorrect structure



B. Circle all constitutional isomers that can exist as a pair of cis-trans isomers.

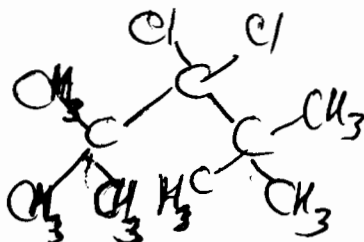
2 correct circles = 2 pts

1 correct circle = 1 pt

1 or more incorrect circle = 0 pts

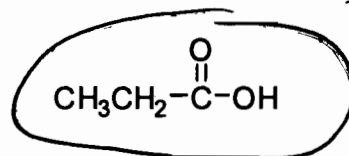
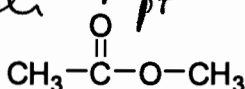
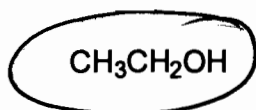
VII. (23 points)

- A. (3 points) Draw the structure of a compound that has the molecular formula $C_9H_{18}Cl_2$ and has only 1° (primary) hydrogens.



- B. (3 points) Circle the compound(s) that should show strong intermolecular interactions due to hydrogen bonding. 2 correct circles = 3 pts 1 or more incorrect circles = 0 pts

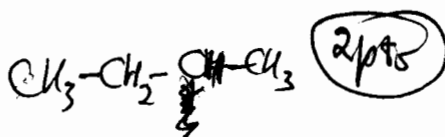
1 correct circle = 1 pt



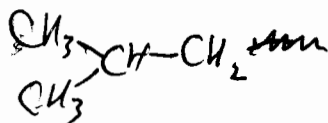
- C. (9 pts.) There are four isomeric 4-carbon alkyl groups. One of these is called the butyl group. Give the structure and name of the three other 4-carbon alkyl groups.



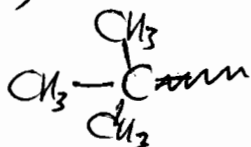
butyl



sec-butyl (1 pt)



isobutyl



tert-butyl

- D. (8 pts.) Using the standard dipole symbol ($\overset{+}{\text{---}}\overset{-}{\text{---}}$), draw the direction of the molecular dipole for the following molecules. If there is no molecular dipole, circle the molecule.

