

# **Cover Sheet! EXAM2**

**CHEM230-001 FALL 2002**

**PRINT your name legibly on the line below.**

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Name: \_\_\_\_\_ Student ID No: \_\_\_\_\_

**First:** You are allowed to have a writing utensil, a calculator and molecular model set at your seat. Please put away all other materials.

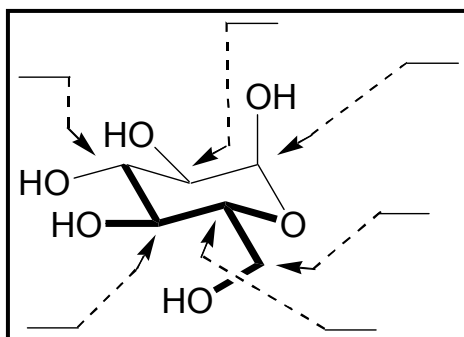
**Second:** Place your student identification on your desk. A proctor will come around to check everyone's ID. **Is your name and number on your test?**

**Third:** Quickly read through the entire exam. Your goal, as always, is to score as many points as possible. Do not waste time on problems that you can't do if there are easy questions to do first.

**Fourth:** It is critically important that your answers be written in a clear, unambiguous manner. Answers in which your intentions are unclear will not receive credit. **SHOW YOUR WORK!**

**Fifth: READ THE INSTRUCTIONS FOR EACH PROBLEM. answer each question**

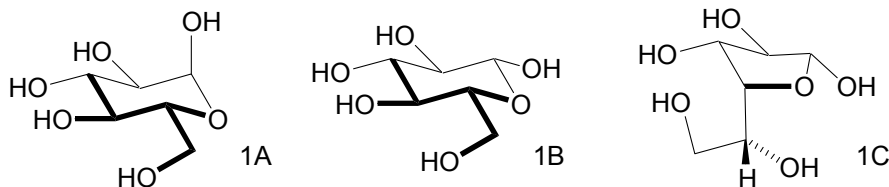
Problem Number	Points possible	Score
1a.	14	_____
1b.	10	_____
1c.	10	_____
1d.	08	_____
2.	10	_____
3.	08	_____
4.	30	_____
5.	10	_____
<b>Total</b>	<b>100</b>	_____



1. (a) (14 pts for all otherwise two points each)  
Label the carbon atoms according to absolute configuration R, S or NA for not applicable in the case of non-stereogenic atoms.  
Remember that the convention is that the lower portion of the ring is closest to you.

1. (b) (10 pts) Glucose above is broken down by the body to yield  $\text{CO}_2$ ,  $\text{H}_2\text{O}$  and energy. Use what you know about the chirality of our biochemistries and the nature of diastereomers and enantiomers to **explain** (short answer) the following question. **Could we ingest the enantiomer of glucose and feel just as energetic?**
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1. (c) (10 pts) Living systems put glucose into other forms for specific purposes. The molecules are 1A: glucopyranose  $\alpha$ -anomer, 1B: glucopyranose  $\beta$ -anomer and 1C: glucofuranose. Use what you know about ring strain and the conformation of substituted cycloalkanes to say which molecule is most stable and why and which molecule is least stable and why.



Most stable: \_\_\_\_\_ Why? \_\_\_\_\_

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Least stable: \_\_\_\_\_ Why? \_\_\_\_\_

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1. (d) (8 pts) Pick the best word from following choices to complete the sentences below. \* diastereomers, \*conformational isomers, \*tautomers, \*enantiomers, \*structural isomers, \*geometric isomers, \*cis-trans isomers, \*E,Z isomers, \*rotamers, \*configomers, \*atropisomers, \*unrelated, \*cousins, \*twins, \*buddies, \*friends who just met at the park.

Molecules 1A and 1B are \_\_\_\_\_.

Molecules 1A and 1C are \_\_\_\_\_.

**2.** (10 pts) When alkanes burn  $\text{H}_2\text{O}$  and  $\text{CO}_2$  are produced. The heat of formation ( $\Delta\text{H}_f$ ) for the following molecules are listed in kcal/mol.

$\Delta\text{H}_f$  hexane: -39.9.

$\Delta\text{H}_f$  heptane: -44.4

$\Delta\text{H}_f$  octane: -49.8.

$\Delta\text{H}_f$  nonane: -54.5.

$\Delta\text{H}_f$  cyclohexane: -29.4.

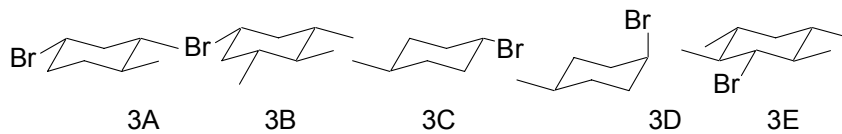
$\Delta\text{H}_f$  cyclodecane: -58.8.

Compute the ring strain in cyclohexene answer: \_\_\_\_\_

and the ring strain in cyclodecane answer: \_\_\_\_\_

Show your work below. Hint, get the average increment for a  $-\text{CH}_2-$  group. Use back of this sheet if you need more room.

**3.** (8 pts.) Rank the molecules below by how fast they undergo E2 reaction mechanism.



FASTEST \_\_\_\_\_ SLOWEST

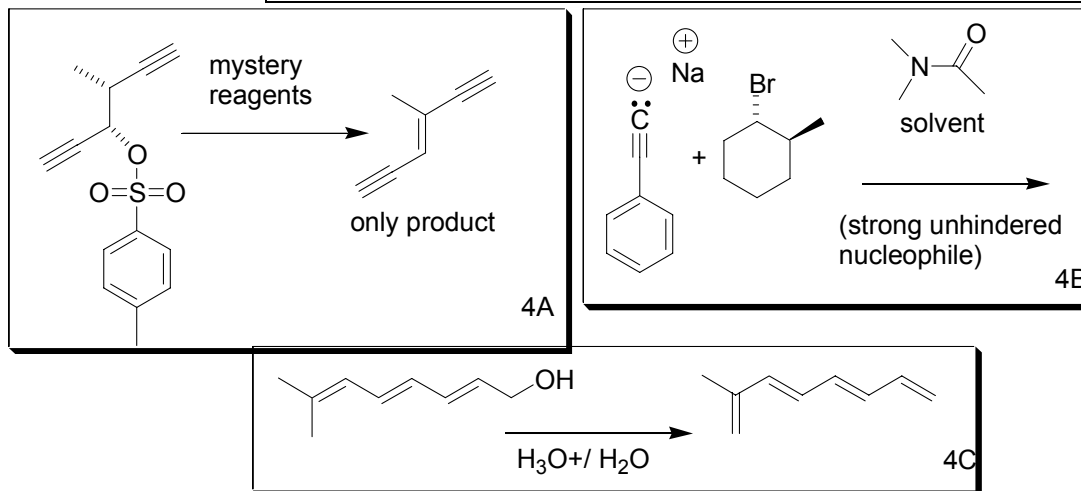
4. (30 pts) Label the following reactions E1, E2, SN1 or SN2. Make little notes reflecting your thought process by each answer for possible partial credit if you are unsure of your answer.

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

Draw the product of 4B for 10pts extra. Is it the lowest-energy stereoisomer?



5. (a) (5 pts) Do you expect 5A and 5B to react at the same rate under the given conditions? Why or Why not?

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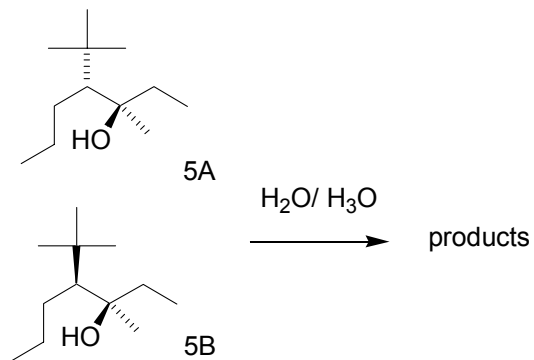
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- (b) (5 pts) Do you expect 5A and 5B to give the same products under the given conditions? Why or Why not?

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You know what is going on. The proton sits on the oxygen atom of the OH group making it a better leaving group than the rest is history. Please think about this one; it might help to write out the mechanism and draw out the reaction energy diagram.