

Chemistry 333

Examination #1

February 27, 2019

Professor Charonnat

Name: \_\_\_\_\_

Be certain that your examination has seven (7) pages including this one.

Put your name on **each** page of this examination booklet.

By putting your name on this examination booklet you agree to abide by California State University, Northridge policies of academic honesty and integrity.

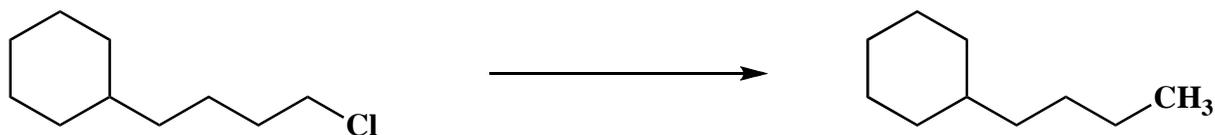
Molecular models are allowed for this examination. All electronic devices, including calculators and cell phones, are unnecessary and are not allowed.

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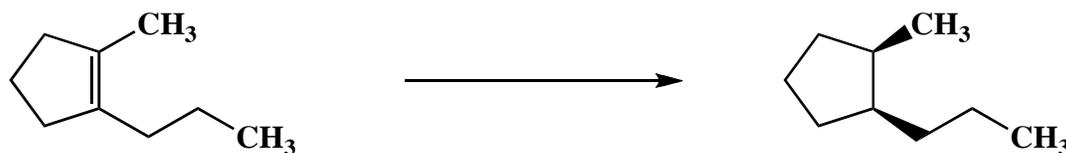
1. (25 points)

Draw the specific reagent(s) necessary to effect the following five (5) transformations. Specify stoichiometric coefficients of reactants, also.

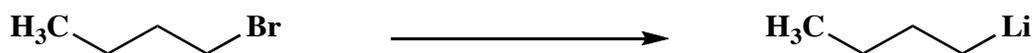
A.



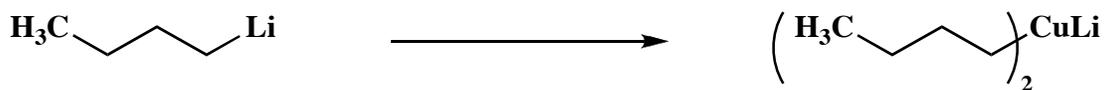
B.



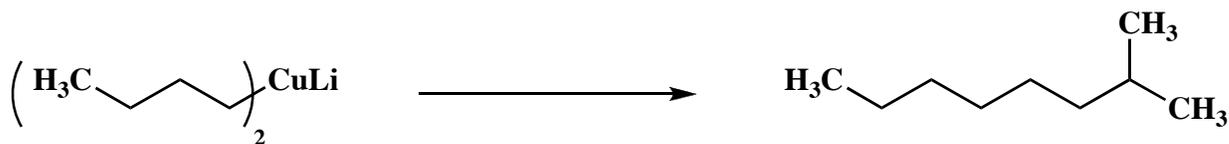
C.



D.



E.



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2. (25 points)

Circle the number that corresponds to the correct answer for each of the following five (5) questions.

A. Reading from left to right, the hybridization of the nitrogen atoms in  $\text{H}_3\text{CNHCH}_2\text{CH}_2\text{CN}$  is

1.  $\text{sp}^2, \text{sp}^2$
2.  $\text{sp}^3, \text{sp}$
3.  $\text{sp}^3, \text{sp}^2$

B. For a compound to be a strong Brønsted-Lowry acid it must have a

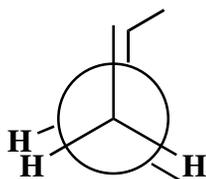
1. more stable conjugate acid
2. less stable conjugate base
3. more stable conjugate base

C. If the temperature of a reaction mixture is increased by  $20^\circ\text{C}$  then the reaction rate likely will increase by a factor of

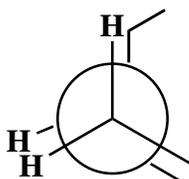
1. 18–20
2. 4–9
3. 2–3

D. Which of the following conformations is most stable?

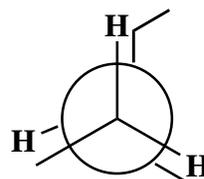
1.



2.



3.



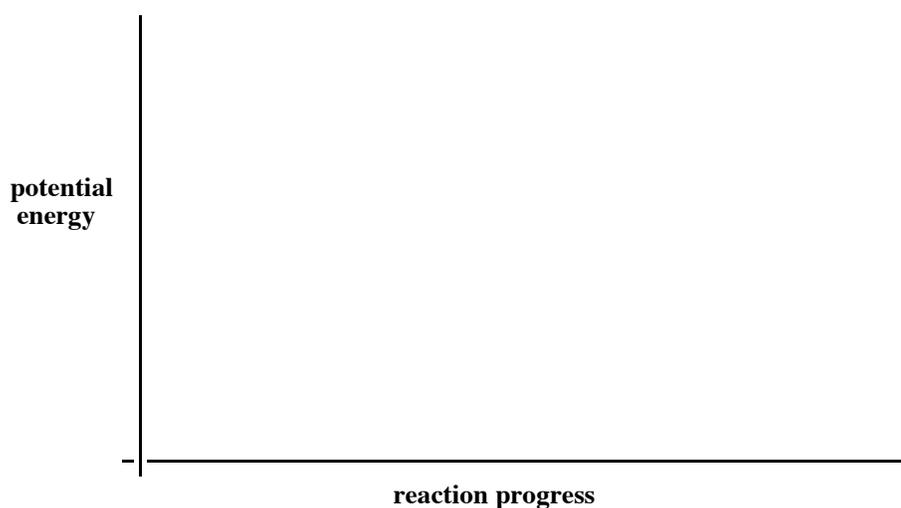
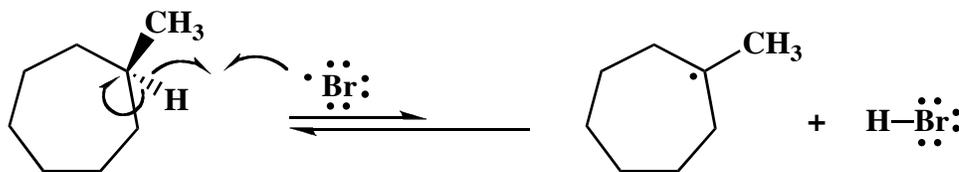
E. Which of the following is a termination step in the free-radical chlorination of ethane?

1. reaction of an ethyl radical with a chlorine atom
2. reaction of an ethyl radical with a chlorine molecule
3. reaction of a chlorine atom with ethane

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3. (10 points)

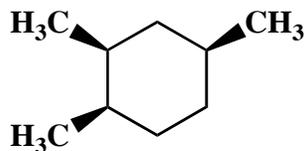
Draw an annotated graph of potential energy as a function of reaction progress for the following primary mechanistic step in the free-radical bromination of methylcycloheptane. State whether the transition state for this step resembles reactants or the radical intermediate and HBr. Explain your reasoning in detail.



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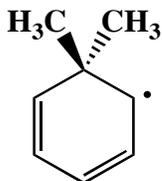
4. (20 points)

Draw the two possible chair conformations of the following trisubstituted cyclohexane. Draw carefully positioned intersecting arcs to denote all sources of steric strain for both conformations. Put a star next to the more stable conformation. Describe your reasoning.



5. (10 points)

Draw all the major resonance structures for the following radical. In order to do so, use the curved-arrow notation to indicate the delocalization of electron density.



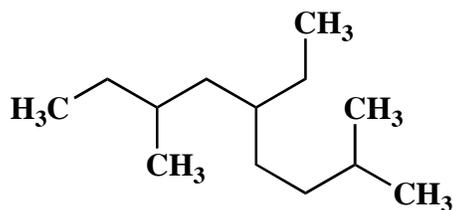
Name: \_\_\_\_\_

6. (10 points)

Draw the Lewis structure for dimethyl ether,  $\text{H}_3\text{COCH}_3$ . Then use the VSEPR rules to determine its corresponding molecular geometry. Describe your reasoning clearly by specifying the hybridization and electron-domain geometry of the oxygen, and the basis for the observed electron-domain geometry. Then draw a three-dimensional structural formula for dimethyl ether. Finally, draw an annotated vector-sum diagram to determine the directionality of its molecular dipole moment.

7. (10 points)

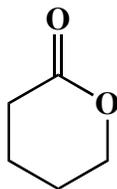
Use IUPAC nomenclature to write the systematic name of the following alkane.



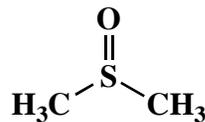
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8. (10 points)

The lactone **1** is a liquid at room temperature. Dimethylsulfoxide (DMSO) is a very polar organic solvent due to the polarity of its S=O double bond. Describe in detail what must occur at the molecular level for the lactone **1** to dissolve in DMSO. In particular, describe the specific interactions that are broken and those that are formed, both for the solute and for the solvent.



**1**



**DMSO**

**Congratulations!**

1	/25
2	/25
3	/10
4	/20
5	/10
6	/10
7	/10
8	/10
<hr/> Total:	<hr/> /120