Final Exam

Chemistry 3331

December 6, 2006

Name (PRINT)_____
Last, First

Signature _____

ID# _____

Please circle class time.

Dr. Bean's 10:00 AM

Dr. Bean's 1:00 PM

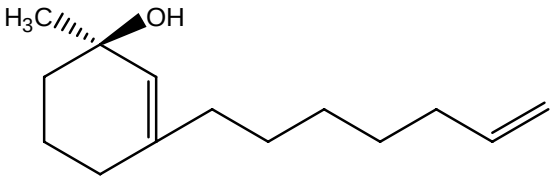
Page #	Score	
1. 12 pts.		
2. 22 + 2 pts.		
3. 12 pts.		
4. 12 pts.		
5. 12 pts.		
6. 10 pts.		
7. 10 pts.		
8. 6 pts.		
9. 4 pts.		
10. 10 pts.		

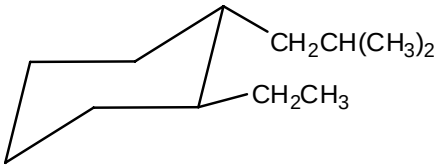
TOTAL_____

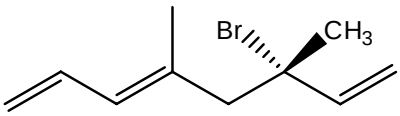
Note: Present your student ID when you return the exam booklet

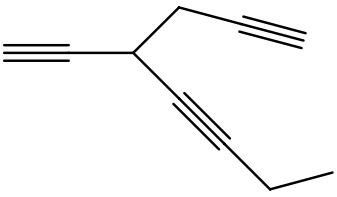
A. Nomenclature: Total = 12 points

Please provide a proper IUPAC name for each of the following compounds. Include stereochemistry where appropriate.

1 

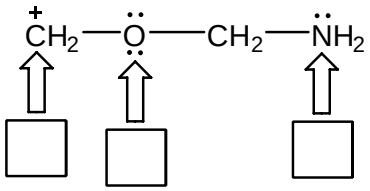
2 

3 

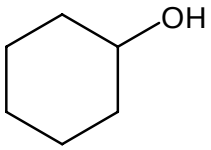
4 

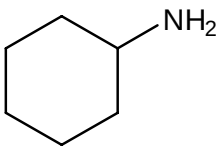
B. Facts: Total Points = 22

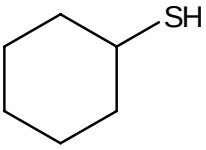
1. Label the hybridization of the indicated atoms in the structure below. (3 pts.)



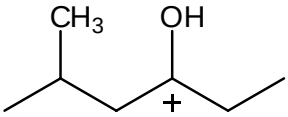
2. Rank the following compounds in order of increasing acidity. (1=least acidic, 3=most) (3 pts.)

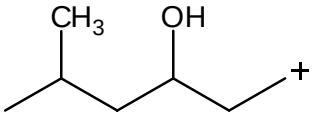


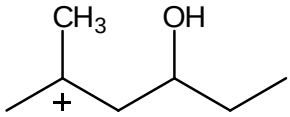




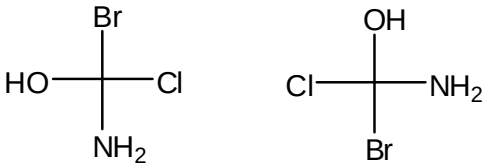
3. Rank the following carbocations in order of increasing stability. (1=least stable, 3=most) (3 pts.)



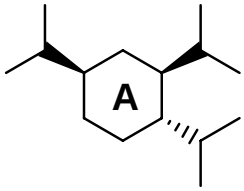


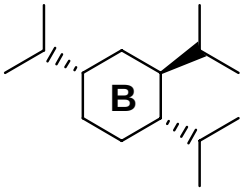


4. Label the following pair as identical, structural isomers, enantiomers or diastereomers. (3 pts.)

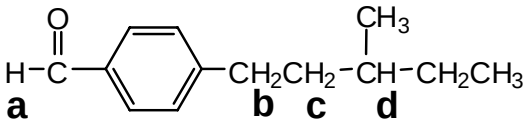


5. Place the letter of the more stable isomer in the box provided. (3 pts.)





6. Place the answers to the following questions in the appropriately labeled boxes. a) How many distinct types of protons does the compound below have? b) What are the theoretically predicted multiplicities (splitting patterns) of the signals for the protons labeled **a,b and c**? (7 pts.)



a) types of protons

b) multiplicity of H_a

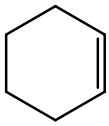
multiplicity of H_b

multiplicity of H_c

2 pt. bonus: multiplicity of H_d

C. Reactions: Total = 36 points, 4 points each
Please provide the major product in the answer box. Be sure your drawing indicates stereochemistry if applicable. Partial credit is awarded only when intermediate products are shown below the reaction.

1.

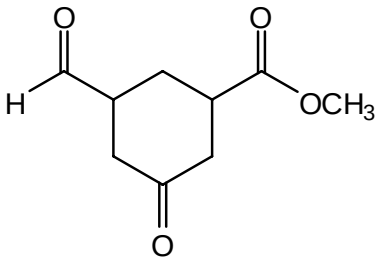


1. NBS / light

2. CH_3S^- / acetone

Note: NBS = N-bromosuccinimide

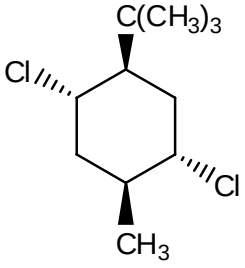
2.



$NaBH_4$

EtOH

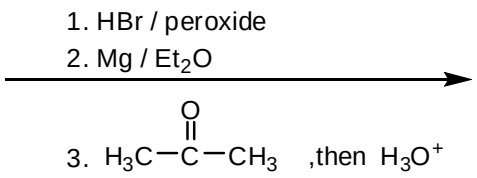
3.

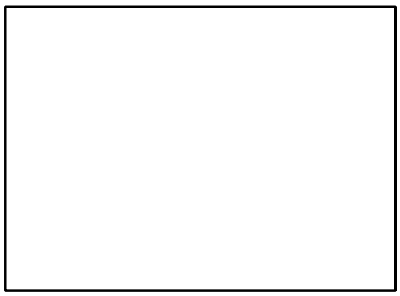


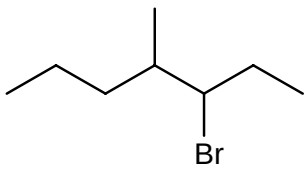
$CH_3CH_2O^-\ Na^+$

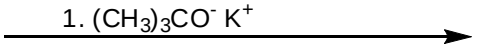
CH_3CH_2OH

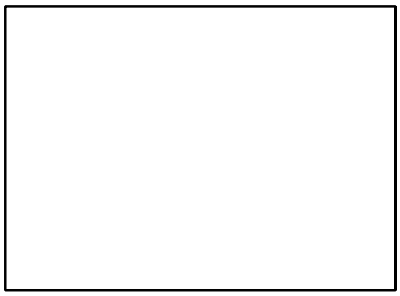
4. $CH_3CH_2CH_2-C\equiv C-H$

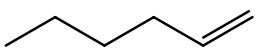


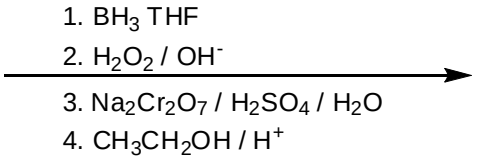


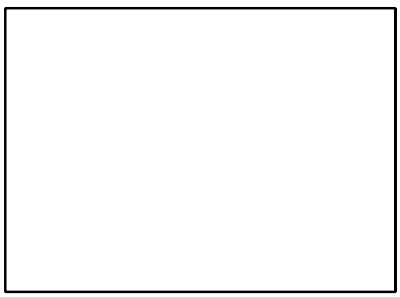
5. 



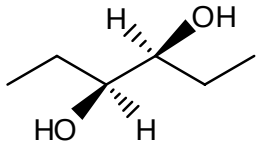


6. 



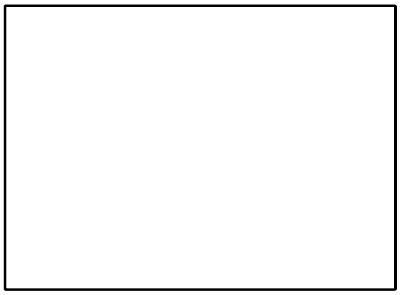


7.



1. HIO_4

2. CrO_3 / H_2SO_4 / H_2O / acetone / 0°C



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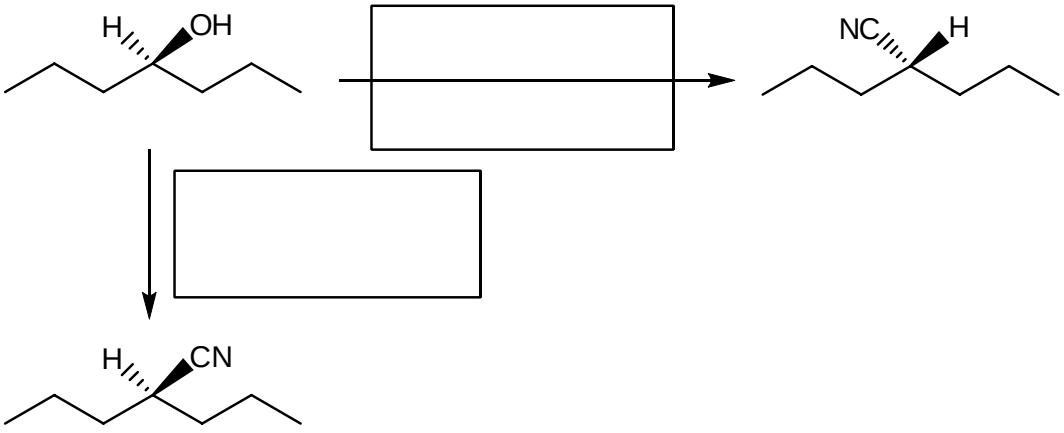
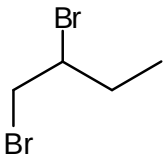


9.

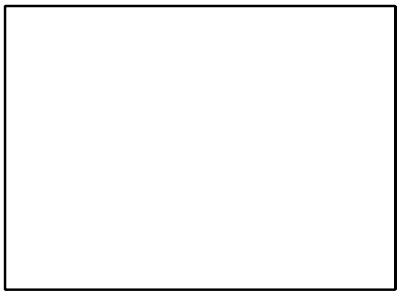


1. KOH / 200°C

2. H_2SO_4 / H_2O / $HgSO_4$

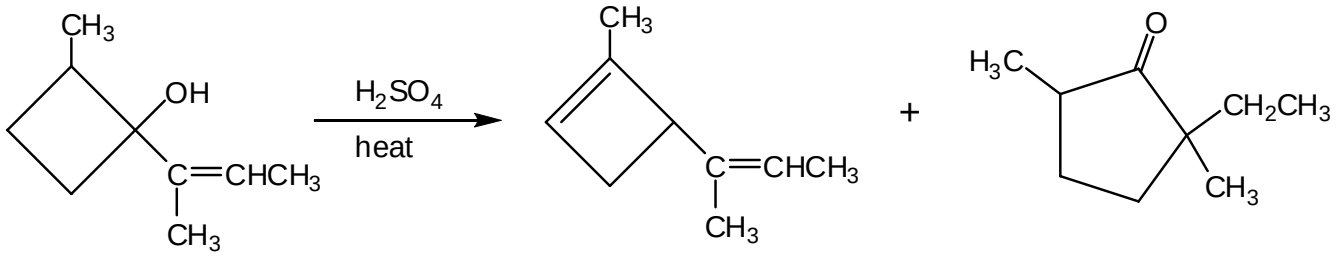
3. Ra-Ni / H_2

Note: Ra-Ni = Raney nickel



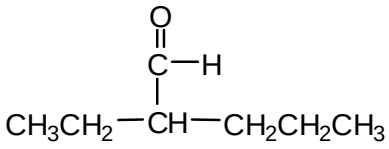
D. Mechanisms: (10 points)

The reaction presented below produces several products. Provide clear mechanisms to explain the formation of the two products shown. Use curved arrows to indicate “electron flow”. Remember to show only one step at a time. **Show all intermediates and all formal charges. Do not show transition states!**



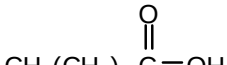
E. Synthesis: (10 points)

Synthesize the molecule below using any of the following reagents: alkanes, alkenes, or alcohols of no more than **three carbons**, any inorganic reagents, any peroxy acids, and any oxidizing or reducing agents.

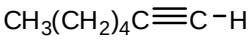


F(a). Spectroscopy (10 points)

Carefully examine the five infrared spectra and the compounds below. Place the letter of the compound in the box beside its spectrum.



A



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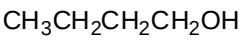

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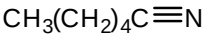
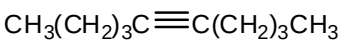
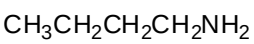


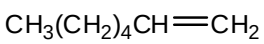
D



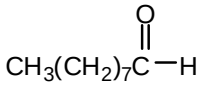
E



F

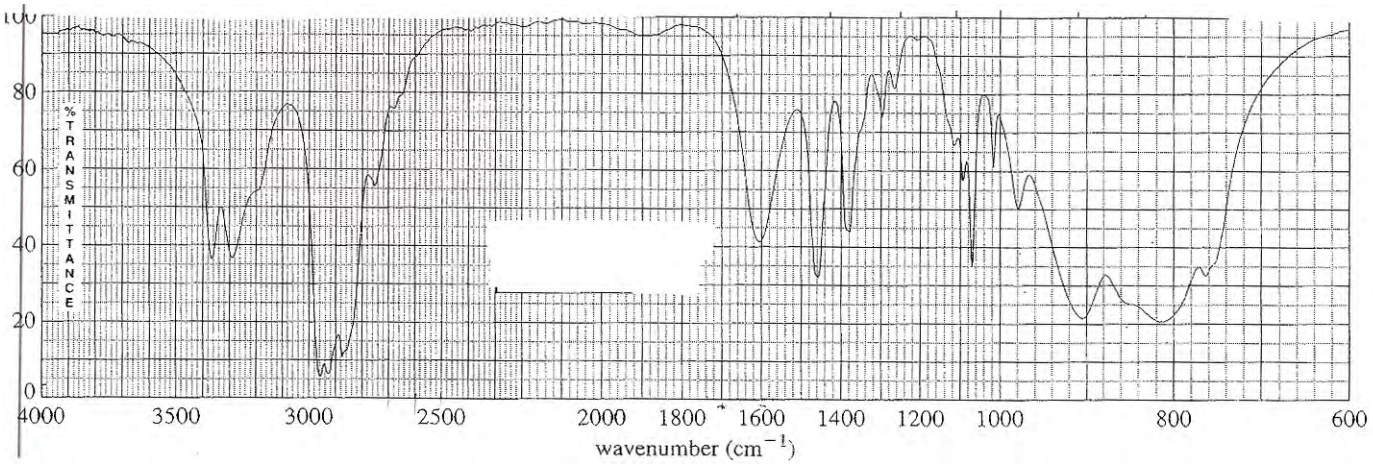


G



H

1.



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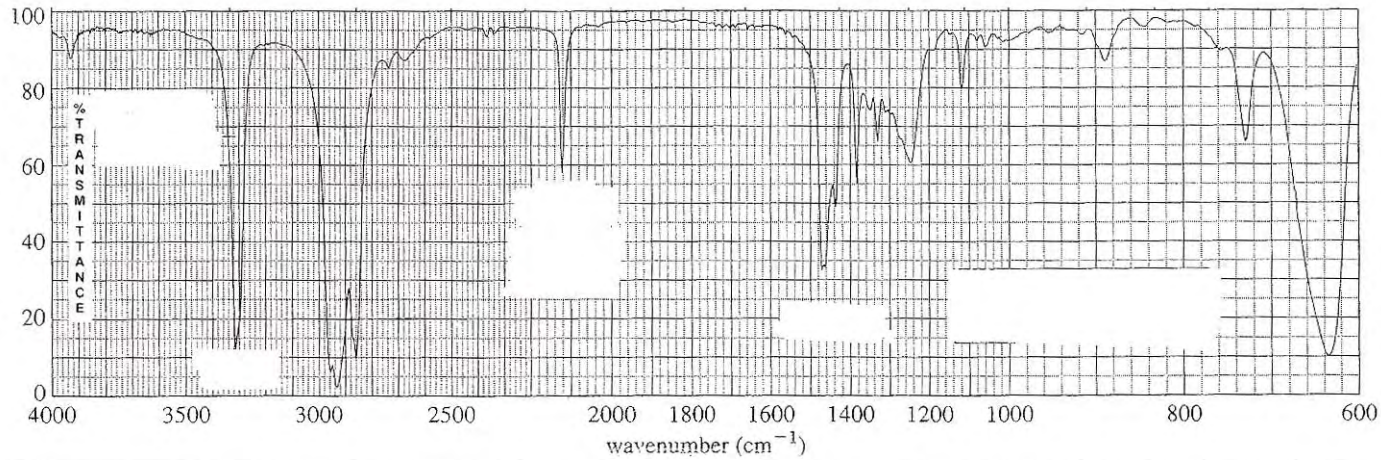

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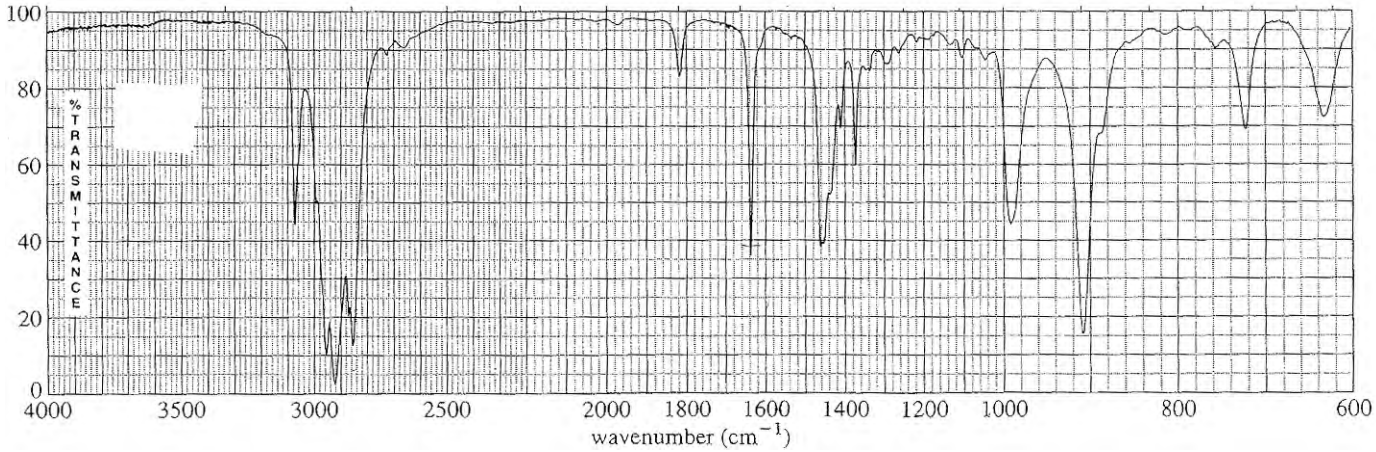

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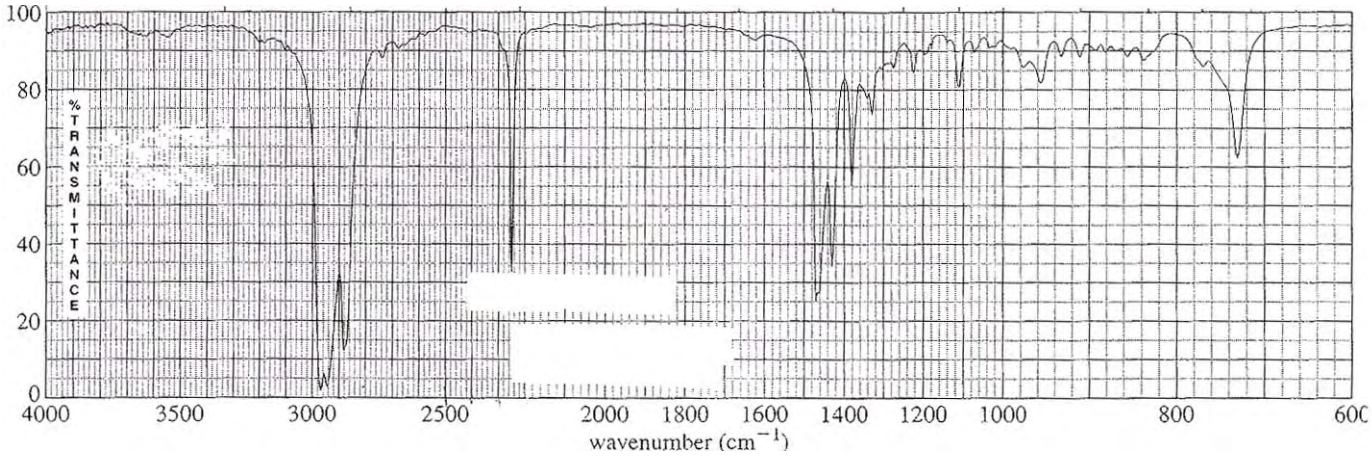
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80
60
40
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0
%TRANSMITTANCE
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1200
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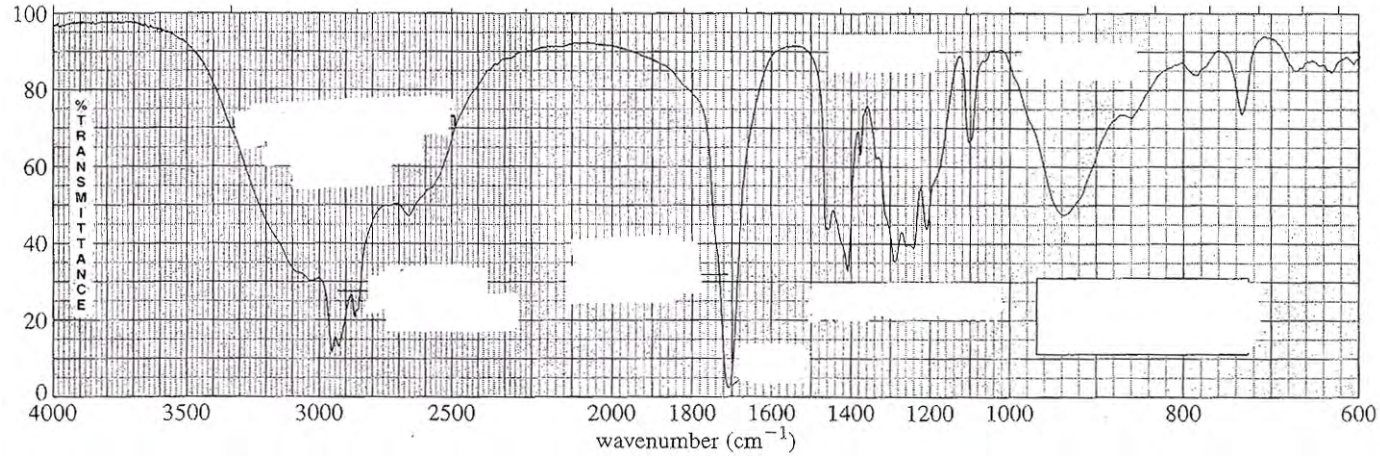
800
600
wavenumber (cm^{-1})

5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2000
1800
1600
1400
1200
1000
800
600
wavenumber (cm^{-1})

F(b. Spectroscopy BONUS: 10 Points

A compound with the formula $C_5H_{10}O$ exhibits the IR and ^1H NMR shown below. Please identify this compound and draw the structure in the box provided below.