

Olive Oil Hydrogenation Report

NAME: _____

PARTNER'S NAME: _____

LAB SECTION: _____

DATE: _____

% SCORE:

| | Points possible | |
|----------------|-----------------|--|
| Lab Notebook | | |
| CNMR worksheet | | |
| Abstract | | |
| CNMR spectra | | |
| IR spectra | | |
| Questions | | |
| Total | | |

ABSTRACT: *Hydrogenation of Olive oil*

For input on what should be included in your abstract see the Appendix. Your abstract should be brief!

B. Spectroscopic Analysis

Attach labeled spectra to your report.

1. IR Spectroscopy

For full credit include an IR spectrum of your product identifying stretches characteristic of a saturated triglyceride. Please label with sp^3 C-H, C=O and C-O stretches, your name and the sample name. Attach your IR to your report.

C. Questions

1. Considering the energies of bonds made and broken, is the hydrogenation of olive oil endothermic or exothermic? Explain (Bond energies are available on the back cover of your manual)
2. Calculate the volume (in milliliters) of hydrogen gas at room temperature and 1 atmosphere of pressure that is required to completely hydrogenate 60 mg of glycerol trioleate. Did your balloon supply enough hydrogen?
3. During the hydrogenation reaction, you combined Pd/C, olive oil, dichloromethane, and hydrogen gas. Complete the diagram below by drawing each component in its appropriate location. To simplify the diagram, create a key for your sketch.

Key



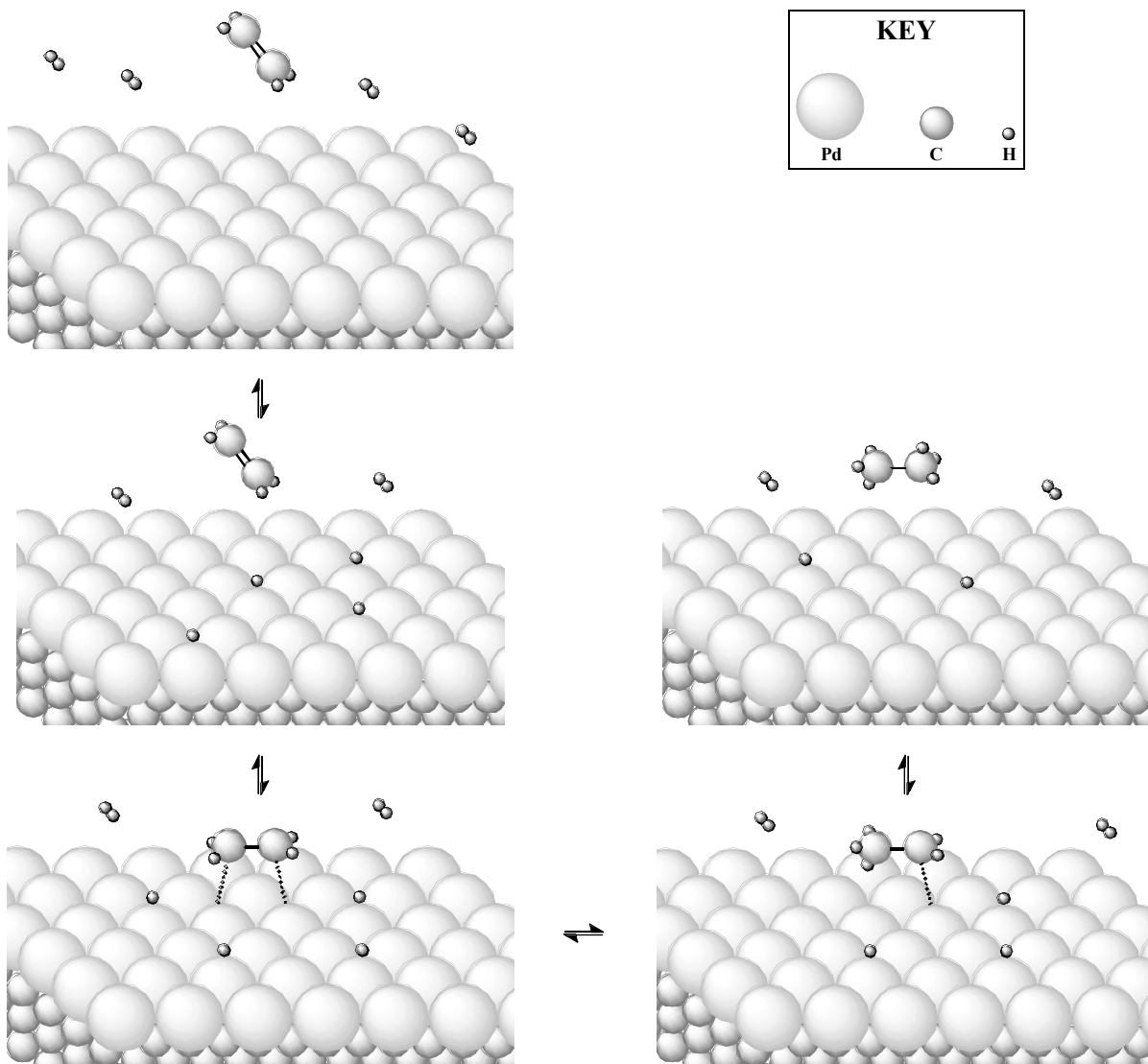
4. The reaction mixture above was continuously stirred. If it had not been stirred, the reaction would have occurred very slowly even with the catalyst present. Why did stirring increase the rate of the reaction?

5. When removing the solvent from your product, you were told that when the flask no longer felt cool, the evaporation process was complete. Why does the flask feel cool while evaporation occurs but not when evaporation is complete?

6. What physical changes accompanied the hydrogenation? Why does the hydrogenation of the fatty acid chain change the melting point of the triglyceride?

7. What changes in the CNMR of the starting material and product confirm the hydrogenation of the double bond? Cite specific values.

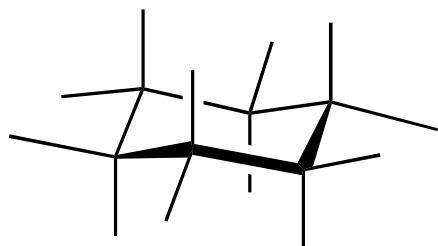
The mechanism for the reaction of ethene with hydrogen gas in the presence of Pd/C is shown below. Use the mechanism to answer the questions.



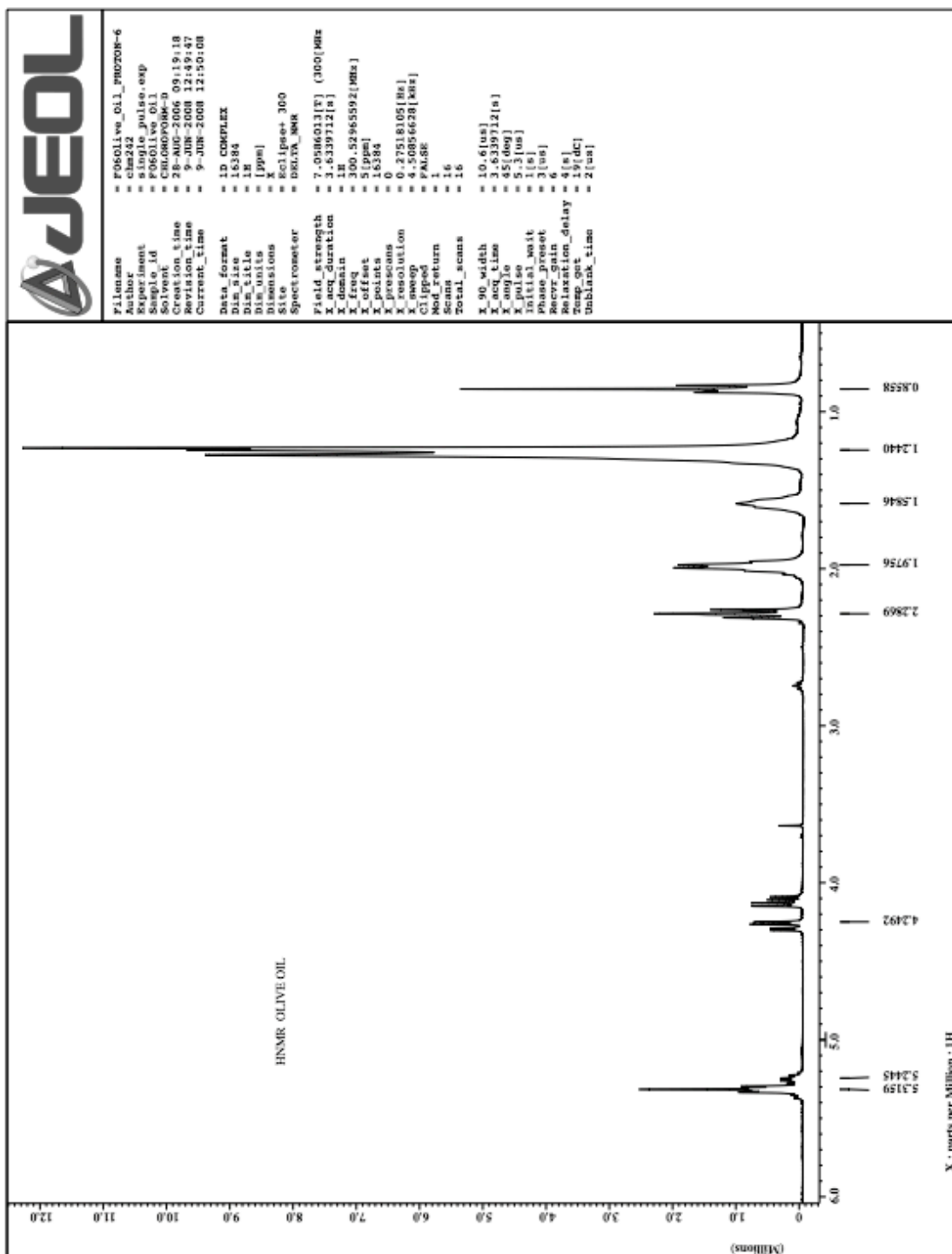
8. How does Pd/C decrease the activation energy of the hydrogenation reaction?

9. Why is only *syn* addition of H_2 observed in this reaction?

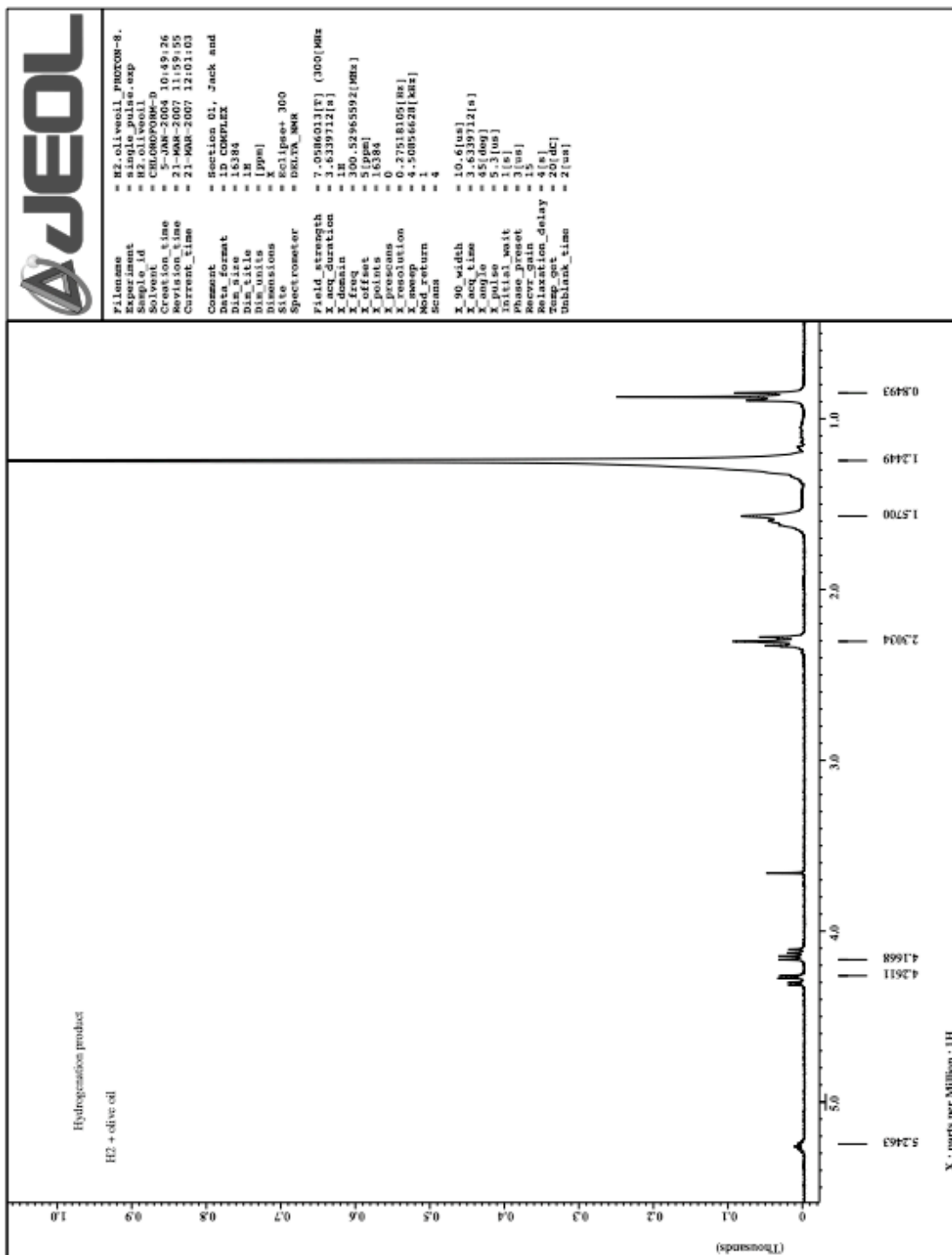
10. Depict the lowest energy chair conformer of the product formed from the reaction of **cyclohexene** with D_2 in the presence of Pd/C. Complete the structure below, adding hydrogen and deuterium where appropriate.



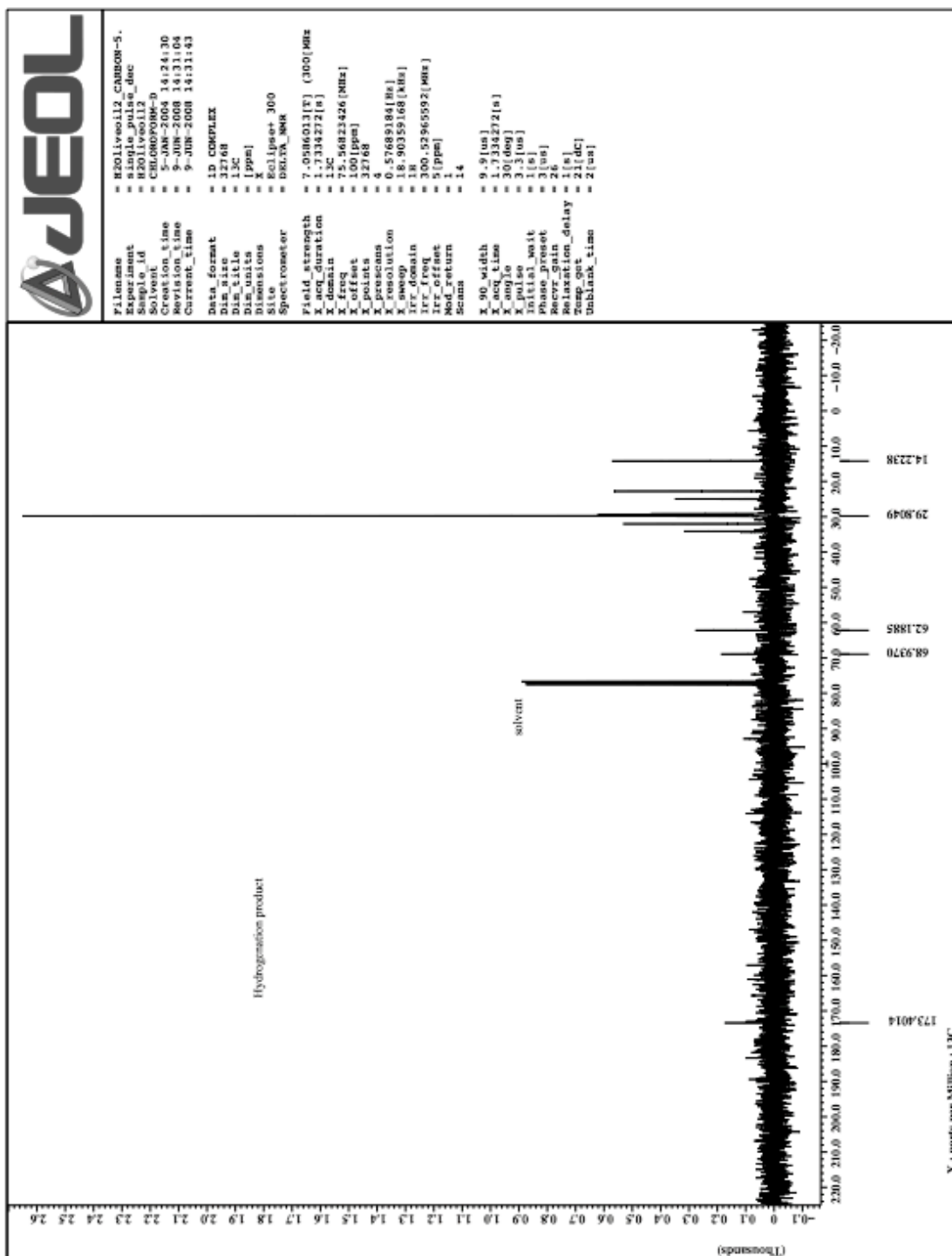
HNMR of Starting Material- olive oil



HNMR of Hydrogenated product



CNMR of hydrogenation product



DEPT spectrum of hydrogenation product-

