Student Name…….. Student Number……

1. a) Write an equation for the acid catalyzed hydrolysis of ethyl propanoate. [2]

b) Propose a mechanism for the acid catalyzed hydrolysis of ethyl propanoate. [4]

2. a) Indicate which of the following reactions will and which ones will not give the carbonyl product shown by writing "yes" or "no" in the box following each equation.

i) $CH_3COCl + H_2O \rightarrow CH_3COOH$ ☐

ii) $CH_3COOCH_3 + CH_3NH_2 \rightarrow CH_3CONHCH_3$ ☐

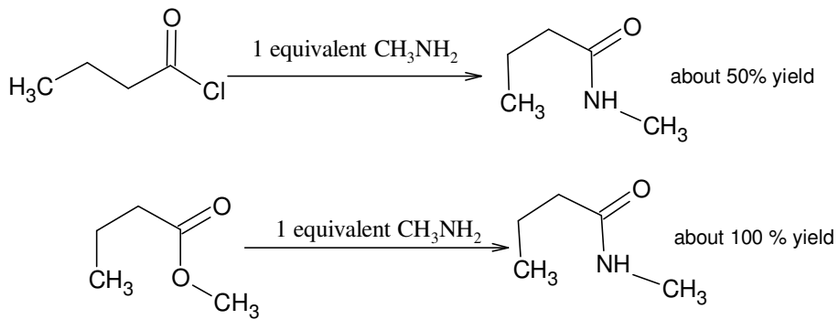
iii) $CH_3CO_3Cl + CH_3NH_2 \rightarrow CH_3CONHCH_3$ ☐

iv) $C_6H_5CH_2CONH_2 + Cl^- \rightarrow C_6H_5CH_2COCl$ ☐ [2]

b) Choose a reaction to which you answered "no", and explain why the reaction would not occur. [2]

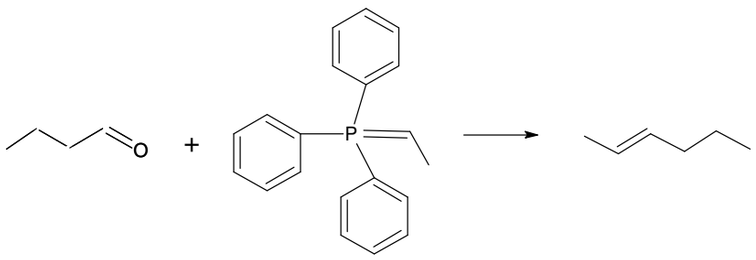
Student Name…….. Student Number……

3. a) Explain the difference in the yields shown: [4]

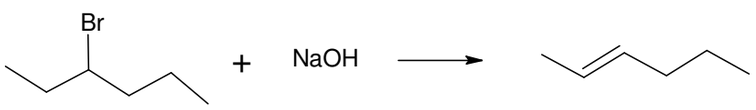



4. 2-hexene can be prepared by either of the two reactions shown:

**Reaction A**:



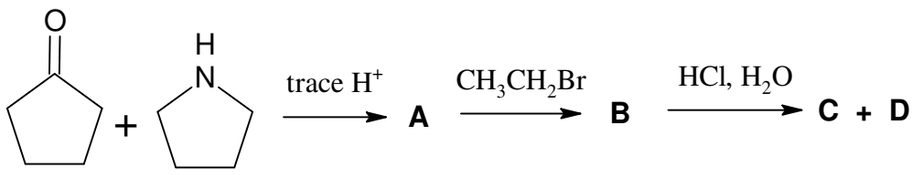

**Reaction B**:



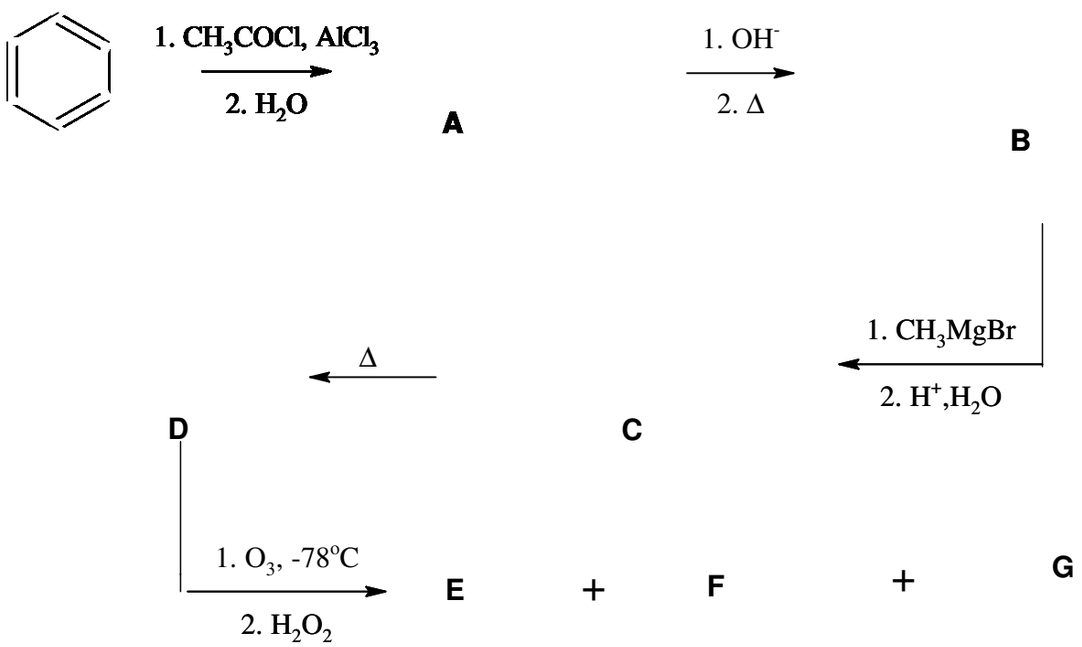

What is the advantage of using reaction A rather than reaction B for the preparation of 2-hexene? [3]

Student Name…….. Student Number……

5. Give the structures of the compounds A to D in the reaction scheme.

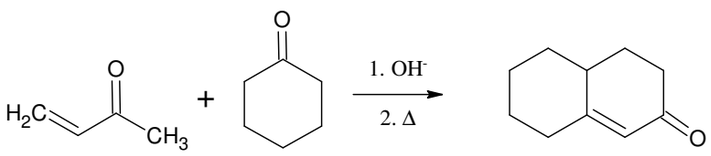



6. Identify the compounds A to G by drawing their structures. A to G represent the major organic products. [7]



Student Name…….. Student Number……

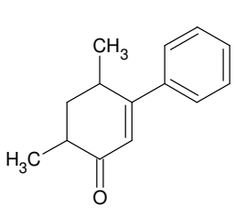
7. The following equation represents a Robinson Annulation reaction which is a Michael reaction followed by an intramolecular aldol condensation reaction:




a) Draw the structure of the Michael reaction product. [1]

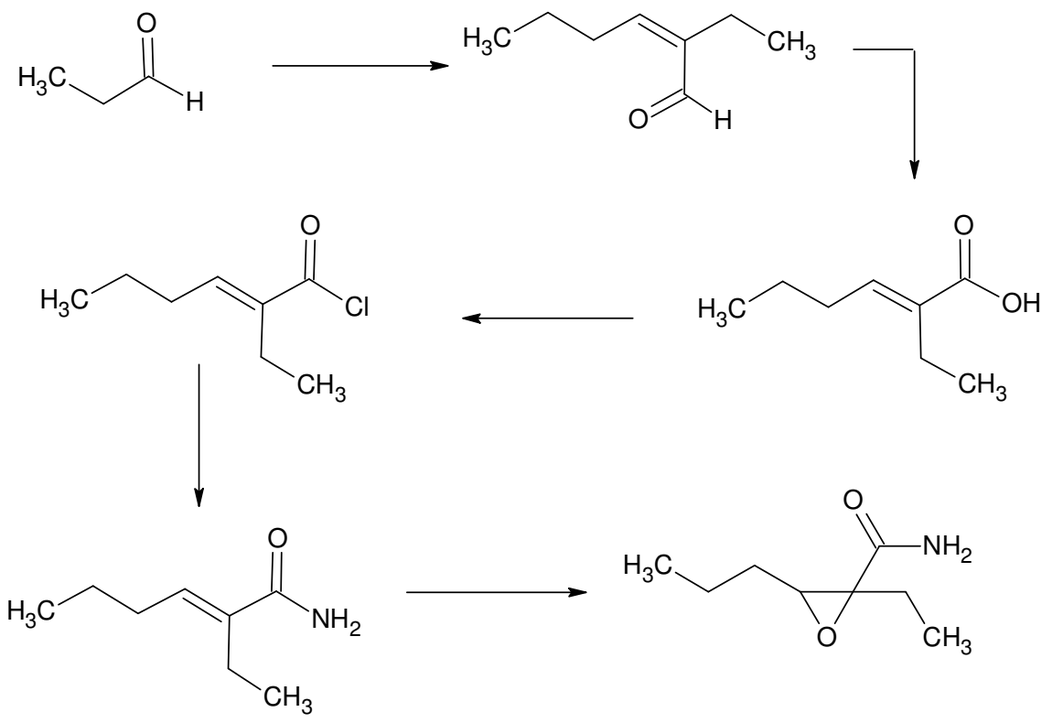
b) Propose a mechanism for the Robinson Annulation reaction. [6]

c) Which reactants would you use for the synthesis of the following compound using a Robinson Annulation?. [2]

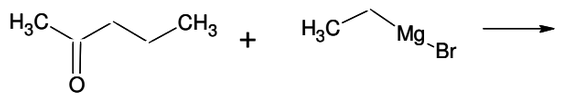


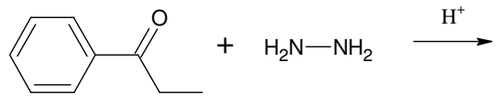
Student Name…….. Student Number……

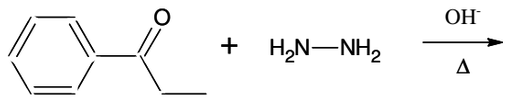
8. The reaction scheme shows the preparation of the sedative, oxanamide, from butanal. Show the reagents necessary for each step in this scheme. [5]

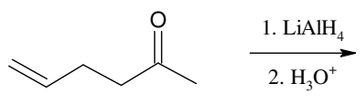


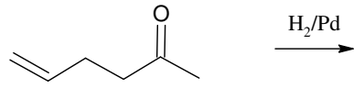

9. Draw the structures of the main organic product(s) of each reaction, showing stereochemistry where appropriate. Mechanisms and names of products are **not** required.

a) 

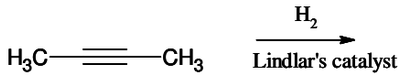

b) 

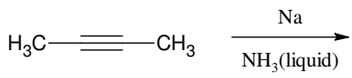

c) 

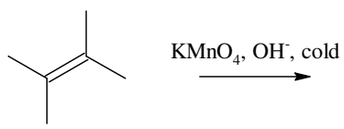

d) 

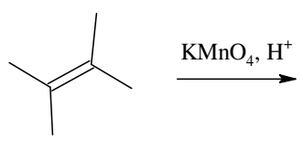

e) 

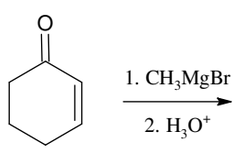
Student Name…….. Student Number……

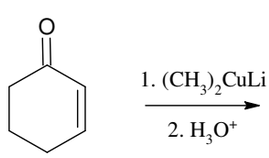
f) 

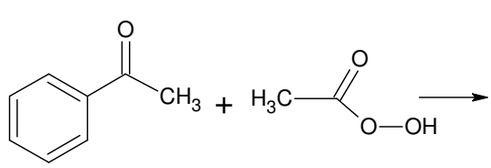

g) 

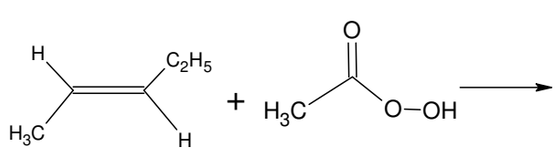

h) 

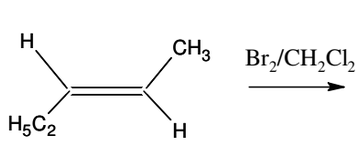

i) 


j) 


k) 

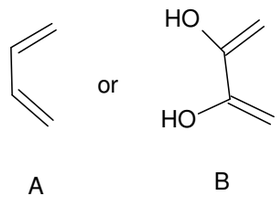

l) 


m) 


n) 

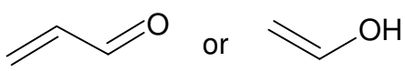
Student Name…….. Student Number……

10. a) Which diene, A or B, is more reactive in a Diels-Alder reaction? Explain your choice. [2]



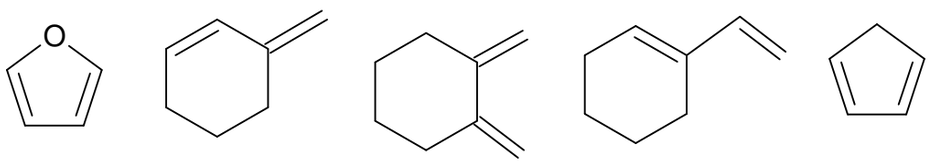

A B

b) Which dienophile, X or Y, is more reactive in a Diels-Alder reaction? Explain your choice. [2]



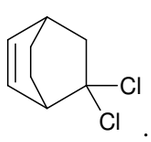

X Y

c) Which **one** of the following dienes would **not** react with a dienophile in a Diels-Alder reaction? Explain your choice. [2]



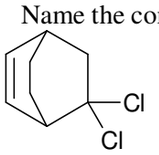

A B C D E

d) i) Give the structure of the diene and dienophile which should be used to prepare




.

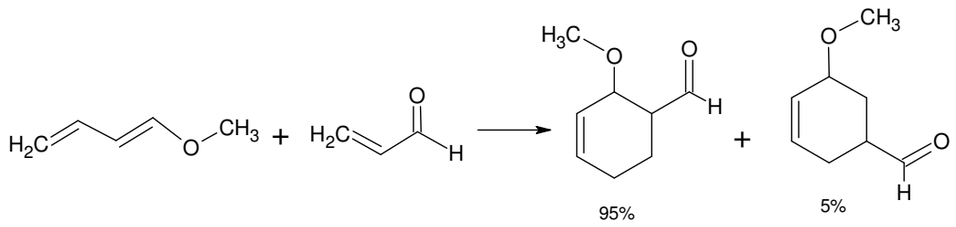
ii) Name the compound




[1]

Student Name…….. Student Number……

e) Explain the product ratio shown in the following Diels-Alder reaction: [4]



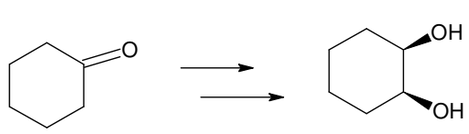

11. a) Which alkyl bromide should be used in the malonic ester synthesis of

3-phenylpropanoic acid? [1]

b) Explain why $C_6H_5CH_2COOH$ **cannot** be prepared by the malonic ester synthesis. [2]

12. Provide a reaction scheme for **five** of the following compounds from the given starting material and any other necessary reagents. Mechanisms are **not** required. More than one step may be necessary. Show intermediate compounds formed. [15]

a)



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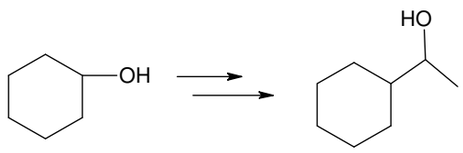
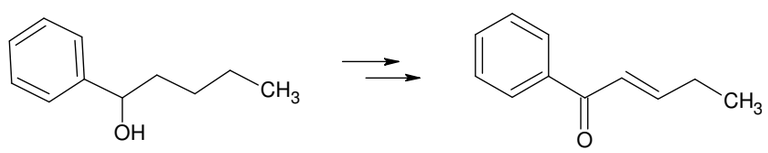
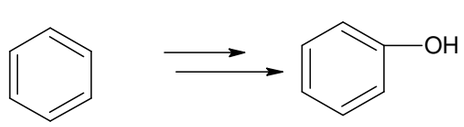
b)



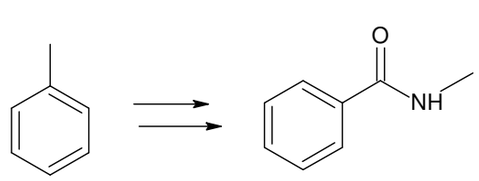

c)



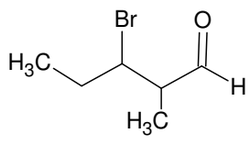

d)

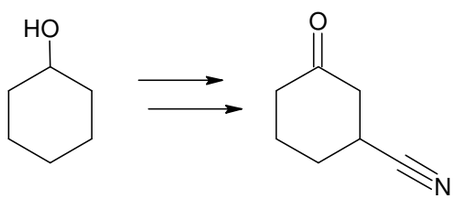


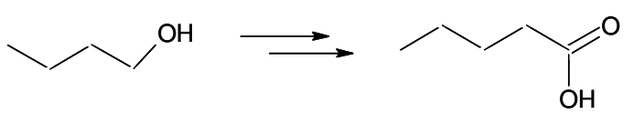

e)



Student Name…….. Student Number……

f) any compound with 3 C atoms ⟶ 


g) 


h) 


**END OF EXAMINATION**