

## CHEM 921: ADVANCED DEVELOPMENT IN ORGANIC SYNTHESIS

### INSTRUCTIONS: ANSWER ALL QUESTIONS

#### QUESTION ONE (20 MARKS)

- a) Write short notes on retrosynthetic analysis (4mks)
- b) Discuss using an example the three classification of functional groups in organic synthesis (3mks)
- c) Draw two possible ways to disconnect 2-pentanol as a target molecule and comment on the best disconnection approach (4mks)
- d) Discuss briefly one method of protection and deprotection of the following functional groups:
  - i) Alcohols
  - ii) Aldehydes and ketones
  - iii) Carboxylic acids (6mks)
- e) Discuss briefly three Baldwin rules for ring closure (3mks)

#### QUESTION TWO (20 MARKS)

- a) Write the mechanism for the aldol addition of butanal (5mks)
- b) Write the mechanism of the Claisen condensation of ethyl acetate
- c) Benzoquinone reacts with 2-chloro-1,3-butadiene to give a single product  $C_{10}H_9ClO_2$  in 95 % yields. Write a structural formula for this product.
- d) Write the mechanism of epoxidation of the following  $\alpha,\beta$ -unsaturated carbonyl compounds
- e) Discuss the criteria to be followed when choosing a method for synthesizing a compound using retrosynthetic analysis (2mks)

#### QUESTION THREE (20 MARKS)

- a) Write the intramolecular route for the preparation of the following diketone (5mks)

- b) What combination of diene and dienophile would you choose in order to prepare the following and write the mechanisms (4mks)
- c) Write the bimetallic hydroformylation mechanism (5mks)
- d) Write the base catalyzed Dakin oxidation mechanism (6mks)