nitrosoureas. Illustrate and explain the mode of anticancer action of nitrosoureas through structural and chemical representations. 1+3=4

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PG Even Semester Examination, May 2025

CHEMISTRY

(4th Semester)

Course No.: CHM-653B

(Organic Chemistry-IV)

Full Marks: 70

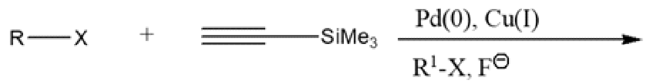
Pass Marks: 28

Time: 3 hours

The figures in the right margin indicate full marks for the question. Answer any five questions selecting one from each unit.

UNIT-I

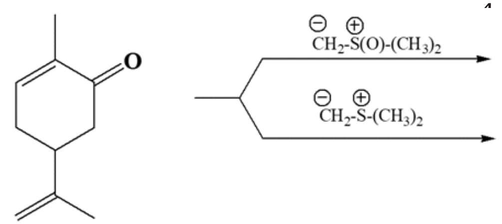
1. (a) Draw the catalytic cycle of the following reactions: 3+2=5

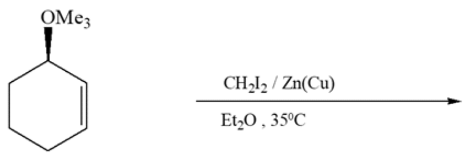


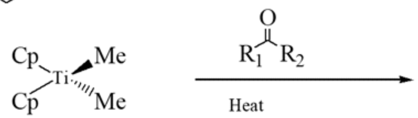
Carryout the above reaction with low-cost alternative 

of to get the same product

(b) Complete the following reactions. Suggest plausible mechanism (show stereochemistry wherever necessary) 4+2+3=9

i) 

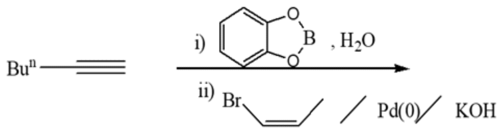
ii) 

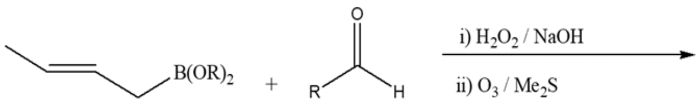
iii) 

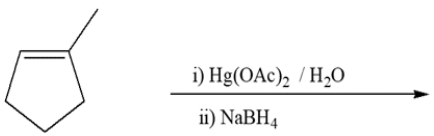
2. (a) Identify the product P, suggest general mechanism in support of the product P. 3+2=5

Show sequence of reactions to covert by-product $Ph_3P{=}O$ to valuable product(s).

(b) Provide the product(s) of the following reactions with supportive mechanism. 3x3=9

i) 

ii) 

iii) 

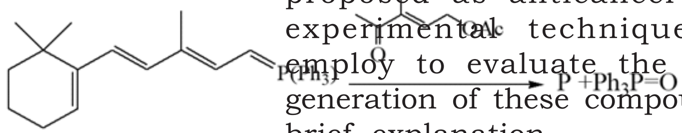
(c) Write notes on (i) QSAR, (ii) Diverse binding roles of -COOH group 3+3=6

UNIT-V

9. (a) Discuss the mechanism of immunogenic cell death (ICD) induced by IPDT, elaborating on the mechanisms of action of its three cell-death pathways. Additionally, explain the role of donor–π–acceptor (D–π–A) structured photosensitizers in enhancing this process. 8+3=11

b) Compare and contrast the mechanisms of chemotherapeutic action between taxols and vinca alkaloids. 3

10. (a) Three porphyrin-based photosensitizers—designated as A, B, and C—have been proposed as anticancer agents. What experimental techniques would you employ to evaluate the singlet oxygen generation of these compounds? Provide a brief explanation. 3



(b) Define caspases and describe their role in apoptosis associated with Photodynamic Therapy (PDT) action. 3

(c) i) What types of anticancer effects are triggered by the inhibition of M-phase and S-phase of the cell cycle? 1

ii) Explain the mechanism of action of 5-fluorouracil (5-FU) using relevant chemical equations. 3

(d) What are nitrosoureas? Provide the chemical structures of any two

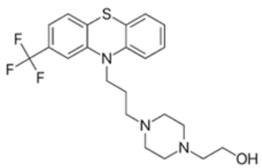
UNIT-IV

7. (a) Discuss the Occupancy theory and Induced-fit theory of drug activity. Point out two important differences between the two. 3+2+1=6

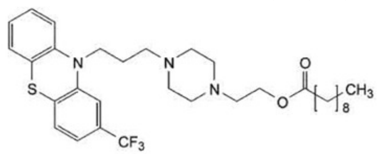
(b) What is partition coefficient? Which alcohol is used as model of biological lipid membrane in lab for partition coefficientstudy of a drug? Given the log P values of benzene, chlorobenzene and benzamide as 2.13, 2.84 and 0.64 respectively. Considering the substituent constant for Cl and $CONH_2$ being 0.71 and -1.49 respectively, calculate the log P for m- chlorobenzamide. 2+1+2=5

(c) What is Lead structure in drug discovery? What are the important sources of Lead structures? 1+2=3

8. (a) What are pro-drugs (with example)? What are the advantages of using pro-drugs? Explain how Fluphenazine decanoate (a prodrug of Fluphenazine) helped in achieving prolonged drug activity. 2+2+2=6



Fluphenazine

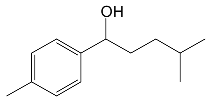


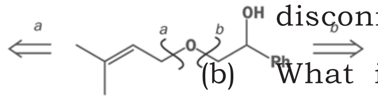
Fluphenazine Decanoate (Intramuscular Injection)

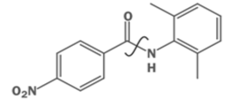
(b) What is meant by Competitive inhibitor and Non-competitive inhibitor? 1+1=2

UNIT–II

3. (a) Provide the retro synthesis of the following compounds as directed, 3x3=9

(i)  (A Grignard type synthetic equivalent to be achieved)

(ii)  (Select the better pathway with justification)

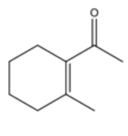
(iii)  (Initiate with the indicated disconnection)

(b) What is 1,2-diX disconnection? Provide one example 2

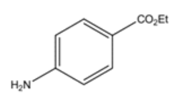
(c) What is Latent polarity? Provide an example each for consonant and dissonant pattern of latent polarity? 1+2=3

4. (a) What is meant by order of events in organic synthesis? 2

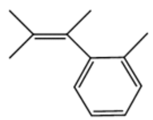
(b) Provide the retro synthesis followed by forward synthesis for each of the following compounds: (2+1)×4=12



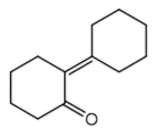
(i)



(ii)



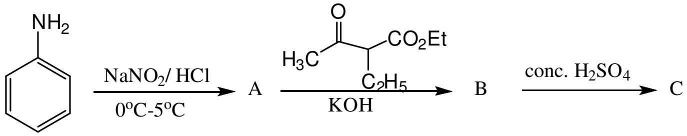
(iii)

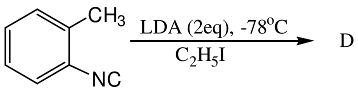


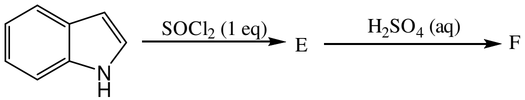
(iv)

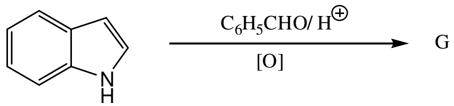
UNIT-III

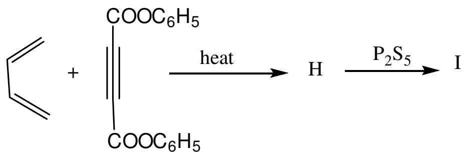
5. (a) Identify A-I for the following reaction(s) 2+1+1+1+1=6

i) 

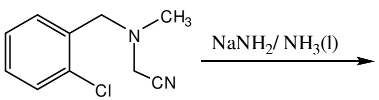
ii) 

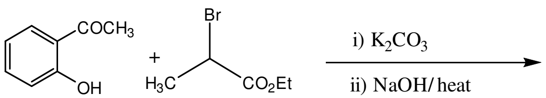
iii) 

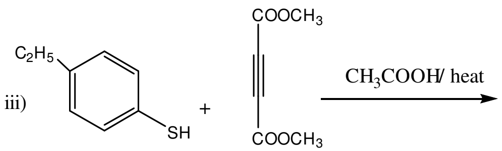
iv) 

v) 

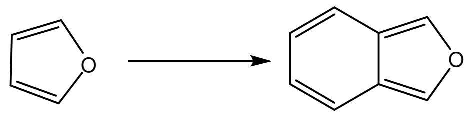
(b) Provide the major product (s) of the following reaction (s) and provide mechanism. 2×3= 6

i) 

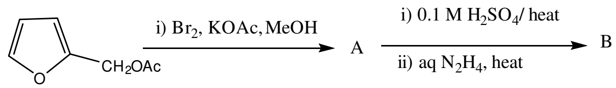
ii) 

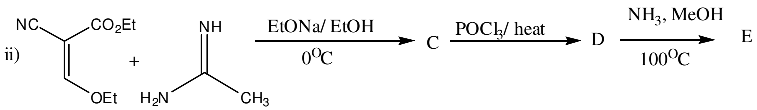
iii) 

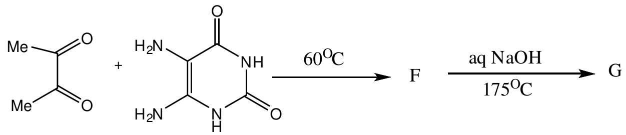
(c) Carry out the following conversion with suitable reagents, reaction condition and provide mechanism 2



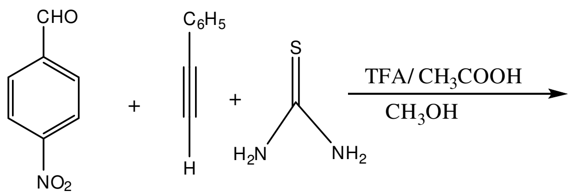
6. (a) Complete the following reaction(s).2×3=6

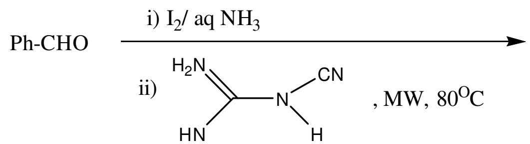
i) 

ii) 

iii) 

(b) Predict the major product (s) of the following reaction(s) and suggest plausible mechanism: 3+3+2=8

i) 

ii) 

iii) $CH_3CN + PhCN \xrightarrow[\text{ii) } NaNO_2]{\text{I) 5 mol\% Ni(OTf)}_2\text{, } N_2H_4\text{, } 60^{O}C}$