Time: 3 hrs **Marks: 80**

N.B: 1. All question are compulsory.
2. Figures to the right indicate full marks

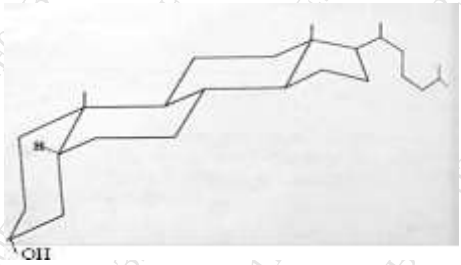
Q.1 Choose the correct options **20 M**

1. C- terminal amino acid of a peptide has ____
   a. A free -NH2 group
   b. A free -COOH group
   c. A free -NHCOCH3 group
   d. A free -COOCH3 group

2. Identify the correct order of aromaticity for the following heterocycles
   a. Thiophene>furan>pyrrole
   b. Pyrrole>furan>thiophene
   c. Thiophene>pyrrole>furan
   d. Thiophene>pyrrole>furan

3. Aniline + glycerol in presence of H2SO4/ FeSO4, nitrobenzene, heat gives ____
   a. Indole
   b. Quinoline
   c. Imidazole
   d. Pyridine

4. IUPAC name of the given structure is ____



   a. 5β-Cholestane-3 α –ol
   b. 5β-Cholestane-3 β-ol
   c. 5β-androstane-3 β-ol
   d. 5 α -Cholestane-3 β-ol

5. Condensation of a 1,4-dicarbonyl compound with an excess of a primary amine or ammonia is ____
   a. Paal Knorr synthesis of pyrrole
   b. Hinsberg synthesis for thiophene
   c. Gabriel synthesis for thiazole
   d. Radziszewski imdazole synthesis

6. Identify the carboxy protecting group from the following:
   a. -COOCH3
   b. -t-BOC
   c. –CONH2
   d. –CHO

7. Electrophilic aromatic substitution reaction in Pyrimidine takes place at_____position.
   a. 2nd
   b. 3rd
   c. 4th
   d. 5^{th}

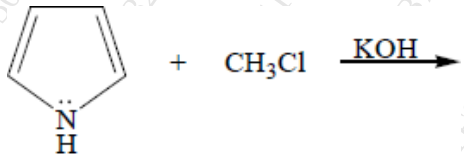
8. Thiophene with POCl3/DMF gives_____.
   a. 2-chloro-thiophene
   b. 3-chloro-thiophene
   c. Thiophene-2-carbaldehyde
   d. Thiophene-2-carboxylic acid

9. Chichibabain reaction of pyridine gives _____.
   a. 2-nitro-pyridine
   b. 2-bromopyridine
   c. 2-aminopyridine
   d. 2-hydroxypyridine

10. Pyrimidine with hydrazine hydrate/130^0C gives _____.
    a. Pyrazine
    b. Pyrazole
    c. Pyrrole
    d. Pyridine

11. Pyridine reacts with peracids to give _____.
    a. Pyridine-N-oxide
    b. Pyridine-2-acetic acid
    c. Pyridinium salt
    d. 1,4-dihydropyridine

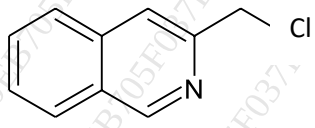
12. Predict the products formed



Pyrrole

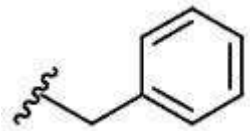
    a. Pyrrole-2-carbaldehyde, 3-chloropyridine
    b. 2-hydroxy-pyrrole, 3-chloropyridine
    c. Pyrrole-2-carbaldehyde, 3-chloro-pyrrole
    d. 2-hydroxy-pyrrole, 3-chloro-pyrrole

13. IUPAC nomenclature of the given structure is



a. 2-chloromethyl-isoquinoline
b. 3- chloromethyl-isoquinoline
c. 3- chloromethyl-1H-Indole
d. 3- chloromethylquinoline

14. The following structure is a protecting group used in peptide synthesis. Identify the name:



a. Tertiary-butyloxycarbonyl
b. Benzyloxycarbonyl
c. Benzyl
d. 9-fluorenylmethoxycarbonyl

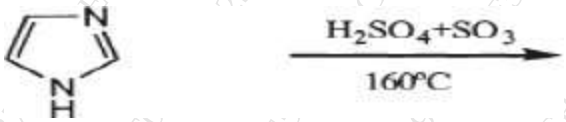
15. The isoelectric point of Lys is _____. (Its three pKa values are 2.18, 8.95, 10.79)
a. 9.87
b. 8.87
c. 10.2
d. 6.48

16. Which product is formed on cathyation cholestan-3β, 5α, 6α –triol
a. Monocathylate
b. Dicathylate
c. Tricathylate
d. No cathylation

17. Identify the name of the structure:

a. 2,5-dimethyl-2,5-dihydrofuran
b. 1,4-dimethyl-pyrrole
c. 2,5-dimethylthiophene
d. 2,5-dimethyl –oxazole

18. Predict the product

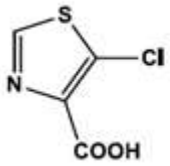


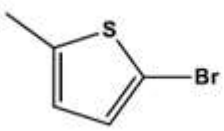
a. 1H-Imidazole-2-sulphonic acid
b. 1H-Imidazole-4-sulphonic acid
c. 1H-pyrrole-2-sulphonic acid
d. 1H-pyrrole-4-sulphonic acid

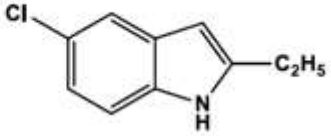
19. In steroids, ketones on reduction in acidic medium yields _____as a product.
    a. Equatorial alcohol
    b. Equatorial aldehyde
    c. Axial alcohol
    d. Axial aldehyde

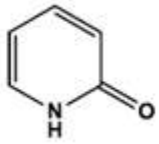
20. Nitration in pyrrole is carried out using
    a. Conc.HNO3
    b. Conc.HNO3 and conc.H2SO4
    c. Acetyl nitrate
    d. Acetic anhydride

Q.2.A. Give IUPAC nomenclature of the following: (Any 3) **3M**

(i) 

(ii) 

(iii) 

(iv) 

Q.2.B. 5-Cholestene (A) when treated with peracetic acid gives product B, which on treatment with water to give product C. Give the structures of A, B and C with proper stereochemistry. **3M**

Q.2.C. Write the following synthesis with mechanisms: (Any 3) **6M**

i) Doebner-Miller Synthesis
ii) Robinson-Gabriel Synthesis for oxazole
iii) Hantzsch Pyridine Synthesis
iv) Knorr Pyrrole Synthesis

Q.3.A. Compare the basicity of pyridine and pyrimidine. **5M**

Q.3.B. Attempt the following conversions: **5M**
(i) Furan to Furfural (Gatermann reaction)
(ii) Pyridine to 4-nitro pyridine
(iii) Indole to 3-Formyl-Indole
(iv) Thiazole to thiazole-5-sulphonic acid
(v) Acrolein to quinoline (Skraup Synthesis)

Q.3.C. Can imidazole be considered as amphoteric? Justify. **2M**

Q.4. Answer the following in brief: (2M each) **12M**

(i) Size exclusion chromatography of monodisperse fractions of a linear polymer A and B, yield molecular weights 4,00,000 and 8,00,000 respectively. Mixture is prepared from 3 parts by weight of A and 5 parts by weight of B. Determine weight average molecular weight.

(ii) During DNA synthesis, A, G and C requires protecting group while thymine does not. Justify.

(iii) Calculate the isoelectric point for Aspartic acidgiven that pKa1 = 1.88, pKa2 = 3.65, and pKa3 = 9.60. Write the structure of the zwitterions.

(iv) Give the structure/s of oxidation product of Pyridine.

(v) At which position does electrophilic aromatic substitution occur in pyrrole? Why?

(**vi**) Draw resonating structures for Indole

Q.5.A. Give reasons for the following: **6M**

(i) 5α-cholestane-3α-ol is oxidized 3 times faster than 5α-cholestane-3β-ol.

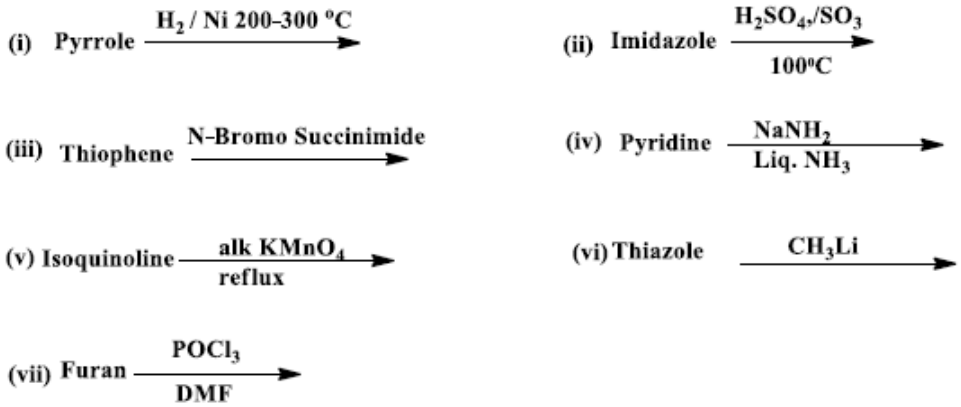
(ii) Nucleophilic substitution in pyridine takes place at 2 and 4 position.

(iii) Cholesterol gives cis product upon oxidation with $KMnO_4$ while with H_2O_2 it gives trans product.

Q.5.B. What are co-polymers? Explain different types of co-polymers. **3M**

Q.5.C. Draw the general structures for androstane, pregnane and estrane backbone of steroids **3 M**

Q.6.A. Give the products of the following reactions **(Any 6)** **6M**



Q.6.B. Illustrate the Edman degradation analysis for the peptide Gly-Phe-Glu-Lys **3M**

Q.6.C. Briefly discuss the Merrifield solid phase synthesis of DNA **3M**

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