KATHMANDU UNIVERSITY
End Semester Examination
June/July, 2023

11 JUL 2023

Level : B.Pharm.
Year : II
Time : 2 hrs. 30 mins.

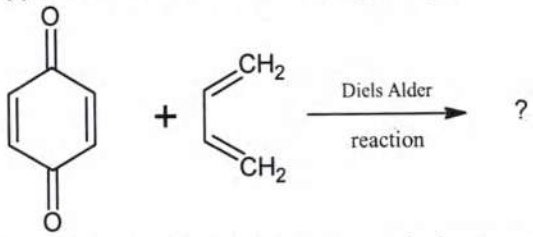
Course : CHEM 203
Semester : I
F. M. : 55

SECTION "B"

Attempt *ALL* questions.

1. Give the mechanism for the following reactions. [5 × 2 = 10]
   a. CH_3-CO-OC_2H_5 + C_2H_5OH/NaOH
   b. CH_2=CH-C_6H_5 + Peroxide
   c. Gabriel phthalimide synthesis
   d. [4+2] Cycloaddition reaction in a thermal condition
   e. Acetoacetic ester synthesis using C_2H_5Br for mono-substitution

2. Explain the following statements (*ANY FIVE*). [5 × 2 = 10]
   a. In electrocyclic reaction, only HOMO plays an important role whereas in cycloaddition reaction, HOMO and LUMO are considered.
   b. Pyrrole upon hydrogenation gives more basic heterocyclic amine.
   c. Kiliani-Fischer synthesis generates epimers.
   d. (+) Lactose is a reducing sugar.
   e. Electrophoresis helps to separate protein mixture.
   f. Electrophilic substitution in pyridine takes place at 3 position.

3. Give the chemical reactions involved in the following processes *(ANY SIX)*. [6 × 2 = 12]
   a. (-) Fructose with HCN and hydrolysis followed by HI
   b. 

   c. CH_3-CO-OC_2H_5 with excess methylmagnessium bromide
   d. Preparation of non-ionic detergent
   e. Thermal cyclization of trans,trans-2,4,-hexadiene
   f. Benzaldehyde with Ph_3P=CRR'
   g. (+) Maltose with Br_2/H_2O and methylation followed by hydrolysis

4. a. Why is the α hydrogen of malonic ester relatively more acidic? What is it good for? [2]
   b. Give the complete scheme of synthesis of dipeptide made from NH_2CH_2COOH and $NH_2CH(CH_3)$-COOH. [2]

c. Show that acids and bases can help in the polymerization process. Justify your statements with suitable chemical equations. [2]

d. (+) Glucose reacts with acetic anhydride to give two isomeric pentaacetyl derivatives neither of which reduce Fehling's or Tollen's regent. Account for these facts. [2]

e. Write down the role of four vital amino acids involved in the enzymatic activity of chymotrypsin. [2]

f. Write down chemical reactions which demonstrates electrophilic substitution in pyrrole. Where does the substitution take place and why? [3]

5. Write short notes on (*ANY FOUR*). [2.5 × 4 = 10]

a. Preparation and cleansing action of soap
b. Cellulose
c. Structure and properties of macromolecules
d. Halogenation of ketones
e. Ring size determination of sugar

Marks Scored:

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SECTION "A"

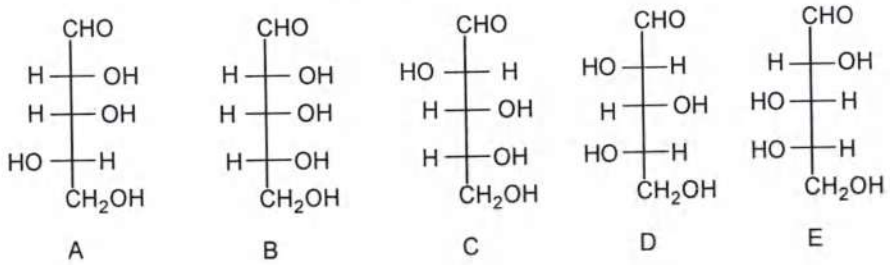
[20 Q. × 1 =20 marks]

Mark [X] in the most appropriate answer.

1. Which of the following best describes the starch molecule?
   [ ] β-1,4 Linkage between D-glucose units
   [ ] Unbranched amylose and branched amylopectin
   [ ] Branched amylose and branched amylopectin
   [ ] Unbranched amylose and unbranched amylopectin

2. How many molecules of phenyl hydrazine react with glucose to produce glucosazone?
   [ ] 1 [ ] 2 [ ] 3 [ ] 4

3. Select the following sugars that would produce the same osazone.



   [ ] A & C; B & D
   [ ] A & B; C & D
   [ ] C & E; B & D
   [ ] A & D; B & C

4. Select the one that does not match regarding aldol condensation.
   [ ] Aldol condensation can be used to make saturated alcohol
   [ ] The key step in base catalyzed reaction is the attack on carbonyl carbon
   [ ] Dehydration of aldol gives alpha beta unsaturated acid
   [ ] Carbonyl group helps in the stabilization of enolate ion

5. A hexapeptide made from the repeating unit of Gly-Lys has
   [ ] Free amino group on Lys and free carboxyl group on Gly, 5 amide bonds
   [ ] Free amino group on Gly and free carboxyl group on Lys, 6 amide bonds
   [ ] Free amino group on Gly and free carboxyl group on Lys, 5 amide bonds
   [ ] Free amino group on Lys and free carboxyl group on Gly, 6 amide bonds

6. Which of the following statements are **CORRECT**?
   a. [1, 3] Sigmatropic migration of carbon occurs with inversion of configuration
   b. For 4n π electrons in electrocyclic reaction, thermal condition leads to disrotatory motion
   c. For 4n +2 total π electrons in cycloadditon reaction; supra, antara process is applicable in thermal condition
   d. For 4n+2 π electrons in electrocyclic reaction, photochemical condition leads to conrotatory motion

   [ ] a,c [ ] a,d [ ] b,c [ ] b,d

7. The reaction of 2-bromopyridine with NH_3 in heating condition is an example of
   [ ] Electrophilic substitution [ ] Addition
   [ ] Elimination-addition [ ] Nucleophilic substitution

8. The monomers of Glyptal polymer are
   [ ] Urea and formaldehyde
   [ ] Adipic acid and hexamethylene diamine
   [ ] Phthalic anhydride and methyl terephthalate
   [ ] Glycerol and phthalic anhydride

9. C_6H_5CHO reacts with _____ in order to give crossed aldol condensation product.
   [ ] HCHO [ ] CH_3-CO-Ph [ ] $(CH_3)_3CCHO$ [ ] Ph-CO-Ph

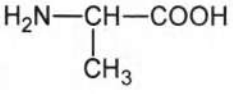
10. Select the incorrect statement from the following.
    [ ] Oils have lower melting points [ ] Oils can be converted to methyl esters
    [ ] Oils are saturated triglyceride [ ] Oils are susceptible to rancidity

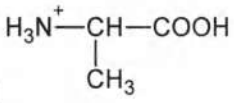
11. Acetoacetic ester upon treatment with sodium ethoxide/alcohol followed by replacement of one hydrogen by methyl group gives
    [ ] Propanone [ ] Butanone [ ] Ethanoic acid [ ] Ethyl ethanoate

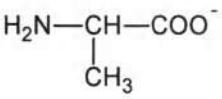
12. Which statements are **TRUE** about [2+2] cycloaddition reaction?
    a. Thermal reaction occurs in supra, supra mode
    b. Thermal reaction occurs in supra, antara mode
    c. Photochemical reaction occurs in supra, supra mode
    d. Photochemical reaction occurs in supra, antara mode

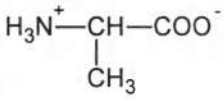
    [ ] a,b [ ] b,c [ ] c,d [ ] a,d

13. Which of the following structure best represents alanine in a strongly acidic solution?

[ ] 

[ ] 

[ ] 

[ ] 

14. Which of the following statements are **CORRECT** regarding sigmatropic reactions?
    a. [1, 3] Sigmatropic migration of carbon occurs with inversion of configuration
    b. [1, 3] Sigmatropic migration of carbon occurs with retention of configuration
    c. [1, 5] Sigmatropic migration of carbon occurs with inversion of configuration
    d. [1, 5] Sigmatropic migration of carbon occurs with retention of configuration

    [ ] a,c [ ] a,d [ ] b,c [ ] b,d

15. During the biosynthesis of fatty acid, crotonyl-S-ACP upon reduction (ACP is acyl carrier protein) gives

    [ ] Butyryl-S-ACP [ ] Malonyl-S-ACP
    [ ] Hydroxybutyryl-S-ACP [ ] Acetoacetyl-S-ACP

Fill in the blanks with appropriate words/symbols.

16. Pyridine on treatment with phenyllithium yields _____.

17. The correct sequence of chemicals needed for Ruff degradation are _____.

18. _____chemical facilitates peptide bond formation.

19. One example which acts as a host to guest molecules is _____.

20. CH_3MgBr reacts with _____to yield propan-2-ol.