This question paper contains **6** printed pages]

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S. No. of Question Paper : **1924**

Unique Paper Code : **2172012402**

Name of the Paper : **Carbohydrates, Lipids and Heterocyclic Compounds**

Name of the Course : **B.Sc. (H) Chemistry**

Semester : **IV**

Duration : **3 Hours** Maximum Marks : **90**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt *six* questions in all.

All questions carry equal marks.

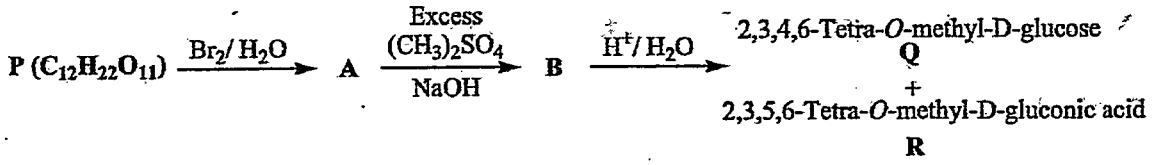
1. (*a*) An α-D-methylglycoside **X** (molecular formula $C_7H_{14}O_6$) consumes 2 moles of periodic acid (HIO_4) to give one mole of HCHO, and the product **A**. On subsequent oxidation with bromine/H_2O in the presence of $SrCO_3$, **A** gives the crystalline salt **B**. With reactions, arrive at the possible structures for **X**, **A** and **B**.

(*b*) Which is the anomeric carbon in fructose ? Draw the Fischer projection formula for the two anomeric forms of D-fructofuranose.

(*c*) What are steroids ? Give an example and discuss its biological importance. What are good and bad cholesterols ? 5,5,5

P.T.O.

2. (*a*) A carbohydrate **P** (molecular formula $C_{12}H_{22}O_{11}$) on enzymatic hydrolysis gives D-glucose. **P** reacts with bromine water as well as Benedict reagent. When **P** is subjected to the following sequence of reactions **Q** and **R** are obtained as products. Deduce the structure for **P**, **A** and **B** and explain the reaction involved.



(*b*) Electrophilic substitution reactions in furan occur at C-2 position. Show the attack of the electrophile and justify.

(*c*) (*i*) Write the products for the HIO_4 oxidation of the open chain form of D-fructose.

(*ii*) Differentiate between amylose and amylopectin based on the glycosidic linkage and the monosaccharide units along with their structures. 5,5,5

3. (*a*) Identify the two products formed when an aldohexose reacts with excess of acetic anhydride in the presence of sodium acetate. Will the two products obtained react with excess of phenylhydrazine ? Explain.

(*b*) How will you confirm the ring size of glucopyranose by the methylation method ? Give the reactions involved.

(*c*) An aromatic compound **A** (molecular formula C_5H_5N) on treatment with *n*-butyl lithium at 100°C gives **B** ($C_9H_{13}N$). **B** on oxidation with alkaline $KMnO_4$ gives **C**, which on further treatment with PCl_5 followed by NH_3 gives **D**. **D** on Hofmann bromamide reaction gives 2-aminopyridine. Complete the sequence of the reactions giving the structures of **A**, **B**, **C** and **D**. 5,5,5

4. (*a*) Distinguish between the following with examples and structures wherever required :

(*i*) Phospholipids and glycolipids

(*ii*) Omega-3-fatty acid and omega-6-fatty acid.

(*b*) How many isomers can be drawn for a D-aldohexose ? Draw their structures. Which of these on oxidation with nitric acid give *meso*-aldaric acid ?

(*c*) Pyrrole undergoes ring expansion on treatment with $CHCl_3$ and aqueous KOH. Write the complete reaction and mechanism involved. 5,5,5

5. (*a*) What are epimers ? Suggest the method for the conversion of D-glucose to its epimer.

(*b*) Write the product obtained when phenylhydrazone of acetone is treated with conc. H_2SO_4. Give the name of the reaction and the mechanism involved.

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(c) Carry out the following conversions :

(i) Pyrrole to 2-formylpyrrole

(ii) Thiophene to thiophene-2-carboxylic acid. 5,5,5

6. (a) Draw the resonating structures for quinoline. Explain the orientation of electrophilic substitution in quinoline.

(b) Draw the structure for the triglyceride **A**, which on hydrolysis gives glycerol and 3 equivalents of oleic acid. Write the complete reaction. Further, write the products obtained when **A** reacts with :

(i) Br_2/CH_2Cl_2

(ii) H_2/Pd

(iii) O_3 and Zn/CH_3COOH.

(c) Arrange the following and justify :

(i) Pyrrole, pyrrolidine and pyridine in increasing order of basicity.

(ii) Furan, thiophene and pyrrole in increasing order of their reactivity toward electrophiles. 5,5,5

7. Write short notes on (any *three*) :

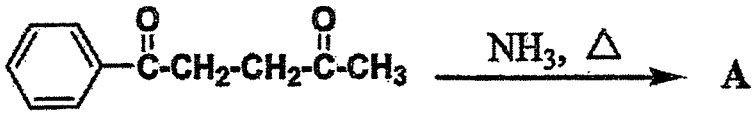
(a) Skraup synthesis of quinoline

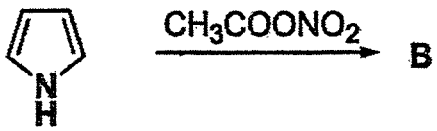
(b) Hantzsch pyridine synthesis

(c) Saponification value and its significance

(d) Mutarotation in glucose. 5,5,5

8. (*a*) Complete the following reactions :

(*i*) 

(*ii*) 

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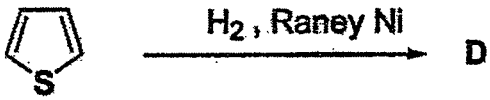
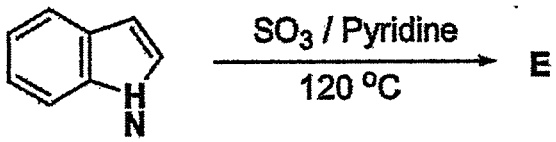
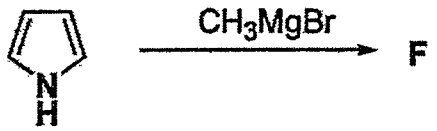
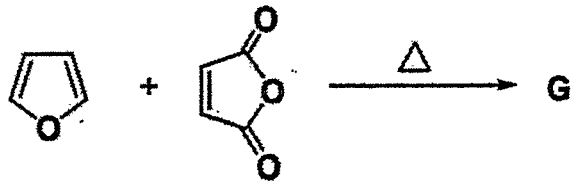
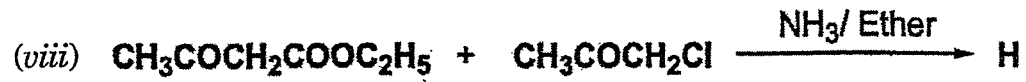
(*iv*) 

(*v*) 

(*vi*) 

(*vii*) 

(*viii*) 

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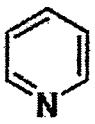
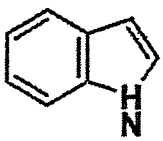
(*ix*)  $\xrightarrow{CH_3COOOH}$ I

(*x*)  $\xrightarrow{DMF + POCl_3}$ J

(*b*) Write short notes on (any *two*) :

(*i*) Inversion of sugar

(*ii*) Chichibabin reaction

(*iii*) Fischer projection of lactose. 10,5