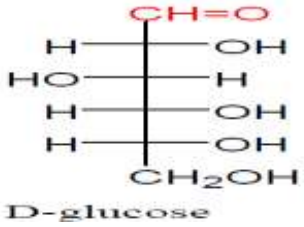
NATIONAL OPEN UNIVERSITY OF NIGERIA
FACULTY OF SCIENCES
DEPARTMENT OF CHEMISTRY
2025_2 EXAMINATIONS

COURSE CODE: CHM315
COURSE TITLE: CARBOHYDRATE CHEMISTRY
COURSE UNIT: 2 UNITS
TIME: 2 HOURS

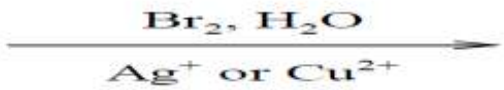
INSTRUCTION: ANSWER QUESTION 1 AND ANY OTHER 2 QUESTIONS

QUESTION 1

(a). Define carbohydrates and describe their chemical composition. **(3 marks)**
(bi). Explain the classification of monosaccharides based on the placement of the carbonyl group and the number of carbon atoms they contain. Provide examples in your answer. **(5 marks)**
(bii). Describe the classification of monosaccharides based on their chiral handedness and provide examples of how the classification systems can be combined. **(4 marks)**
(c). Copy and complete the below oxidation reaction equation. **(5 marks)**



D-glucose



(d). Explain how monosaccharides undergo reactions typical of alcohols, providing examples of the reactions they undergo and the reagents used. **(5 marks)**
(ei). Explain the structure and components of glycosaminoglycans. **(4 marks)**
(eii). Describe the physiological importance and examples of glycosaminoglycans. **(4 marks)**

QUESTION 2

(a). Arrange the following monosaccharides into triose, tetraoses, hexoses and pentoses. **(10 marks)**
D-(+)-allose, D-(+)-altose, D-(-)-threose, D-(-)-ribose, D-(-)-arabinose, D-(+)-glucose, D-(+)-mannose, D-(-)-erythrose, D-(-)-gulose, D-(-)-idose, D-(+)-glyceraldehyde, galactose, D-(-)-talose, D-(+)-xylose, D-(-)-lyxose.
(bi). Describe the mechanism of ring formation in glucose. **(5 marks)**
(bii). Differentiate between alpha and beta glucose, and define the term anomers. **(5 marks)**

QUESTION 3

(a). Draw the Chair and Boat formation of beta-D-glucose **(10 marks)**
(b). Explain the formation and significance of cyclic hemiacetal structures in monosaccharides. **(5 marks)**
(c). Discuss the concept of anomers in glucose and how the anomeric carbon influences their formation. **(5 marks)**

QUESTION 4

(ai). Describe the esterification process of monosaccharides, using β-D-glucose as an example. **(5 marks)**
(aii). Provide the structural equations for the esterification of a monosaccharide and the formation of an ether from a monosaccharide. **(10 marks)**
(b). Explain the oxidation reactions of monosaccharides and the types of acids produced, including
the reactions with various reagents. **(5 marks)**

QUESTION 5

(a). Write a short note on the following: Reduction of monosaccharides, Formation of amino sugars, N-acetylneuraminic acid, Formation of glycosides, and Osazone formation. **(10 marks)**
(b). Provide a summary of the reactions depicted in the diagram below: **(10 marks)**