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**University Examinations 2016/2017**

FOURTH YEAR, FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE PHYSICAL

**SCH 2402: ADVANCED STEREOCHEMISTRY AND REACTION MECHANISM**

**DATE: December, 2016 TIME: HOURS**

**INSTRUCTIONS:** *Answer questions* ***one*** *and any other* ***two*** *questions.*

**QUESTION ONE - (30 MARKS)**

1. Distinguish between;
2. Syn-elimination and anti-elimination (2 Marks)
3. Configuration and conformation (2 Marks)
4. Configurational isomers and conformational isomers (2 Marks)
5. How many stereoisomers would you expect to exist in the following molecules.
6.  (2 Marks)
7. Glucose (2 Marks)
8. To obtain each of the following compound by addition reaction, give the structure of the unsaturated compound you would start with, and the reagents and any special condition you would use.
9. Erythro – 2,3 – dichloropentane (2 Marks)
10. Meso – 3,4- hexanediol (2 Marks)
11. Racemic ($2^{3}$,$D\_{2}$) butane (CH3 CHD CHD CH3) (3 Marks)
12. Compare and contrast the properties of diastereomers. (3 Marks)
13. Discuss three methods used for resolving racemic mixtures. (6 Marks)
14. Describe the approach towards confirming stereoisomers. (4 Marks)

**QUESTION TWO (20 MARKS)**

1. (i) Define torsional strain. (1 Mark)

(ii) Using an energy level diagram, demonstrate the two possible structures of butane

(6 Marks)

(iii) State three factors that affect the relative stabilities of conformation. (3 Marks)

1. $C\_{6}H\_{5}$CH (Br) CH ($CH\_{3}$) $C\_{6}H\_{5}$ undergoes dehydrohalogenation under E 2 elimination reaction to give $C\_{6}H\_{5}$CH C ($CH\_{3}$)$C\_{6}H\_{5}$. Demonstrate and explain the possible reaction mechanisms. (10 Marks)

**QUESTION THREE (20 MARKS)**

1. Distinguish between stereoselectivity and stereospecificity. (4 Marks)
2. State three methods used in monitoring the reactants and products configuration during a chemical reaction. (3 Marks)
3. On treatment with $MnO\_{4}^{-}$ Cis-2-butene yields 2,3-butanediol of melting point 34$°C$ and trans-2-butene yields 2,3-butanediol of melting point 19$°C$. Both diols are optically inactive. The diol of $M.P\_{t}$ 19$°C$ is converted into two optically active fractions of equal but opposite rotation, via protection and deprotection to form salt. While the diol of M.P 34°$C$ is not.
4. What is the configuration of the diol of m.p 19°$C $ and of m.p 34°$C$ (2 Marks)
5. What is the stereochemistry of hydroxylation with permanganate? (1 Mark)
6. Morphine has an optical rotation of – 132. If a laboratory uses a sample that has a concentration of 0.128g/ml and a path of 1dm, what would be the expected observed rotation be? (3 Marks)
7. Using chlorination of n-butane. Show how achiral molecule can be converted into a chiral molecule. (5 Marks)
8. Assign R/S configuration to the following Fischer Projection. (2 Marks)

 

**QUESTION FOUR (20 MARKS)**

1. (I) Using CH3 CH OH CH OH Cl molecules distinguish between enatiomer and diastereomers. (4 Marks)

(ii) What is the maximum number of stereoIsomers of the molecule? (2 Marks)

1. (+) 2- butanol has a specific rotation of + 9.720 while the pure (+) enatiomer’s specific rotation is +$13.5^{0}$. Calculate its optical purity. (2 Marks)
2. For each of the following structures;

 

1. Determine whether chiral or not (2 Marks)
2. Identify all the stereogenic centre (s) (2 Marks)
3. Name their absolute configuration. (2 Marks)
4. Show the plausible reaction mechanism for the addition of $Br\_{2}$ to But-2-ene leading to the formation of (i) Racemic-2,3- dibromo butane (3 Marks)

 (ii) Meso-dibromo butane (3 Marks)