CHEM1611 Answers to Problem Sheet 9

1. Tautomers are structural isomers which are related by migration of a hydrogen atom and the exchange of a single bond and adjacent double bond.





(d) Which pair (or pairs) are (E)- / (Z)-isomers? (c)

2.





3.

Information for answering questions 4 and 5:

The sequence rules for assigning priorities to substituents on a stereogenic centre are:

- (i) Look at the four atoms directly attached to the stereogenic centre and assign priorities in order of decreasing atomic number.
- (ii) If a decision about priority can not be reached by applying rule 1, compare atomic numbers of the second atoms of each substituent, continuing outwards if necessary until the first point of difference is reached.
- (iii) Multiple-bonded atoms are considered as an equivalent number of single bonded atoms.
- 4. After assigning priorities to the groups on each end of the C=C bond as above, the structure is then viewed with the substituent with the lowest priority projecting backwards.

If a curved arrow drawn from the highest to second-highest to third-highest priority substituent is clockwise, the configuration is (R).

If the curved arrow is anticlockwise, the configuration is (S).





need to reorientate with **d** at the back

a - b - c is clockwise: **R**

a - b - c is clockwise: **R**

5. After assigning priorities to the groups on each end of the C=C bond as above, the arrangement is Z if both the substituents of higher priority are on the same side and E if they are on opposite sides.



5.

(a) The starting material is achiral and the reaction gives rise to the generation of a chiral carbon. Both faces of the alkene double bond are equally accessible to the Br_2 and hence compound (F) is obtained as the racemic mixture.

(b) The priorities of the substituents on the chiral carbon in F are:

 $Br > CH_2Br > CH_2CH_3 > H$

The (*R*) enantiomer has the configuration shown below in order to get a clockwise arrow from $Br \rightarrow CH_2Br \rightarrow CH_3CH_3$ with the H placed at the back:



a - b - c is clockwise: **R**