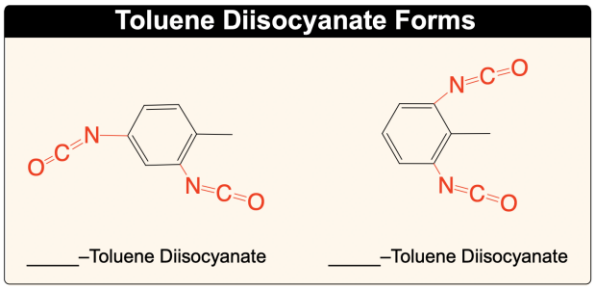
CONCEPT: STEP-GROWTH POLYMERS: POLYURETHANE MECHANISM

Polyurethane Formation Mechanism

- Polyurethanes are created from the nucleophilic addition of a ____ol to a _____ _____.
  - □ It is produced commercially as a _____ (_____-toluene diisocyanate **:** _____-toluene diisocyanate) mixture.

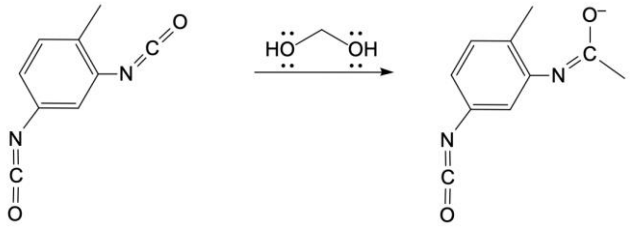


  - □ The formation mechanism has ____ required steps.

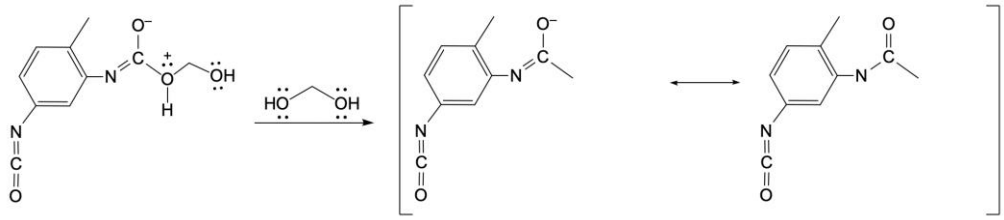
EXAMPLE: Provide the mechanism for the reaction between toluene diisocyanate and methylene diol.

Step 1 Nucleophilic Attack | **Step 2a** Proton Transfer | **Step 2b** Protonation

STEP 1: Nucleophilic alcohol attacks the carbonyl ____ of isocyanate.

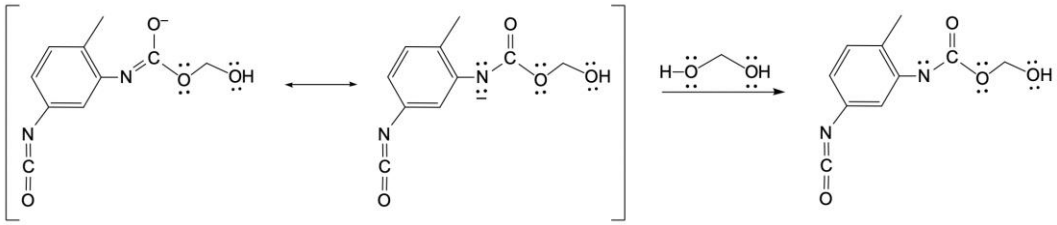


STEP 2a: _____ of the alkoxyl group by second diol.



STEP 2b: _____ of the isocyanate ____ by protonated alcohol to form urethane.

  - □ This urethane represents a _____ _____ than can be elongated as needed.



CONCEPT: STEP-GROWTH POLYMERS: POLYURETHANE MECHANISM

PRACTICE: Determine the monomer created from the reaction between toluene diisocyanate and ethylene diol.

PRACTICE: Provide the mechanism for the reaction between toluene diisocyanate and butane-2,3-diol.