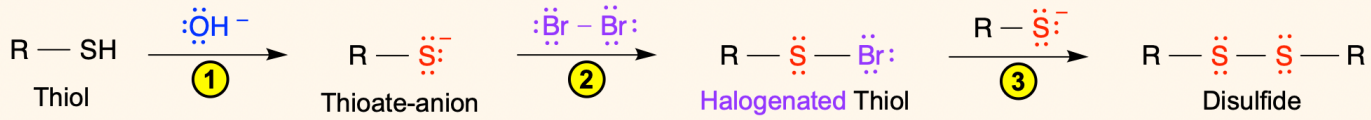
CONCEPT: DISULFIDE BONDS

Disulfide Bond Formation

- Thiols can be oxidized into a *disulfide* in the presence of the mild oxidizing agent ____ or____ in NaOH solution.
  - □ A disulfide represents two ___ atoms covalently bonded.
- Takes place in ___ steps:
  1. **Thiol Ionization:** A _____ base deprotonates the thiol to create a thiolate-anion.
  2. **S_N2 Reaction:** Thiolate-anion reacts with a _____ molecule.
  3. **S_N2 Reaction:** A second thiolate-anion reacts with _____ thiol.

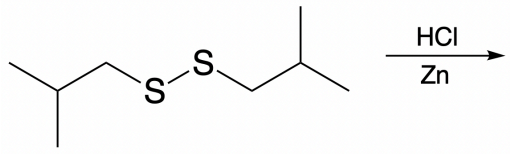
Disulfide Bond Formation



- **Thiol Reversion:** Disulfides are reverted back to their initial thiols through reducing agent of _____ in Zn.

EXAMPLE: Provide the mechanism when two moles of ethanethiol reacts with bromine in basic solution.

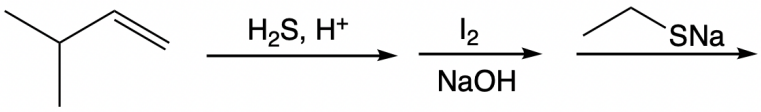
PRACTICE: Provide the name of the product created when the following reaction takes place.



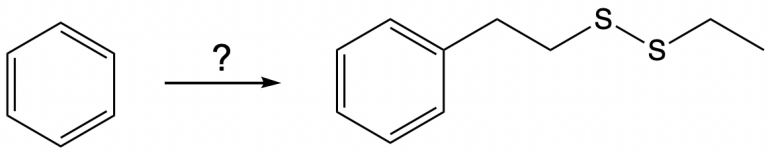
a) Isopropyl thiol b) 2-methyl-1-propanethiol c) 3-methyl-1-propanethiol d) 2-methyl-3-propanethiol

CONCEPT: DISULFIDE BONDS

PRACTICE: Using 3-methyl-1-propene as a starting material, predict the final product based on the list of reagents given.



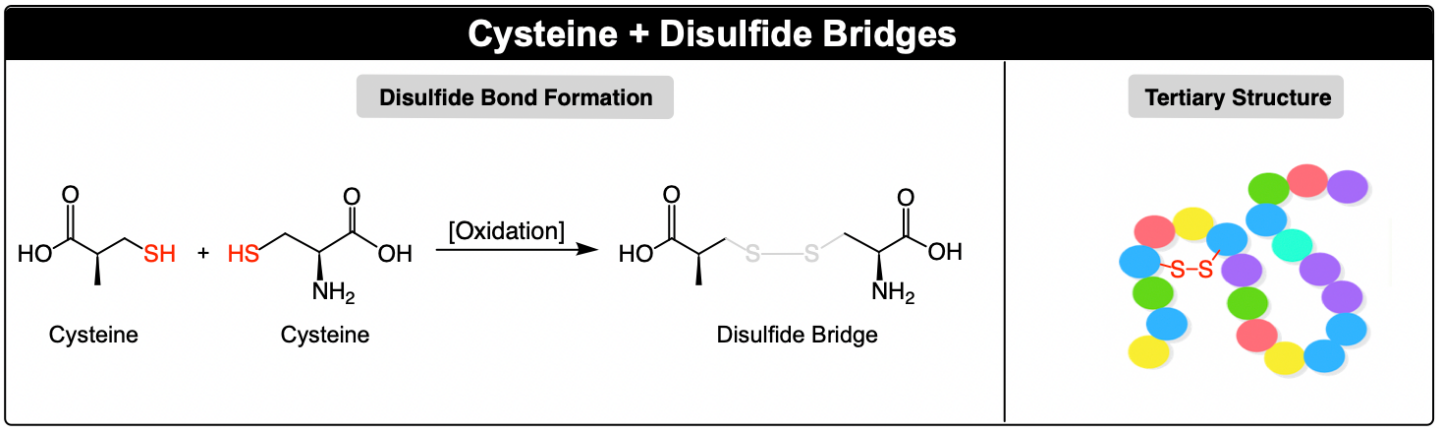
PRACTICE: Beginning benzene, determine the chemical steps needed to prepare the following compound.



CONCEPT: DISULFIDE BONDS

Interactions within the Tertiary Structure

- **Recall:** The tertiary structure of a protein is its overall 3D _____.
  - □ One of the interactions responsible for this structure are the disulfide bonds (bridges).
    - Disulfide bridges form when _____ groups from two cysteine residues react.



EXAMPLE: Illustrate the pentapeptide formed when a molecule of Cys-Gly connects with Cys-Val-Phe via a disulfide bridge.

PRACTICE: Determine which of the following peptide chains could be further stabilized by intramolecular a disulfide bridge(s).

a) Trp–Cys–Met–Ile–Val–Gln–Arg–Ala–Arg–Gly–Glu–Met–Pro–Leu–Phe

b) Ala–Phe–Met–Ser–Trp–Ser–Leu–His–Arg–Arg–Ala–Pro–Thr–His–Val

c) Gly–Leu–Ala–Glu–Gln–Cys–Ser–Met–Gln–Leu–Asn–Cys–Trp–Ile–Val–Ala

d) Phe–Ile–Leu–Cys–His–Arg–Tyr–Thr–Phe–Met–Arg–Ala–Asn–Ile–Phe–Lys

e) Gly–Asn–Val–Val–Ille–His–Leu–Thr–Pro–Met–Tyr–Ser–Cys–Trp–Leu–Ala