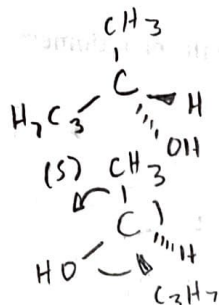
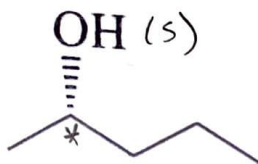


S_N1 and S_N2 Reactions: Stereochemistry Assignment

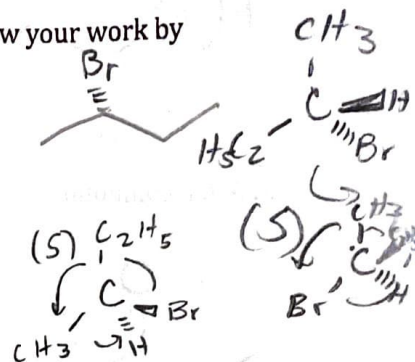
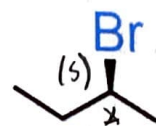
Name: Answer Key Date: _____

Assign the R or S configuration to each chiral center marked with an asterisk (*). Show your work by indicating priority rankings (1-4) for each substituent.

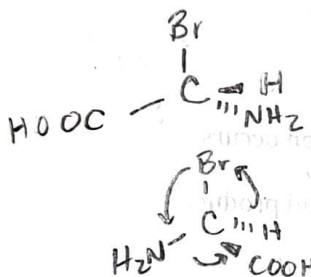
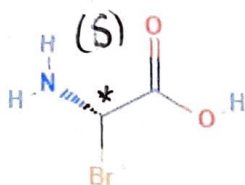
1.



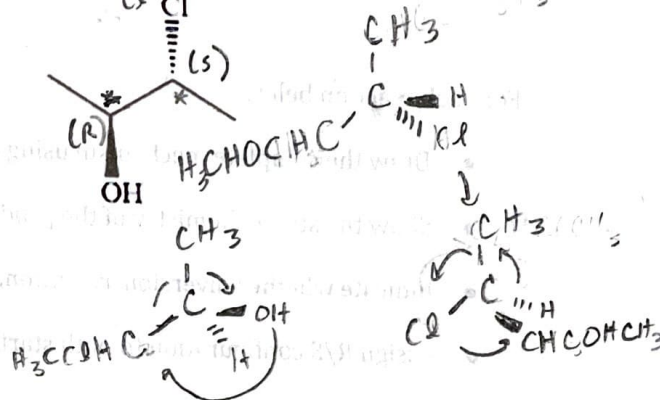
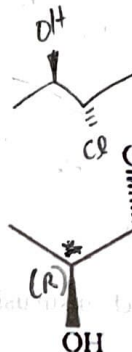
2.



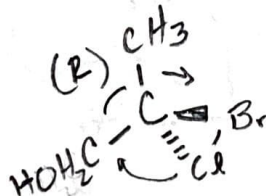
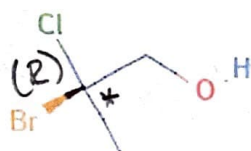
3.



4.



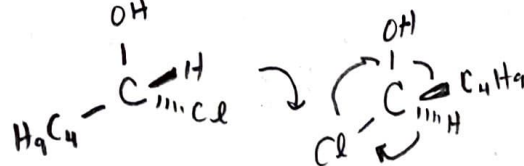
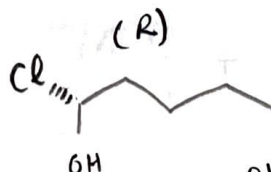
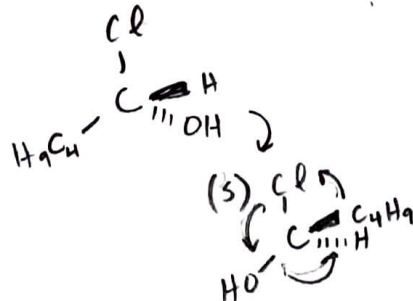
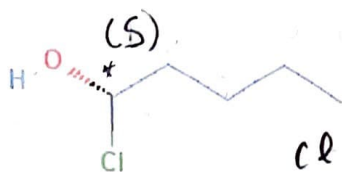
5.



For each compound below, draw its enantiomer. Use wedge-and-dash notation to show stereochemistry clearly.

1. Given compound:

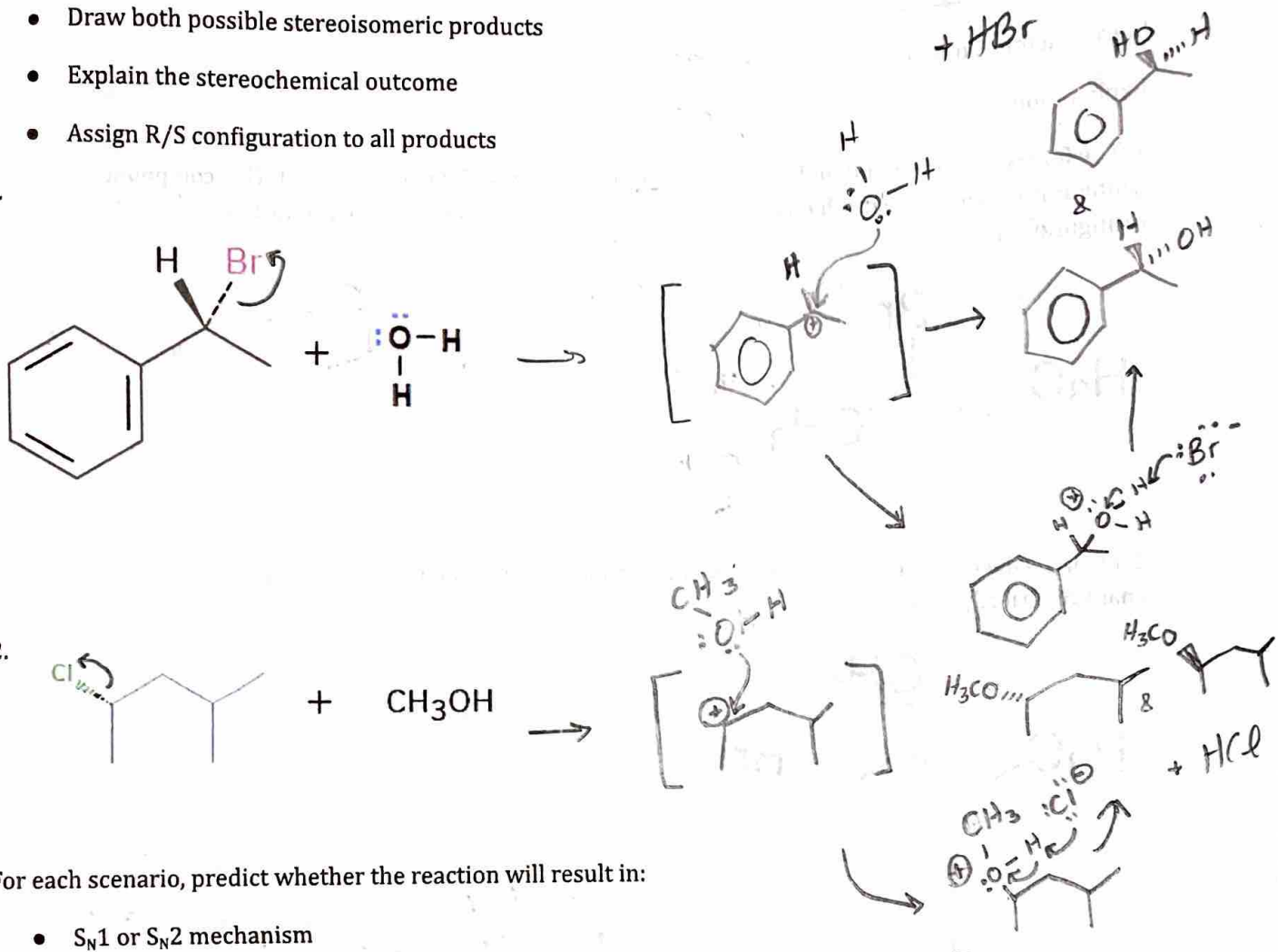
Draw the enantiomer:



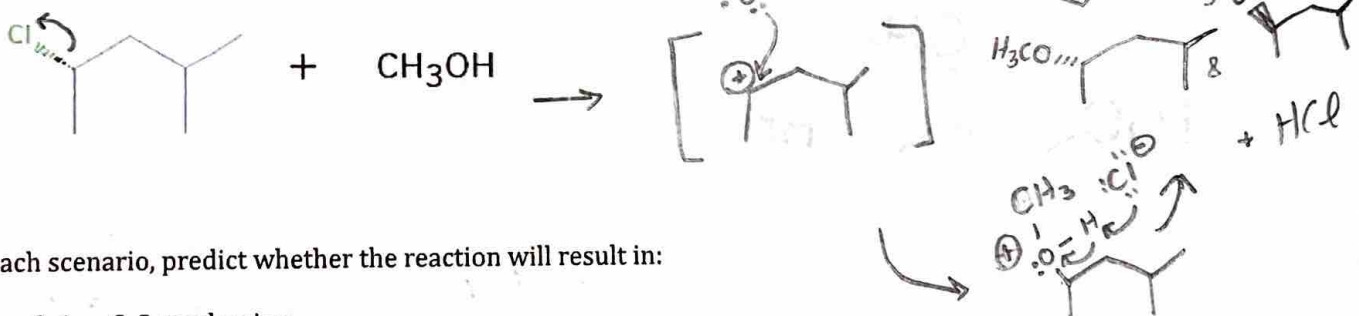
For each reaction below:

- Draw the complete mechanism showing the carbocation intermediate
- Draw both possible stereoisomeric products
- Explain the stereochemical outcome
- Assign R/S configuration to all products

1.



2.



For each scenario, predict whether the reaction will result in:

- S_N1 or S_N2 mechanism
- Stereochemical outcome (Inversion of configuration or racemization)
- Explain your reasoning for each answer.

1. A primary alkyl bromide undergoes substitution with hydroxide ion in a polar aprotic solvent.

Mechanism: S_N2

Stereochemical outcome: Inversion

Explanation: 1° substrate, strong Nu, polar aprotic solvent

2. A tertiary alkyl chloride undergoes substitution with water in a polar protic solvent.

Mechanism: S_N1

Stereochemical outcome: racemization

Explanation: 3° substrate, weak Nu, polar protic solvent

Question 2: Periodic Trends, Ionic Compounds, and Bonding (24 points)

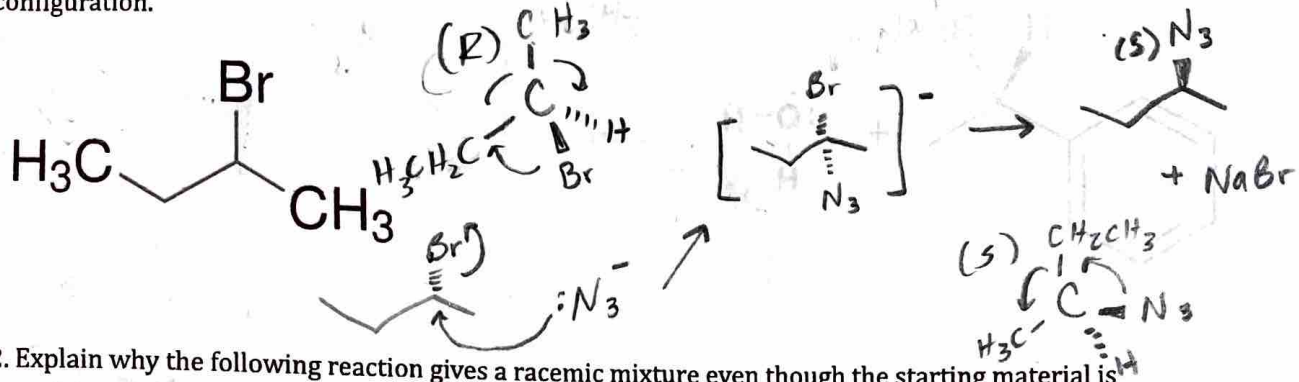
3. A secondary alkyl iodide undergoes substitution with cyanide ion in DMSO (polar aprotic solvent) at room temperature.

Mechanism: S_N2

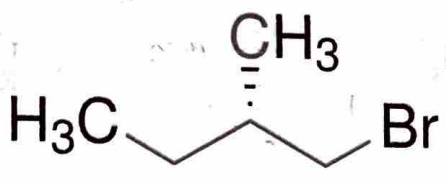
Stereochemical outcome: inversion

Explanation: 2° substrate, strong Nu, polar aprotic solvent

1. The following compound undergoes an S_N2 reaction with sodium azide (NaN_3). This compound has R configuration. Draw the mechanism and predict the stereochemistry of the product. Assign its R/S configuration.



2. Explain why the following reaction gives a racemic mixture even though the starting material is enantiomerically pure:



rxn w/ a weak nucleophile would cause the rxn to undergo S_N1 rxn mechanism, causing a racemization of products since the nucleophile can attack from either side of the carbocation intermediate.