Week 3 Worksheet: Nucleophilic Substitution

1. Compare and contrast the conditions under which an SN1 vs. an SN2 reaction would occur (suggestion: make a table!)

2. Rank the following nucleophiles in order from strongest (1) to weakest (5)
   
   a. \( \overset{\ominus}{\text{O}} \) \quad \overset{\ominus}{\text{O}} \quad \overset{\ominus}{\text{O}} \quad \overset{\ominus}{\text{O}} \quad \overset{\ominus}{\text{H}_2\text{O}} \\

   b. \( \overset{\ominus}{\text{H}_2\text{O}} \quad \overset{\ominus}{\text{H}_3\text{O}} \quad \overset{\ominus}{\text{H}_2\text{C}} \quad \overset{\ominus}{\text{H}_2\text{N}} \quad \overset{\ominus}{\text{H}_2\text{O}} \\

3. Complete the following nucleophilic substitution mechanism. Is this an example of an SN1 or SN2 mechanism?

\[ \overset{\ominus}{\text{Br}} + \overset{\ominus}{\text{H}_2\text{O}} \]
4. Which part of the energy diagram shown below corresponds to steps 1 and 2 as labelled in the previous question?

![Energy Diagram](image)

5. We know that the melting point of a substance can never truly increase. State a possible reason why an experimentally measured melting point of a known substance may be slightly higher than the literature value.