

1. (2) Which nucleophile, fluoride or thiophenoxide (PhS^-) is most likely to react via an $\text{S}_{\text{RN}}1$ mechanism? Provide a reasonable rationale for your answer.

2. (4) Rank these ethers in order of tendency to form peroxides: di-*t*-butyl ether; diisopropyl ether, diethyl ether, methyl *t*-butyl ether.

3. (3) Draw structures for (1) DBU (2) AIBN (3) NMP.

4. (15) Balance the equations below and provide a reasonable mechanism for each transformation.

