1. **Synthesis of Alcohols from Alkenes.** Where possible, devise a *selective* synthesis for each of the isomeric alcohols shown below. For each compound, show the alkene you would use as a starting material and the reagents and reaction conditions you would employ to obtain the desired isomeric alcohol. If you cannot come up with a selective synthesis, suggest a synthesis that will produce the desired isomer as part of a mixture and show the other alcohols that would be part of the mixture.

![Chemical structures of alcohols](image)

2. Write four resonance structures for the intermediate formed by addition of $\text{NO}_2^+$ to anisole by putting in all $\pi$-bonds, lone pairs of electrons, and formal charges. **CIRCLE** the resonance structure that is needed to explain the selective formation of the *para* product. The nitration of anisole is ____ faster ____ slower than the nitration of benzene.

![Resonance structures of anisole nitration](image)
3. (a) Redraw the following carbocations showing all carbons and hydrogens in the vicinity of the positively charged carbon. Then rank the carbocations according to their relative stability, going from least stable to most stable.

\[ \text{A} \quad \text{B} \quad \text{C} \]

(b) Write a second resonance structure for each of the following two carbocations. Which of the carbocations is more stable? Why?

\[ \text{D} \quad \text{E} \]

(c) The reaction of isoprene with HBr produces F as the major product. Write an electron pushing mechanism to explain the formation of F. Explain why G and H are not formed.

\[ \text{isoprene} \xrightarrow{\text{HBr}} \text{F (major)} \quad \text{minor} \]

\[ \text{G} \quad \text{not seen} \quad \text{H} \quad \text{not seen} \]