1. (6) Show how the following compound can be prepared starting from acetylene, any necessary inorganic reagents, and any necessary organic compound that has no more than four carbon atoms.

\[ \text{H–C≡C–H} \quad \overset{?}{\longrightarrow} \quad \text{CH}_3\text{CH}_2\text{CH}_2\text{CHCH}_3 \]

2. (4) Which of the following compounds have delocalized electrons? You must show your work/reasoning.

\[ \text{NH}_2 \quad \text{CH}_3\text{CN(CH}_3)_2 \]

\[ \text{CH}_3\text{CH}–\text{CHCH}_2\text{CH}_2 \quad \text{H}_3\text{C}–\text{C}–\text{H} \]

\[ \text{OCH}_3 \]

\[ \text{O} \]
3. (4) In each of the following pairs, which species is more stable? Why?

\[
\text{CH}_3\text{CH}_2\text{S}^\ominus \quad \text{or} \quad \text{CH}_3\text{C}^\ominus\text{S}^\ominus
\]

\[
\Theta\text{CH}_2\text{CCH}_2\text{CCH}_3 \quad \text{or} \quad \text{CH}_3\text{CCHCCH}_3
\]

4. (6) Draw the contributing resonance forms for the following anion and rank them in order of decreasing stability (#1 being most stable to #4 being the least). There are four total including the one given.

\[
\text{N}=\text{C}^-\text{C}^-\text{Cl}^-
\]

5. (2) Concerning the drawing of resonance contributors, which of the following statements are true:

A. Only electrons move. The nuclei of the atoms never move.
B. The only electrons that can move are \(\text{p}\) electrons and nonbonding electrons.
C. The total number of electrons in the molecule does not change, and neither does the number of paired and unpaired electrons.
D. all of the above.

6. (2) Concerning the drawing of resonance contributors, the electrons can be moved in which of the following ways:

A. Move \(\text{p}\) electrons toward a negative charge or toward nonbonding electrons.
B. Move a nonbonding pair of electrons toward a \(\text{s}\) bond
C. Move a single nonbonding electron away from a \(\text{p}\) bond.
D. none of the above.