1. a) Label each pair as enantiomers, diastereomers, or same molecule.

b) Label each stereocenter with its \( R \) or \( S \) configuration.
2. a) Label each molecule as chiral or achiral.
   b) Label each stereocenter with its R or S configuration.
   c) Label all of the meso compounds.
3. **a)** There are three different constitutional isomers of dichlorocyclopentane. Draw them.

*b)* There are seven different stereoisomers of dichlorocyclopentane. Draw all of them.

c) Label each stereocenter as **R** or **S**.

d) Label each structure as **chiral** or **achiral**.

e) Label any meso compounds.
4. The following molecule A is drawn in such a way that the 3-D structure is ambiguous.
   a) Circle the atoms that are stereocenters.

   ![Molecule A](image)

   b) Based on the number of atoms you circled in part a, what is the maximum number of stereoisomers possible for A?

   c) Draw all of the possible stereoisomers of A and label their stereoisomeric relationships (diastereomers, enantiomers).
   d) Label each stereocenter with its R or S configuration.
5. a) Provide a **complete detailed** mechanism for the following reaction (including initiation, propagation, and termination steps). **Remember to use fishhook arrows!**

\[ \text{H}_3\text{C—CH}_3 \; + \; \text{Br—Br} \; \xrightarrow{hv} \; \text{H}_3\text{C—CH}_2\text{Br} \; + \; \text{H—Br} \]

b) Using the BDE table on p. 134 in Wade, calculate \( \Delta H \) for each of the propagation steps.
c) Draw a reaction-energy diagram for the propagation steps from part a.
d) Label $\Delta H^\circ$ for each step, $\Delta H^\circ_{\text{overall}}$, and the rate-determining step.
e) Is the overall reaction endothermic or exothermic?