"It's a dead man's party
Who could ask for more?
Everybody's comin', leave your body at the door."

- Oingo Boingo
1. Give the product or products for the following reactions. Be aware of details like rearrangements, Z&E, cis and trans, stereochemistry, regiochemistry, etc. (5 pts each) Are each of the final products chiral or achiral? (2 pts each)

a.  
\[ \text{2-bromo-3-methylcyclohexene} \rightarrow \text{1,2-dihydroxy} + \text{enantiomer} \]  
achiral

b.  
\[ \text{2-methylpropene} \rightarrow \text{chiral} \]  
chiral

c.  
\[ \text{1-bromo-2-cyclohexene} \rightarrow \text{achiral} + \text{chiral} \]  
achiral

achiral

(28)  
\[ \text{1,3-diphenylpropene} \rightarrow \text{achiral} \]  
achiral
2. a. Give a single product (there may be more!) of the reaction of Z-3-methyl-2-hexene with H-Br in the presence of peroxides. Label any stereocenter present as R or S. (6 pts)

\[
\begin{array}{c}
\text{Z-3-methyl-2-hexene} \\
\xrightarrow{\text{HBr}} \\
\text{ROOR} \\
\end{array}
\]

(all stereoisomers are possible)

For drawings, see below

b. How many chiral centers does your compound have? (3 pts) How many possible stereoisomers could a compound like this have – perhaps not from this reaction? (2 pts)

2 chiral centers, 4 stereoisomers.

c. Draw a diastereomer of the product that you have drawn in part a. Label any stereocenter present as R or S. (7 pts)

\[
\begin{array}{c}
\text{S} \\
\text{S} \\
\text{Br} \\
\end{array}
\]

maximum credit given to actual diastereomer relationships

3. Give reagents or a set of reagents that would perform the following transformation. Be aware that there may be multiple correct answers. (5 pts each)

a. \[
\begin{array}{c}
\text{OH} \\
\xrightarrow{1) \text{H}_2\text{SO}_4} \\
\text{2) BH}_3\text{-THF} \\
\text{3) KOH, H}_2\text{O}_2 \\
\end{array}
\]

b. \[
\begin{array}{c}
\text{Br} \\
\xrightarrow{1) \text{E2 conditions (ex: KOTu, EtOH)}} \\
\text{2) H}_3\text{O}^+ \text{or} \\
\text{2) HgSO}_4, \text{H}_2\text{O} \text{ or} \\
\text{2) H}_2\text{SO}_4 \\
\text{3) NaBH}_4 \text{ or} \\
\text{3) H}_2\text{O, heat} \\
\end{array}
\]
4. Draw step by step mechanisms to account for the products shown. There may be other products formed, but you do not need to account for them in your mechanisms. Be sure to draw arrows to account for the flow of electrons and show all steps. (10 pts each)

a. 

b. 

\[ \text{Cl}_2 \rightarrow \text{(2R) 2-chloro-3-ethyl-3-pentanol} \]
(24) 5. What is the relationship between the following pairs of compounds? Choose only four of the next five. You choices are: same compound; resonance structure; structural (or constitutional) isomer; geometric isomer; enantiomer; diastereomer; or completely different compound. (6 pts each)

a. \[ \text{HO}_2\text{C} \] and \[ \text{C}_2\text{H}_5\text{O}_2\text{H} \] diastereomer

b. \[ \text{HOCH}_2\text{C} \text{C}_2\text{H}_5\text{OH} \] and \[ \text{CH}_2\text{OH} \text{C}_2\text{H}_5\text{OH} \] different compound

c. (2R, 3S) 2-bromo-3-pentanol and \[ \text{CH}_3\text{OH} \text{C}_2\text{H}_5\text{Cl} \] same thing

d. \[ \text{CH}_3\text{OH} \text{H}_2\text{C}_2\text{H}_5\text{OH} \] and \[ \text{CH}_3\text{OH} \text{H}_2\text{C}_2\text{H}_5\text{OH} \] enantiomer

e. \[ \text{Cl}\text{CH}_3\text{OH} \] and \[ \text{Cl}\text{CH}_3\text{OH} \] diastereomer

(3) BONUS: Name one of the medications that Miles is taking, you need not draw the structure. Prilosec, Phenobarbital, diazepam (Valium)