22.1 What type of reactive intermediate is involved in the Markovnikov addition of hydrogen bromide to 1-pentene to give 2-bromopentane?
[a]. 1-pentyl radical
[b]. 1-pentyl cation
[c]. 2-pentyl cation
[d]. 2-pentyl anion

22.2 What is the major organic product obtained upon reaction of HBr with 1-pentene?
[a]. 1,2-dibromopentane
[b]. 1-bromopentane
[c]. 2-bromopentane
[d]. 3-bromo-1-pentene

22.3 How many stereoisomers of 1-bromopentane are formed upon addition of HBr to 1-pentane in the presence of peroxides?
[a]. 1
[b]. 2
[c]. 3
[d]. 4
23.1
How many stereoisomers (i.e., enantiomers, diastereomers) are formed in the acid-catalyzed Markovnikov addition of water to 2,5-dimethyl-2-hexene
[a]. one
[b]. two
[c]. three
[d]. four

23.2
What is the major organic product obtained from the following reaction?

\[
\text{[a]. A} \\
\text{[b]. B} \\
\text{[c]. C} \\
\text{[d]. D}
\]

23.3.
What is the major organic product obtained from the following reaction?

\[
\text{[a]. A} \\
\text{[b]. B} \\
\text{[c]. C} \\
\text{[d]. D}
\]
24.1.
What is (are) the major organic product(s) obtained from the following reaction?

\[ \text{Br}_2 \]

A \((2R,3R)\)-dibromobutane  
B \((2S,3S)\)-dibromobutane  
C \text{meso-2,3-dibromobutane}  

[a]. only A  
[b]. only B  
[c]. only A and B  
[d]. only C

24.2.
What is (are) the major organic product(s) obtained from the following reaction?

\[ \text{Br}_2 \to \text{Br}_2 \]

A \((2R,3R)\)-3-bromo-2-butanol  
B \((2R,3S)\)-3-bromo-2-butanol  
C \((2S,3R)\)-3-bromo-2-butanol  
D \((2S,3S)\)-3-bromo-2-butanol  

[a]. only A and D  
[b]. only B and C  
[c]. only A and B  
[d]. A, B, C and D

24.3.
Which of the following statements is not true concerning the addition of chlorine to cyclohexene to give \textit{trans} 1,2-dichlorocyclohexane?

[a]. The two halogen atom are delivered at the same time in an \textit{anti} addition  
[b]. The cyclic chloronium ion intermediate is attacked in a \textit{S_n}2 manner by chloride anion  
[c]. The \textit{trans} product forms because it is more stable  
[d]. The formation of the cyclic chloronium ion is an \textit{anti} addition process
25.1.
What is the major organic product of the following reaction?

1. O₃, CH₂Cl₂
2. Zn, AcOH

\[ \text{CH₂Cl₂} \rightarrow \]

\[ \text{OH} \quad \text{OH} \quad \text{OH} \quad \text{OH} \]

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

[a]. A  
[b]. B  
[c]. C  
[d]. D

25.2.
What is the best choice of reagent(s) to perform the following transformation?

\[ \text{?} \rightarrow \text{OH} \quad \text{+ enantiomer} \]

[a]. HgSO₄; followed by NaBH₄  
[b]. OsO₄; followed by NaHSO₃, H₂O  
[c]. BH₃; followed by H₂O₂, H₂O, NaOH  
[d]. H₂O, H₂SO₄

25.3.
What is the major organic product of the following reaction?

\[ \text{CH₃} \text{O}: \text{NH} \rightarrow \text{C}_₂\text{H}_₂ \quad (\text{CH}_₃)_₃\text{OK} \]

\[ \text{CH₃}_₂ \quad \text{I} \quad \text{I} \quad \text{I} \]

\[ 1 \quad 2 \quad 3 \quad 4 \]

[a]. A  
[b]. B  
[c]. C  
[d]. D
26.1. What is the major organic product obtained from the following sequence of reactions?

\[ \text{Br}_2 \xrightarrow{h\nu} \text{C}_7\text{H}_{13}\text{Br} \xrightarrow{\text{NaOCH}_3, \text{CH}_3\text{OH}} \text{C}_7\text{H}_2 \xrightarrow{1. \text{O}_3, \text{CH}_2\text{Cl}_2, 2. \text{Zn, AcOH}} \text{C}_7\text{H}_{12}\text{O}_2 \]

[a]. A  
[b]. B  
[c]. C  
[d]. D

26.2. What is the major organic product obtained from the following sequence of reactions?

\[ \text{Br} \xrightarrow{1. \text{HC\equivCNa, 2. H}_2\text{O}^+} \text{C}_7\text{H}_{12} \xrightarrow{1. \text{NaNH}_2, 2. \text{CH}_3\text{I}} \xrightarrow{\text{H}_2, \text{Lindlar cat.}} \text{C}_8\text{H}_{14} \xrightarrow{\text{CH}_2\text{I}_2, \text{Zn(Cu)}} \text{C}_9\text{H}_{18} \]

[a]. A  
[b]. B  
[c]. C  
[d]. D

26.3. What is the major organic product obtained from the following sequence of reactions?

\[ \text{Br}_2 \xrightarrow{h\nu} \text{C}_7\text{H}_{12}\text{Br} \xrightarrow{\text{NaOCH}_3, \text{CH}_3\text{OH}} \xrightarrow{\text{H}_2\text{SO}_4, \text{H}_2\text{O}} \xrightarrow{1. \text{NaH, 2. CH}_3\text{I}} \text{C}_5\text{H}_{12}\text{O} \]

[a]. A  
[b]. B  
[c]. C  
[d]. D