Alkene Exam Preparation Pack

20 Essential Alkene Practice Exam Problems

Problem 1: Alkene Stability

A
B
C

a) Arrange these alkenes A, B and C from most stable to least stable
b) Hydrogenation of which alkene would be the most exothermic?
c) Given these three energies for $\Delta H^\circ$ of hydrogenation (in kcal/mol):
   $-30.2$, $-28.4$, $-26.8$
   which one would be matched with $-28.4$ kcal/mol?

Problem 2: Draw One Product Of Each Reaction

Br$_2$, H$_2$O
mCPBA
HCl
Pd-C, D$_2$
OsO$_4$, NaHSO$_3$
1) BH$_3$
2) NaOH, H$_2$O$_2$
H$_3$O$^+$
Br$_2$, CCl$_4$

http://bit.ly/Alkenes-MOC-1a
Problem 3: Provide all the products of these reactions. If there is more than one, state the relationship between the products (e.g. enantiomers, diastereomers, or constitutional isomers)

Problem 4: Pick the structure(s) which correspond to the products of the reaction below
Problem 5: Circle the correct product of this reaction

Problem 6: Which product is incorrect?
Problem 7: Draw the product(s) of the following reaction

(3S, 6R)-(Z)-3,6-dimethyl-4-octene \[ \text{OsO}_4 \xrightarrow{\text{KHSO}_3} \]

Problem 8: Draw the product of the following intramolecular reaction, and a mechanism for its formation.

\[ \text{C}_9\text{H}_{15}\text{BrO} \quad (+ \text{HBr}) \]

Problem 9: Draw the mechanisms for these two rearrangement reactions

Problem 10: Draw a mechanism for this reaction
Problem 11: What would be the product(s) of the following reaction?

\[ \text{Br-Cl} \]

(Hint: you may not have seen this reagent before. Use electronegativity differences to figure out which atom is more electrophilic)


Problem 12: Give the reagents for each of the following transformations

Problem 13: Draw a suitable alkene for each of the following reactions

\[
\text{OsO}_4 \quad \rightarrow \quad \begin{array}{c}
\text{HO} \\
\text{HO}
\end{array}
\]

\[
\text{Cl}_2 \quad \rightarrow \quad \begin{array}{c}
\text{Cl} \\
\text{Cl}
\end{array}
\]

\[
Pd-C \quad \rightarrow \quad \begin{array}{c}
\text{H}_3\text{C} \\
\text{H}
\end{array} + \begin{array}{c}
\text{H}_3\text{C} \\
\text{H}
\end{array}
\]

\[
\text{H}_2 \quad \rightarrow \quad \begin{array}{c}
\text{Br} \\
\text{OCH}_3
\end{array} + \begin{array}{c}
\text{Br} \\
\text{OCH}_3
\end{array}
\]

Problem 14: Which alkene (A, B, C or D) would give this dibromide product upon treatment with Br\(_2\) and CCl\(_4\) ?

A

B

C

D
Problem 15: Draw all products resulting from this reaction and indicate how they are related to each other.

\[
\text{\begin{array}{c}
\text{\includegraphics[width=0.2\textwidth]{reaction15.png}} \\
\text{D-Br} \\
\text{C}_4\text{H}_9\text{DBr}
\end{array}}
\]


Problem 16: Draw a mechanism for this reaction:

\[
\text{\begin{array}{c}
\text{\includegraphics[width=0.2\textwidth]{reaction16.png}} \\
\text{H-Br} \\
\text{Br}
\end{array}}
\]


Problem 17: Compound X absorbs 2 equivalents of hydrogen gas during hydrogenation with Pd-C/H\textsubscript{2}. When treated with O\textsubscript{3} (and reductive workup) it gives the two products shown. What is compound X?

\[
\text{\includegraphics[width=0.8\textwidth]{reaction17.png}}
\]

Problem 18: MYSTERY COMPOUND X was found to absorb 2 equivalents of H₂ gas under catalytic hydrogenation conditions. Ozonolysis of X gave the molecule shown. Draw the structure of the mystery compound.


Problem 19: What reagent(s) would you use for the following transformation?


Problem 20: Draw a mechanism for the following reaction.