Chem 30A Spring 2005

QUIZ #2A
(15 Min)

Weds May 11th

INTERPRETATION OF THE QUESTIONS IS PART
OF THE EXAM – DO NOT ASK FOR THE
QUESTIONS TO BE EXPLAINED TO YOU

USE CAPITAL LETTERS WHEN FILLING IN THE BOXES AND BE CLEAR – IF WE CAN’T FIGURE OUT WHAT A LETTER IS, IT WILL AUTOMATICALLY BE GRADED AS INCORRECT

***DO NOT OPEN THIS EXAM UNTIL INSTRUCTED TO DO SO***

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ANSWER TO BONUS QUESTION

\[= +2 \quad = +2 \quad = +2\]
Here's a warm welcome to all the intelligent life forms out there. And to the rest of you... the trick is to bang the rocks together, guys.

– Douglas Adams

Questions 1–10 are worth 3 points each. The bonus is worth 5 points.

1. Which of the compounds shown below are chiral?

A 1, 2, 3, and 4  
B Only 2 and 4  
C Only 2  
D All of them  
E 2, 3, and 4

2. Only ONE of the Fischer projections corresponds to **Compound 1** – which one is it?

![Fischer projections]

**Compound 1**  
A  
B  
C  
D  
E

3. Assuming that the specific rotation of the \((R)\)-enantiomer of a compound containing one chiral center is \(-50°\), what would the specific rotation of a sample containing a mixture of 65% \((S)\)-enantiomer and 35% \((R)\)-enantiomer be?

A \(-35°\)  
B \(-15°\)  
C \(+15°\)  
D \(+35°\)  
E It is not possible to calculate the answer based on the data above
4. Which of the compounds shown below are meso compounds?

A  All of them  
B  1, 4, and 5  
C  3, 4, and 5  
D  1, 2, and 3  
E  1, 3, and 5

5. What is the order of acidity (from lowest $pK_a$ value to highest $pK_a$ value) of the bold hydrogen (H) atoms shown highlighted in the compounds drawn below?

A  1, 4, 3, 2  
B  4, 3, 1, 2  
C  1, 2, 3, 4  
D  2, 3, 4, 1  
E  4, 3, 2, 1

6. The equilibrium constant ($K_{eq}$) for the reaction shown below is...?

\[
\text{Acid} + \text{Base} \rightleftharpoons \text{Conjugate Acid} + \text{Conjugate Base}
\]

\[pK_a = 19\]

\[pK_a = 21\]

A  -2  
B  2  
C  40  
D  100  
E  0.01

7. What is the Index of Hydrogen Deficiency (number of double bond equivalents) for the compound drawn below?

A  3  
B  4  
C  5  
D  6  
E  7
8. What is the order of basicity (from most basic to least basic) of the oxygen-based anions (oxy-anions) drawn below?

\[ \text{1} \quad \text{2} \quad \text{3} \quad \text{4} \]

A 1, 2, 3, 4  B 3, 2, 1, 4  C 4, 3, 2, 1  D 4, 1, 2, 3  E 3, 4, 2, 1

9. For the triene shown below, for which double bond(s) is it possible to assign E or Z descriptors?

\[ \text{1} \quad \text{2} \quad \text{3} \]

A 1, 2, and 3  B Only 1 and 2  C Only 2 and 3  D Only 2  E Only 1

10. What is the major product of the reaction shown below?

\[ \text{HCl} \quad \rightarrow \quad ? \]

A 2-chloro-3-methylpentane  B 2-chloro-2-ethylbutane  C 3-chloro-2-methylpentane  D 3-chloro-3-methylpentane  E 2,3-dichloro-3-methylpentane

**BONUS:** Three different alkenes with the molecular formula C\(_6\)H\(_{12}\) yield 2-chloro-2,3-dimethylbutane as the major product when reacted with HCl – draw the structures of these alkenes on the front cover of this quiz in the box provided.
Chem 30A Spring 2005

QUIZ #2B
(15 Min)

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ANSWER TO BONUS QUESTION

\[
\begin{align*}
\text{\( +2 \)} & \quad \text{\( +2 \)} & \quad \text{\( +2 \)} \\
\end{align*}
\]
Here's a warm welcome to all the intelligent life forms out there. And to the rest of you... the trick is to bang the rocks together, guys.

– Douglas Adams

Questions 1–10 are worth 3 points each. The bonus is worth 5 points.

1. Which of the compounds shown below are chiral?

   ![Compounds](image)

   A All of them  
   B 2, 3, and 4  
   C 1, 2, 3, and 4  
   D Only 2 and 4  
   E Only 2

2. Only ONE of the Fischer projections corresponds to **Compound 1** – which one is it?

   ![Compounds](image)

   Compound 1  
   A  
   B  
   C  
   D  
   E

3. Assuming that the specific rotation of the (R)-enantiomer of a compound containing one chiral center is −50°, what would the specific rotation of a sample containing a mixture of 65% (S)-enantiomer and 35% (R)-enantiomer be?

   A It is not possible to calculate the answer based on the data above  
   B −35°  
   C −15°  
   D +15°  
   E +35°
4. Which of the compounds shown below are meso compounds?

A 3, 4, and 5  
B 1, 2, and 3  
C 1, 4, and 5  
D 1, 3, and 5  
E All of them

5. What is the order of acidity (from lowest $pK_a$ value to highest $pK_a$ value) of the bold hydrogen (H) atoms shown highlighted in the compounds drawn below?

A 4, 3, 2, 1  
B 2, 3, 4, 1  
C 4, 3, 1, 2  
D 1, 2, 3, 4  
E 1, 4, 3, 2

6. The equilibrium constant ($K_{eq}$) for the reaction shown below is...?

\[ \text{Acid} + \text{Base} \rightleftharpoons \text{Conjugate Acid} + \text{Conjugate Base} \]

\[ pK_a = 19 \]

\[ pK_a = 21 \]

A 2  
B -2  
C 0.01  
D 40  
E 100

7. What is the Index of Hydrogen Deficiency (number of double bond equivalents) for the compound drawn below?

A 7  
B 6  
C 5  
D 4  
E 3
8. What is the order of basicity (from most basic to least basic) of the oxygen-based anions (oxy-anions) drawn below?

\[
\begin{align*}
1 & : \text{O}^- \\
2 & : \text{F}_3\text{C} - \text{O}^- \\
3 & : \text{O}^- \\
4 & : \text{F}_3\text{C} - \text{O}^- \\
\end{align*}
\]

A 4, 3, 2, 1  B 4, 1, 2, 3  C 1, 2, 3, 4  D 3, 2, 1, 4  E 3, 4, 2, 1

9. For the triene shown below, for which double bond(s) is it possible to assign \textit{E} or \textit{Z} descriptors?

\[
\begin{align*}
1 & \quad 2 \quad 3 \\
\uparrow & \quad \uparrow \quad \uparrow \\
\end{align*}
\]

A 1, 2, and 3  B Only 1 and 2  C Only 2 and 3  D Only 2  E Only 3

10. What is the major product of the reaction shown below?

\[
\begin{align*}
& \quad \text{HCl} \\
\text{?} & \quad \text{?} \\
\end{align*}
\]

A 2,3-dichloro-3-methylpentane  B 3-chloro-3-methylpentane  C 2-chloro-2-ethylbutane  D 2-chloro-3-methylpentane  E 3-chloro-2-methylpentane

**BONUS:** Three different alkenes with the molecular formula \(\text{C}_5\text{H}_{10}\) yield 2-bromo-2-methylbutane as the major product when reacted with HBr – draw the structures of these alkenes on the front cover of this quiz in the box provided.