Explanations and Predictions Relating to Substitution and Elimination

OK, now it's your turn. Half the fun of chemistry is being able to explain the data. The other half is to make predictions. First explain what is happening. Then predict the effect of changing the reaction. Note that there may be more than one good answer for the prediction. Here you go…

1. Data: 2-bromo-2-methylbutane, 2-chloro-2-methylbutane, and 2-iodo-2-methylbutane all react with refluxing methanol at different rates to produce the *same* mixture of products (2-methoxy-2-methylbutane, 2-methyl-1-butene, and 2-methyl-2-butene). (source: H 153)

Explanation:

Prediction: What conditions would be better if what you really wanted was 2-methyl-1-butene?

2. Data: (*S*)-3-bromo-3-methylhexane reacts in refluxing aqueous acetone to give 3-methyl-3-hexanol having an enantiomeric excess of less than 5%. (source: H 153)

Explanation:

Prediction: Would increasing the concentration of water increase or decrease the ee?

3. Data: Treatment of isopropyl alcohol with hot concentrated HBr gives an 81% yield of 2-bromopropane. (source: V 561)

Explanation:

Prediction: What would happen if you treated methyl isopropyl ether under the same conditions?

4. Data: Treatment of either 2-pentanol or 3-pentanol with hot concentrated HBr gives the exact same mixture of products: 70% 2-bromopentane and 30% 3-bromopentane. (source: V 560)

Explanation:

Predictions: (a) If you start with (*S*)-2-pentanol, will the products have an optical rotation? (b) What would you expect to happen if you started with 1-pentene?

Sources:

H: Heathcock, *Introduction to Organic Chemistry*, 1976
V: Vogel, *Textbook of Practical Organic Chemistry, 5th Ed.*, 1989