

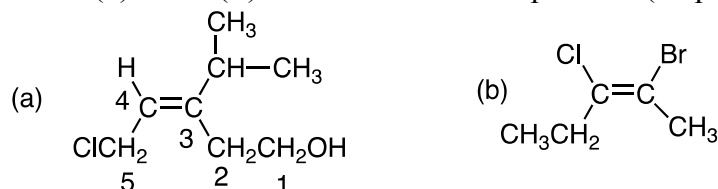
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ANSWER KEY

Chem. 121, Sect 009, Quiz 2

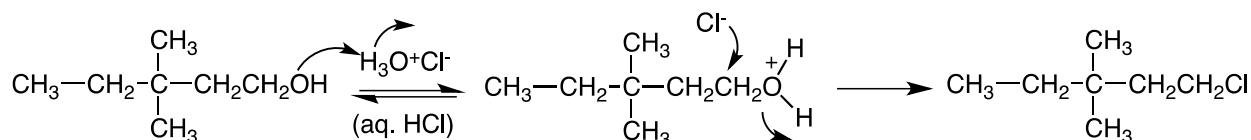
Fall, 2012, 50 points

1. (a) Name the following molecule, indicating E- or Z-configuration as well as giving the full name. (b) Draw (Z)-2-bromo-3-chloro-2-pentene. (10 pts)



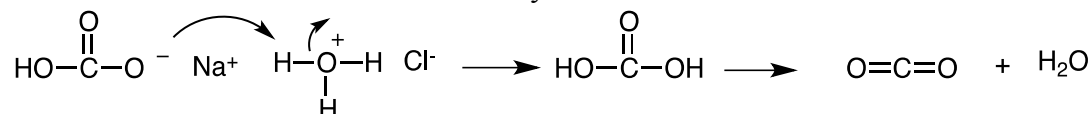
(E)-5-chloro-3-isopropyl-3-penten-1-ol

2. Give the product of the following reaction and show the full mechanism by which it is formed. (10 pts)



3. In the preparation of *t*-butyl chloride (M.W. 92.57 g/mol) from *t*-butanol (M.W. 74.12 g/mol, density = 0.775 g/mL) and concentrated aqueous hydrochloric acid, explain the purpose of (a) venting the separatory funnel (b) adding the 5% sodium bicarbonate (Na⁺·OCO₂H). (Show any reaction that may have occurred.) (c) Adding the calcium chloride. (d) If a student isolated 6.3 g of *t*-butyl chloride, what was her percent yield? (12 pts)

(a) Pressure can build up in the separatory funnel and venting releases this pressure. (b) Adding the 5% sodium bicarbonate neutralizes any HCl that was left over.



(c) The calcium chloride is a drying agent that absorbs any water remaining in the product.

(d) % yield = $\frac{\text{actual yield}}{\text{theoretical yield}} = \left[\frac{6.3 \text{ g/mol}}{\left(\frac{10 \text{ mL } t\text{-butanol} \times 0.775 \text{ g/mL}}{74.12 \text{ g/mol}} \right) (92.57 \text{ g/mol})} \right] \times 100$

4. In the Fractional Distillation experiment, (a) if we have a mixture of methanol (b.p. 64.7) and 1-butanol (b.p. 118), explain why a simple distillation does not completely separate the two compounds. (b) Could we separate the two compounds using a separatory funnel? Why/why not? (c) Briefly explain the purpose of putting copper wool in the fractionating column. (6 pts)

(a) A simple distillation does not completely separate the two compounds because both have a positive vapor pressure, even at the b.p. of methanol, the lower boiling fraction. The product of a simple distillation would be mainly methanol, the lower boiling component, but it would also contain some 1-butanol. (b) No, you cannot separate 1-butanol and methanol using a separatory funnel since they are miscible in each other. (c) The copper wool provides a cold surface to the rising hot vapors, causing the higher boiling fraction to condense more than the lower boiling one and ensuring multiple distillations in a single operation.

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5. In the preparation of cyclohexene from cyclohexanol using a catalytic amount of sulfuric acid (H_2SO_4) (a) show the reaction that occurred, including the complete reaction mechanism. (b) One student could not find the concentrated sulfuric acid, so he decided to use concentrated aqueous hydrochloric acid instead. To be sure he was using enough of the acid, he used one full equivalent. Was this a good idea? Explain and show any reaction(s) that may have occurred. (12 pts)

