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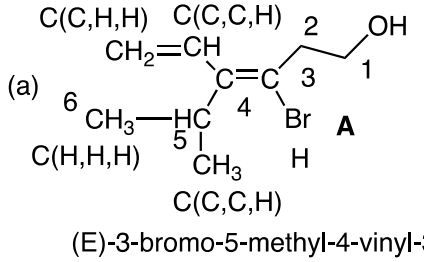
L. I. U.

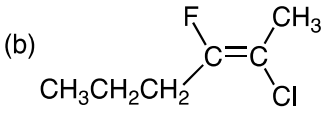
ANSWER KEY

Chem. 121, Sect 012, Quiz 2 Fall, 2012, 50 points

1. Name molecule **A**; be sure to specify the E or Z configuration as well as give the full name. (b) Draw (E)-2-chloro-3-fluoro-2-hexene.

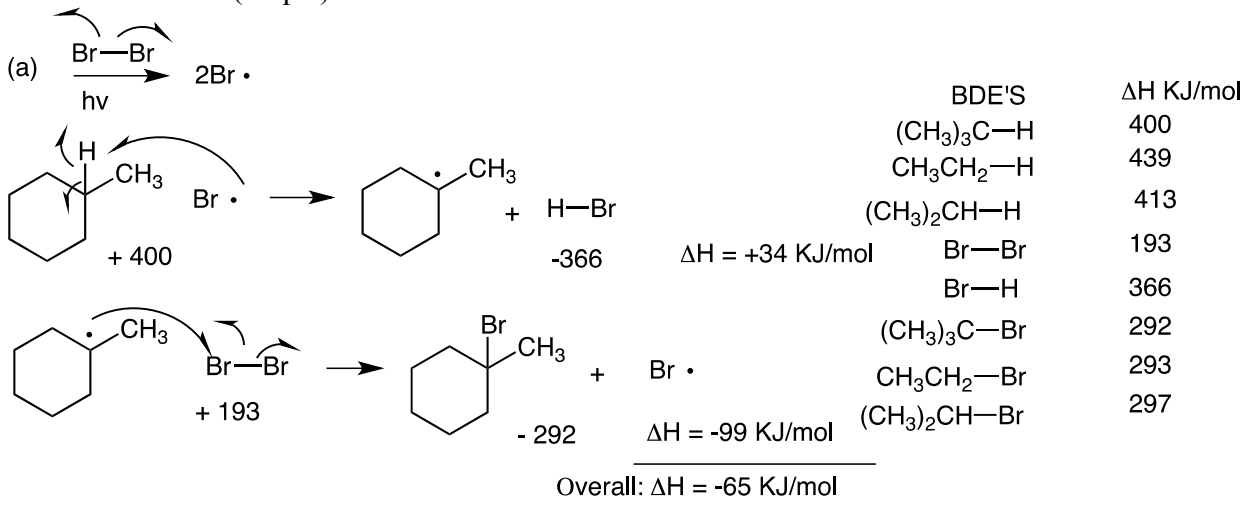


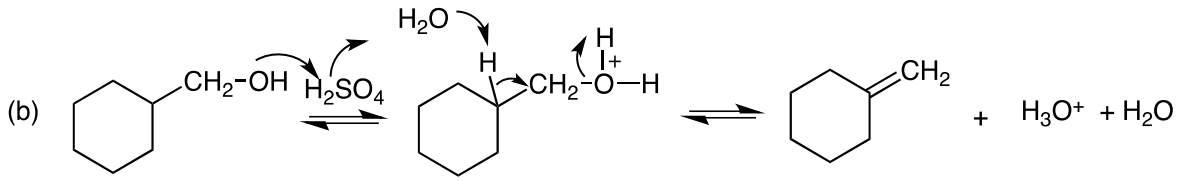
(E)-3-bromo-5-methyl-4-vinyl-3-hexen-1-ol



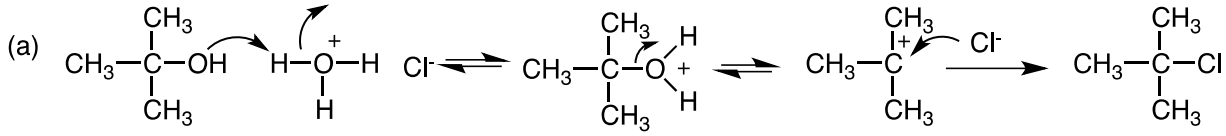
(E)-2-chloro-3-fluoro-2-hexene

2. Give the product of the following reactions, showing all of the steps by which they are formed. For (a) also calculate ΔH, using the given BDE's. If the exact BDE is not given, use the one that is the closest match. (10 pts)





3. In the preparation of *t*-butyl chloride (MW = 92.57 g/mol, density = 0.85 g/mL from 10 mL t-butanol (MW 74.12 g/mol, density = 0.775 g/mL) and excess aqueous concentrated hydrochloric acid, (a) show the complete reaction, including the reaction mechanism. (b) Explain briefly how we separated the product from the reaction mixture. (c) Explain the purpose of adding the boiling stones before doing the final distillation. (d) One student isolated 5.3 g of *t*-butyl chloride. Calculate her percent yield. (12 pts)



(b) We separated the product from the reaction mixture using the separatory funnel.

(c) The boiling stones provide a smooth, even boiling by physically breaking up the large gas bubbles that form at the bottom of the distillation flask.

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(d) $$\%\ \text{yield} = \left[\frac{5.3\ \text{g}}{\left(\frac{(10\ \text{mL}) \times (0.775\ \text{g/mL})}{(74.12\ \text{g/mol})} \right) \times (92.57\ \text{g/mol})} \right] \times 100 = 55\%$$

4. If copper has a heat capacity (amount of heat required to raise the temperature of one gram of one °C) of 0.385 J and iron has a heat capacity of 0.449 J, which would be a better packing material for a fractionating column, copper wool or iron wool? Explain briefly. (4 pts)
(a) Since the sole purpose of the packing material in the condensing column is to absorb heat, the material with the greatest heat capacity, the iron wool, would be the best packing material.

5. In the preparation of cyclohexene from cyclohexanol, explain briefly (a) the purpose of adding the sodium chloride to the distillate (b) how we could tell that the initial distillation was complete? (4 pts)
(a) The sodium chloride was added to the distillate to help in "salting out" the product cyclohexene from the water that co-distilled. The NaCl is very soluble in the water and increases the ionic strength of the water so that any cyclohexene in the water layer is driven out and any water in the cyclohexene layer is drawn to the water layer.
(b) We could stop the distillation when most of the material in the reaction flask was used up.