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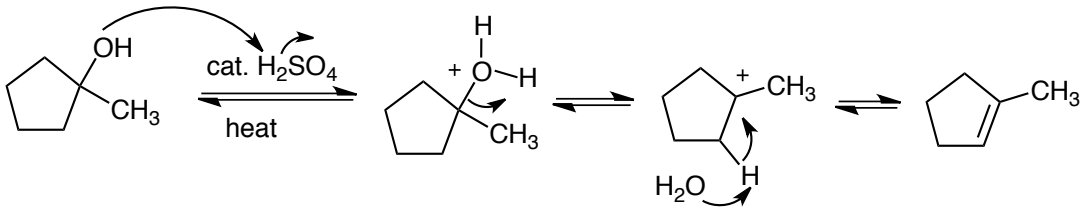
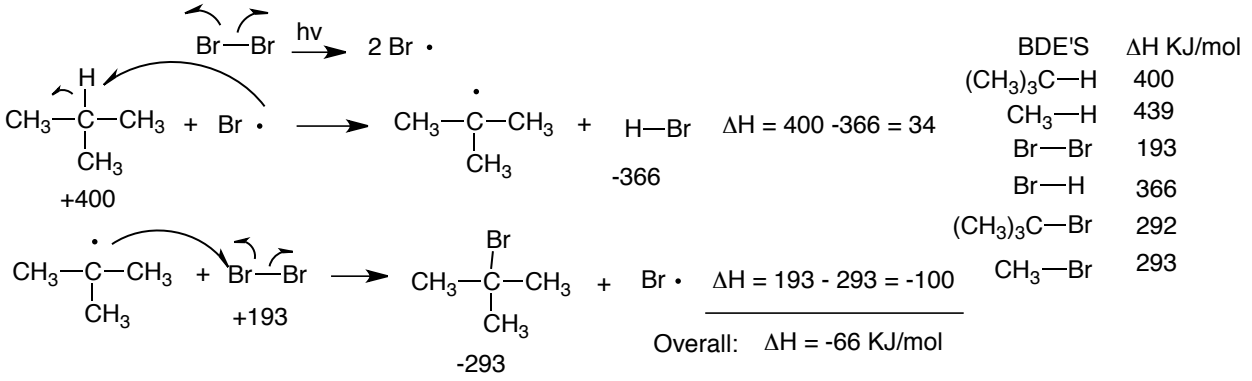
L. I. U.

Chem. 121, Sect 008, Quiz 2 Fall, 2011, 50 points

1. Give the product of the following reaction, showing all of the steps by which it is formed. (10 pts)



2. Give the product of the following radical reaction, showing all of the steps of the mechanism and calculate ΔH for the overall reaction. (15 pts)



BDE'S	ΔH KJ/mol
$(CH_3)_3C—H$	400
$CH_3—H$	439
Br—Br	193
Br—H	366
$(CH_3)_3C—Br$	292
$CH_3—Br$	293

3. In the preparation of cyclohexene (MW 82.15 g/mol, density = 0.811 g/mL) from 10 mL cyclohexanol (MW 100.16 g/mol, density = 0.96 g/mL) and 10 drops of sulfuric acid (MW 98.08 g/mol, density = 1.84 g/mL), one student isolated 5.3 g of cyclohexene. Calculate her percent yield. (5 pts)

$$\%\ \text{Yield} = \frac{\text{actual yield}}{\text{theoretical yield}} = \frac{5.3\ \text{g}}{\left(\frac{(10.0\ \text{mL})\ (0.96\ \text{g/mL})}{100.16\ \text{g/mol}}\right)(82.15\ \text{g/mol})} \times 100 = 67.3\%$$

4. In the preparation of cyclohexene from cyclohexanol, (a) explain the purpose of adding the sodium chloride to the initial distillate. (b) How could you tell that you had added the correct amount of sodium chloride? (6 pts)

(a) The sodium chloride was added to the distillate for "salting out". The NaCl is more soluble in the water than cyclohexene and so it drives out any cyclohexene in the water layer and also draws out any water from the cyclohexene layer into the water layer.

(b) You should saturate the water layer, adding the NaCl until no more dissolves and a slight excess remains un-dissolved in the bottom of the flask.

5. In the separation of the unknown mixture using the fractionating column in experiment 4, explain the purpose of the copper wool in fractionating column. (4 pts)

The copper wool provides a cold surface to re-condense the vapors as they rise up in the column. This allows for multiple distillations.

6. In the preparation of *t*-butyl chloride (2-chloro-2-methylpropane) from *t*-butanol (2-methyl-2-propanol) using concentrated hydrochloric acid (a) show the overall reaction that occurred,

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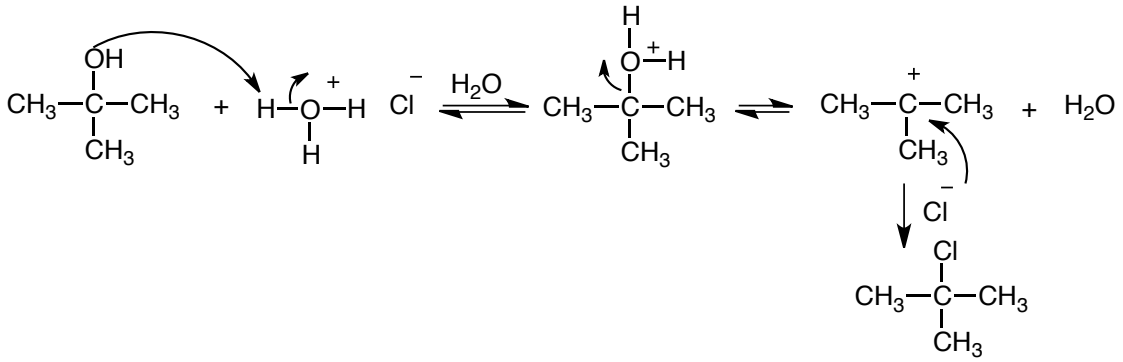
giving all of the steps. (b) Explain the purpose of adding calcium chloride to the product before doing the final distillation. (c) How can you tell that you have added enough calcium chloride? (10 pts)

(a)



(b) The calcium chloride is a drying agent that removes any water from the product before distillation.

(c) The calcium chloride will clump together when it has absorbed water. Add enough so that there is a slight excess that has not clumped together.