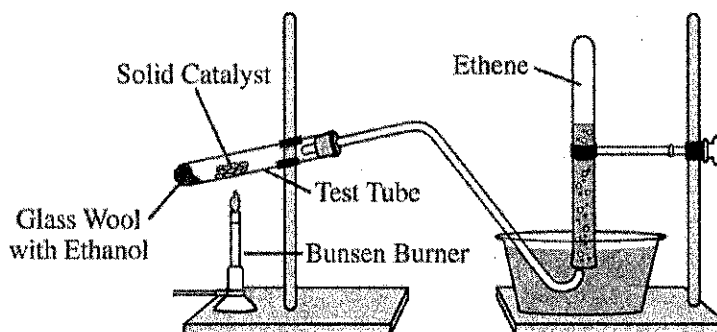
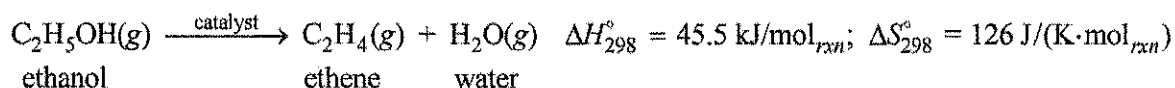


FR Practice #4 (2015 #2 (shortened), 4 points)

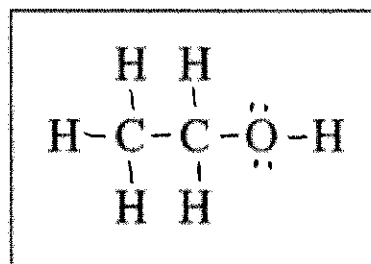
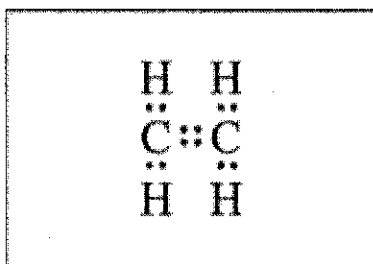


4. Ethene, $C_2H_4(g)$ (molar mass 28.1 g/mol), may be prepared by the dehydration of ethanol, $C_2H_5OH(g)$ (molar mass 46.1 g/mol), using a solid catalyst. A setup for the lab synthesis is shown in the diagram above. The equation for the dehydration reaction is given below.



A student added a 0.200 g sample of $C_2H_5OH(l)$ to a test tube using the setup shown above. The student heated the test tube gently with a Bunsen burner until all of the $C_2H_5OH(l)$ evaporated and gas generation stopped.

- a. The Lewis electron-dot diagram for C_2H_4 is shown below in the box on the left. In the box on the right, complete the Lewis electron-dot diagram for C_2H_5OH by drawing in all of the electron pairs. (1 point)



- b. What is the approximate value of the $H-C-H$ bond angle in the ethene molecule? Explain. (1 point)
- c. During the dehydration experiment, $C_2H_4(g)$ and unreacted $C_2H_5OH(g)$ passed through the tube into the water. The C_2H_4 was quantitatively collected as a gas, but the unreacted C_2H_5OH was not. Explain this observation in terms of the intermolecular forces between water and each of the two gases. (2 points)

b) 120°

c) Ethene is only slightly soluble in H_2O b/c the weak dipole/induced dipole interactions between non-polar ethene molecules + polar H_2O molecules are weaker than the hydrogen bonds between H_2O molecules.] 1 pt

Ethanol is soluble in H_2O b/c it is polar + forms hydrogen bonds with H_2O molecules as it dissolves.] 1 pt