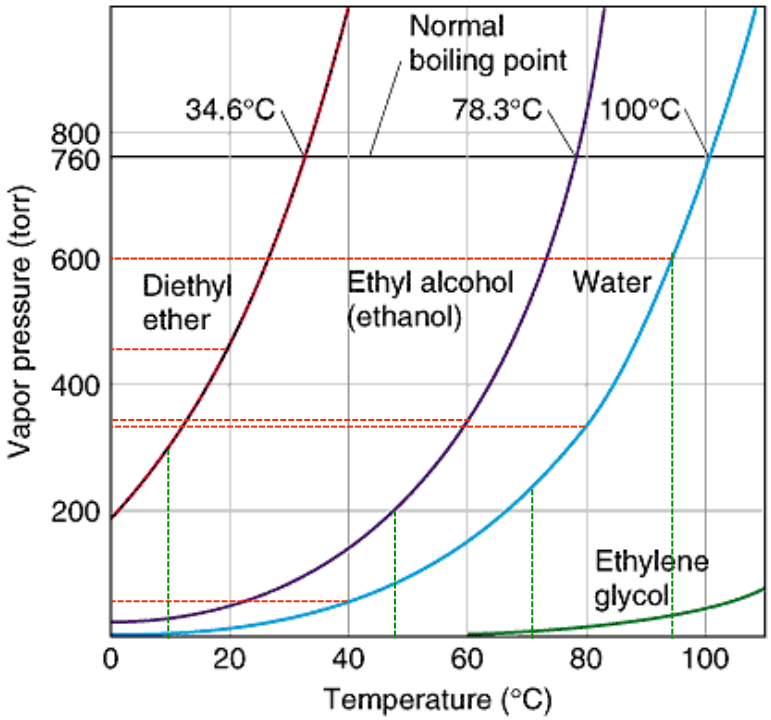
WKS – Chem Honors
Vapor Pressure and Boiling Point

Name Answer Key
Date _____ Period _____

1) Using the diagram at right, estimate the approximate equilibrium vapor pressure of each of the following at the specified temperature.
   a) water at 40ºC: ~60 mm Hg
   b) water at 80ºC: ~320 mm Hg
   c) diethyl ether at 20ºC: ~450 mm Hg
   d) ethanol at 60ºC: ~325 mm Hg



2) Explain why the vapor pressure of a liquid increases with increasing temperature.
As temperature increases, the average KE of the liquid increases, and more molecules have enough KE to break their IMFs and escape into the gas. As the percentage of molecules evaporating increases, the rate of evaporation increases, and the pressure increases until the rate of condensation (which depends on pressure) increases to equal the rate of evaporation.

3) Explain how the attractive forces between the particles in a liquid and the equilibrium vapor pressure of that liquid are related.
For molecules with weak IMFs, it takes relatively low energy to evaporate (it is more volatile), so at a given T more molecules will have enough energy compared to a substance with higher IMFs. Since more molecules can evaporate, the rate of evaporation is higher at a given T, so P must also be higher for the rate of condensation to equal the rate of evaporation.

4) Explain the relationship between atmospheric pressure and the actual boiling point of a liquid.
Since boiling point is the T at which the vapor pressure equals the external (atmospheric) pressure (bubbles have enough pressure to form), increasing atmospheric pressure requires a higher T for the P_{vap} to equal P_{atm} and the boiling point increases.

5) Use the diagram in #1 to estimate the boiling point of each of the following at the specified pressure:
   a) Water at 600 mm Hg (in Denver) ~92 °C
   b) Water at 225 mm Hg (top of Mt. Everest) ~71 °C
   c) Ethanol at 200 mm Hg ~48 °C
   d) Diethyl ether at 300 mm Hg ~10 °C