

**Q.1.**

What is the minimum number of  $\text{m}^3$  of dry air at  $20^\circ\text{C}$  and 100 kPa that are necessary to evaporate 6 kg of ethyl alcohol if the total pressure remains constant at 100 kPa? Mol. wt of ethyl alcohol = 46; vapor pressure of alcohol at  $20^\circ\text{C} = 5.93 \text{ kPa}$

**Q.2.**

The weather reported on the radio on a specific day was that the temperature in the afternoon would reach  $49^\circ\text{F}$ , the relative humidity would be 43%, the barometer reading 29.67 in Hg. How many pounds of water vapor would be in  $1 \text{ mi}^3$  of afternoon air? What would be the dew point of this air? Vapor pressure of water at  $94^\circ\text{F} = 1.61 \text{ in Hg}$ .

**Q.3.**

By absorption in silica gel you are able to remove 0.93 kg of the  $\text{H}_2\text{O}$  from the moist air at  $15^\circ\text{C}$  and 98.6 kPa. The same air measures  $1000 \text{ m}^3$  at  $20^\circ\text{C}$  and 108 kPa when dry. What was the relative humidity of the moist air? Vapor pressure of water at  $15^\circ\text{C} = 1.7 \text{ kPa}$

**Q.4.**

Calculate the bubble point (BP) temperature and composition of a vapor in equilibrium with a liquid that is 50mol% benzene and 50 mol% toluene at 1 atmosphere pressure.

*Data (Antonie constants):*

*Benzene:  $A=6.89272$ ;  $B=1203.531$ ;  $C=219.888$*

*Toluene:  $A=6.95805$ ;  $B=1346.773$ ;  $C=219.639$*

*In Antonie equation use  $T$  in  $^\circ\text{C}$ , and  $P$  in mmHg*

*( $NBP_{\text{Benzene}}=80^\circ\text{C}$ ,  $NBP_{\text{Toluene}}=110^\circ\text{C}$ )*