

## Quiz 13.2 – Colligative Properties

Name: \_\_\_\_\_

All questions on this quiz concern a solution of 12.5 *ml* of ethanol (C<sub>2</sub>H<sub>5</sub>OH) and 36.3 *ml* of water. Below are some useful properties of water and ethanol

|                  | $d_{25^{\circ}C}$       | $T_f$              | $T_b$             | $K_f$                      | $K_b$                       | $P_{25^{\circ}C}^{\circ}$ |
|------------------|-------------------------|--------------------|-------------------|----------------------------|-----------------------------|---------------------------|
| H <sub>2</sub> O | $0.997 \frac{g}{cm^3}$  | $0.00^{\circ}C$    | $100.00^{\circ}C$ | $1.86 \frac{^{\circ}C}{m}$ | $0.512 \frac{^{\circ}C}{m}$ | 23.8 <i>torr</i>          |
| EtOH             | $0.7893 \frac{g}{cm^3}$ | $-114.14^{\circ}C$ | $78.24^{\circ}C$  | $1.99 \frac{^{\circ}C}{m}$ | $1.22 \frac{^{\circ}C}{m}$  | 44.6 <i>torr</i>          |

**Question 1**

Calculate the mole fractions of water and ethanol in both the liquid and the vapor phase

**Question 2**

Because water is the majority component, freezing and boiling points will be determined in relation to water. Find the freezing and boiling points for the solution

**Question 3**

The mixture will have a final volume of 47.5 *ml*. Find the density of the mixture

**Question 4**

How much osmotic pressure will this solution exhibit?

*Holy Sonnets: Death, be not proud*

By John Donne

Death, be not proud, though some have called thee  
Mighty and dreadful, for thou art not so;  
For those whom thou think'st thou dost overthrow  
Die not, poor Death, nor yet canst thou kill me.  
From rest and sleep, which but thy pictures be,  
Much pleasure; then from thee much more must flow,  
And soonest our best men with thee do go,  
Rest of their bones, and soul's delivery.  
Thou art slave to fate, chance, kings, and desperate men,  
And dost with poison, war, and sickness dwell,  
And poppy or charms can make us sleep as well  
And better than thy stroke; why swell'st thou then?  
One short sleep past, we wake eternally  
And death shall be no more; Death, thou shalt die.