

### QUIZ 3 – Summer 2016

NAME: \_\_\_\_\_ Score: \_\_\_\_\_/20

- You have one hour to complete this quiz. Answer **ALL** the problems below.
- You may use a standard or scientific calculator, your class notes, and any lecture or lab handouts. You **MAY NOT** use a computer, laptop, cellphone or other Internet-connected device.
- To receive full credit for calculated values, you **MUST INCLUDE UNITS** and **RECORD THE ANSWER TO THE APPROPRIATE NUMBER OF SIGNIFICANT FIGURES**

- 1) Circle the correct answer: The scale on a hydrometer has the units of:  
a) Density      b) mass      c) Volume      d) Temperature      e) no units
- 2) Maintenance costs for a piece of lab equipment is \$250 each year. What is the present value of these maintenance costs over a 12-year period if the interest rate is 8%, compounded annually? Report your answer to the nearest whole dollar amount. \_\_\_\_\_

Questions 3 – 5) Use the following information to answer questions 3 – 5.

molar masses: Carbon = 12.01 g/mol    Hydrogen = 1.01 g/mol    Oxygen = 15.99g/mol

density of acetone = 0.791 g/mL

- 3) 102 grams of acetone ( $C_3H_6O$ ) is \_\_\_\_\_ moles of acetone. (3 sig figs)
  - 4) 5.2 L of acetone has a mass of \_\_\_\_\_ kg. (2 sig figs)
  - 5) You have a mixture that is 102 grams of water and 102 grams of acetone, the mole fraction of acetone is: \_\_\_\_\_ (3 sig figs)
- 6 – 7) Use the table below to answer questions 6 and 7.

%	10C	15C	20C	25C	30C	35C	40C
35	162	.94832	494	146	790	425	051
36	.94986	650	306	.93952	591	221	.92843
37	805	464	114	756	390	016	634
38	620	273	.93919	556	186	.92808	422
39	431	079	720	353	.92979	597	208

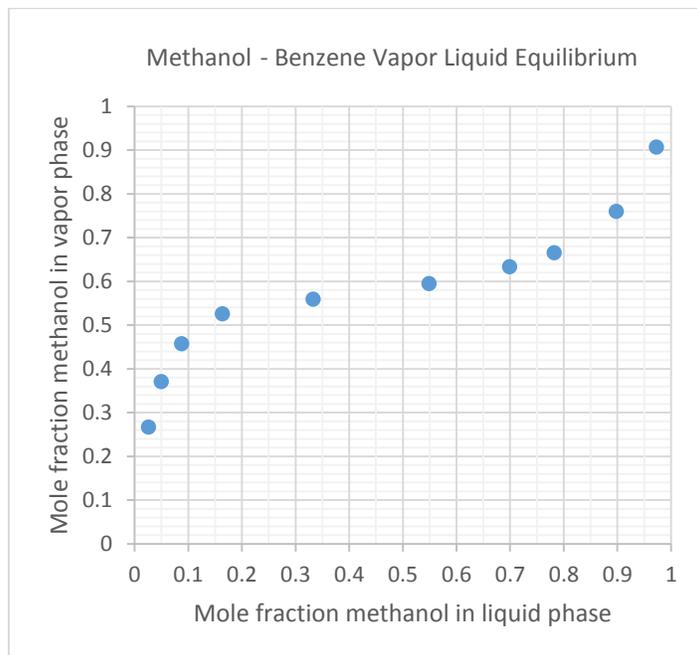
- 6) At what temperature will a 35 weight % ethanol solution have a density of 0.94708? \_\_\_\_\_ (3 sig figs)
- 7) What is the % by weight of ethanol in a solution that has a density of 0.93226 at 30°C? \_\_\_\_\_ (3 sig figs)

8-9) Draw the cash flow diagram for the following scenario:

You purchase a new piece of equipment for \$12,000 and expect to sell it after ten years for \$2000. The estimated maintenance is \$1000 for the first year, but expected to increase by \$200 each year thereafter.

- 10) How much must be invested at the end of each year for 30 years if you want to have \$1,000,000 available after 30 years? Assume 4% interest compounded annually and report answer to the nearest dollar.

Questions 11-13) Use the graph below to answer questions 11-13.



Questions 13 - 18) Circle T for True or F for false in response to the following statements.

- 11) T / F The methanol-benzene system in the figure above has an azeotrope.
- 12) T / F The mole fraction of methanol in the vapor phase that is in equilibrium with 0.3 mole fraction of benzene in the liquid phase is greater than 0.6.
- 13) T / F It would take less than 1 stage to enrich liquid methanol-benzene mixture from 0.05 mole fraction methanol in the sample to 0.42 mole fraction methanol in the distillate.
- 14) T / F The units of density has the dimensions of  $M/L^3$ .
- 15) T / F In the paper chromatography activity, the dye that travels the longest distance up the paper has a higher retention factor.
- 16) T / F in order for paper chromatography to work, the dyes you wish to separate must all be insoluble in the solvent you use.

Questions 17 – 18) Circle the correct answer:

- 17) As the distillation of the ethanol/water solution proceeded during your lab, the boiling temperature of the flask contents increased with time / decreased with time / not have changed with time.
- 18) As the distillation of the ethanol/water solution proceeded in the lab, the concentration of ethanol in the distillate samples being collected increased with time / decreased with time / not have changed with time .
- 19 -20) The specific heat of aluminum is  $897 \text{ J}/(\text{kg} \cdot ^\circ\text{C})$ , the amount of heat energy required to increase the temperature of 64.3 g of aluminum from  $102^\circ\text{C}$  to  $135^\circ\text{C}$  is \_\_\_\_\_ (2 sig figs)