NAME:____________________________________________________

Answer 5 of the 6 problems below. Put a large X through the problem you do not want us to grade. If there is no X, the first five problems will be graded.

Please read each question carefully. Some questions may have more than one answer.

You may use a standard or scientific calculator, your class notes, and any lecture handouts. You MAY NOT use a computer, laptop, or other Internet-connected device.

1) You contribute $440 monthly to a mutual fund that earns 9.4% interest compounded annually. In 13 years you wish to withdraw $120,000 to pay for your child’s college tuition.

Circle the letter in front of each true statement. There may be more than one.

   a. Assuming the interest rate does not change during the 13 year period, you will have $120,000 available in 13 years.

   b. This is an example of a geometric series.

   c. This is an example of a simple interest problem.

   d. This is an example of a future value problem.

   e. If you contributed $220 each month into this same mutual fund, you would need to wait twice as long to have saved $120,000.

2) For parts a – c, circle the letter in front of all true statements, there may be more than one.

   a. If you are borrowing money it is better to borrow from a lender calculating your payments using simple interest rather than compounding interest.

   b. If you are borrowing money and your payments are calculated using compounding interest it is better to have annual compounding rather than monthly compounding.

   c. One hundred dollars today has the same value as $100 one year from now.

For parts d-e, complete the following statements by circling the correct response.

   d. A credit card company charges an interest rate of 2.175% per month on the unpaid balance of all accounts. The annual interest rate, they claim, is 12(2.175%) = 26.1%. The effective interest rate is 2.175% / 2.197% / 26.1% / 29.5% / 33.3%.

   e. You place $100 in an investment for 10 years at 6% compounded quarterly. After 10 years the value of this money is $100.00 / $106.00 / $179.08 / $181.40 / $212.00.
3) Following is a Table of Saturated Steam Data.

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>Pressure (kPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>110</td>
<td>143.27</td>
</tr>
<tr>
<td>128</td>
<td>254.35</td>
</tr>
<tr>
<td>146</td>
<td>427.09</td>
</tr>
<tr>
<td>164</td>
<td>683.56</td>
</tr>
<tr>
<td>182</td>
<td>1049.6</td>
</tr>
<tr>
<td>200</td>
<td>1554.9</td>
</tr>
<tr>
<td>218</td>
<td>2232.4</td>
</tr>
<tr>
<td>236</td>
<td>3118.6</td>
</tr>
</tbody>
</table>

For parts a-c, complete the following statements by circling the correct response.

a. A saturated steam system has a pressure of 400 kPa. The temperature of the system, rounded to the nearest whole number, is 131°C / 134°C / 137°C / 143°C / 144°C.

b. A saturated steam system is operating at a temperature of 150°C. The pressure of the system is 431.09 kPa / 484.08 kPa / 555.33 kPa / 626.57 kPa / 650.12 kPa.

c. Ethanol has a molar mass of 46.07 grams/mole. There are 1.670 moles / 0.5987 moles / 3545 moles / 46.07 moles in 76.95 grams of ethanol.

For parts d – e, circle the letter in front of any statements which are true, there may be more than one.

d. Density may be reported in units of g/in³.

e. Specific gravity may be reported with units of g/cm³.

4) You carry out a batch distillation of a solution of ethanol and water using the system that we used in the distillation lab. Instead of collecting three distillate samples, you stop after collecting the first distillate. The initial solution has a volume of 100.00 mL and is 35.00% by weight ethanol at 20°C. The first distillate has a volume of 15.00 mL and is 63.00% by weight ethanol at 20°C. Assuming the system has no loss of material to the environment; circle the letter in front of all the correct statements. There may be more than one.

a. The mass of ethanol in the initial solution is 35.00 grams.

b. The density of the first distillate is greater than the density of the initial solution.

c. The density of the solution that remains in the flask after the first distillate is collected is greater than the density of the initial solution.

d. The temperature at the top of the Graham’s condenser is hotter than the temperature at the bottom of the Graham’s condenser.

e. The solution that remains in the flask at the end of the experiment will be less than 35.00% by weight ethanol.
5) The same hydrometer was used to determine the specific gravity of two water and ethanol solutions. One solution is the first distillate and the other solution is the third distillate taken from the same distillation experiment. Both solutions were cooled to room temperature prior to measurement with the hydrometer. Use the pictures above to circle all correct statements below, there may be more than one.

a. Solution A is more dense than Solution B
b. Solution B has a higher specific gravity than Solution A
c. Solution B is the first distillate
d. It is impossible to tell which solution is the first distillate
e. Ethanol is less dense than water

6) For parts a – d, circle the letter in front of any statements which are true.

a. Chromatography, distillation, filtration and extraction are all examples of separation processes used in the chemical industry.
b. Heat transfer can occur through the following three pathways - convection, conduction, and radiation.
c. The efficiency of heat transfer is always less than 1.0.
d. In the paper chromatography lab you completed during the chemical processes experiments the density of the various dyes was an important consideration in the separation process.

For part e, complete the sentence by circling the correct answer.

e. You have been given the following information about the chemical compound octane:

Specific heat capacity of liquid octane = 255.68 J/(mol°C)
Molar mass of octane = 114.23 g/mol
Density of octane = 0.0703 g/cm³
Melting point of octane = -57°C
Boiling point of octane = 125.5 °C

It will require 7,909 / 11,250 / 98,485 / 1,285,078 / 4,453,965 Joules of energy to heat 1.0 kg of liquid octane from 76°C to 120 °C.