## PART 1

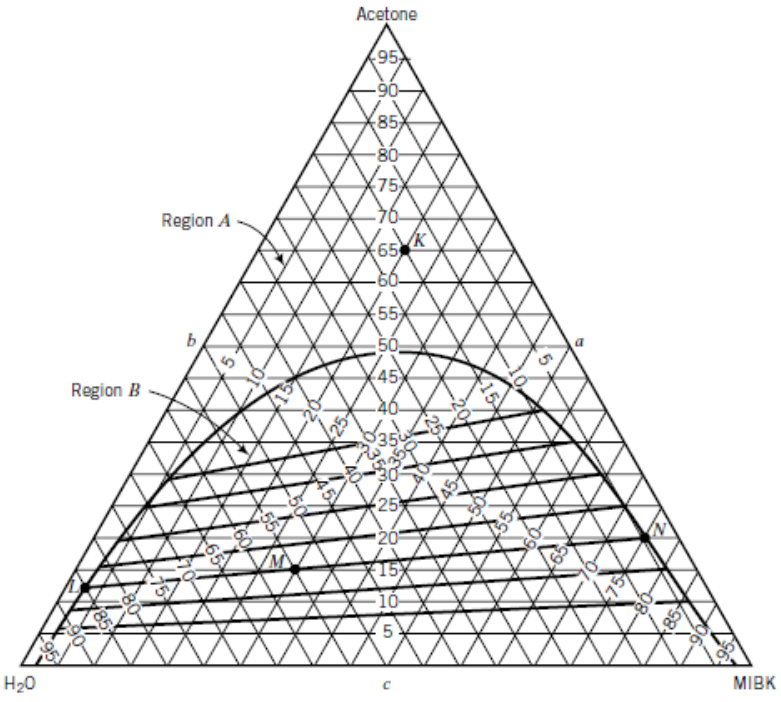
1. An excerpt of the steam tables (saturated water) is given below. Use it to calculate the specific volume of the liquid phase at a temperature of 292.5K. **[3 marks]**

| T<br>K | Press.<br>kPa | Volume, $m^3/kg$<br>$V_t$ | <br>$V_g$ |
|---|---|---|---|
| 273.16 | 0.6113 | 0.001000 | 206.1 |
| 275 | 0.6980 | 0.001000 | 181.7 |
| 280 | 0.9912 | 0.001000 | 130.3 |
| 285 | 1.388 | 0.001001 | 94.67 |
| 290 | 1.919 | 0.001001 | 69.67 |
| 295 | 2.620 | 0.001002 | 51.90 |
| 300 | 3.536 | 0.001004 | 39.10 |
| 305 | 4.718 | 0.001005 | 29.78 |
| 310 | 6.230 | 0.001007 | 22.91 |
| 315 | 8.143 | 0.001009 | 17.80 |

Hint: $y = y_1 + \frac{(x - x_1)}{(x_2 - x_1)} (y_2 - y_1)$

2. The ternary diagram below is for a system consisting of Acetone, Water and Methyl Isobutyl Ketone (MIBK).

a. On the diagram indicate where a mixture consisting of 25% Acetone, 40% $H_2O$ and 35% MIBK would lie. How many phase(s) constitute this mixture? **[4 marks]**
b. What is the composition of each phase? **[3 marks]**



## PART 2

1. Draw a P-T phase diagram at constant *v* and indicate: the four phases, three phase changes, triple point and critical point**. [5.5 marks]**

2. Which of the following properties are intensive and which are extensive? Velocity, moles, internal energy, potential energy, surface tension, color, density, weight, specific volume. **[4.5 marks]**

## PART 3

**Question 1**

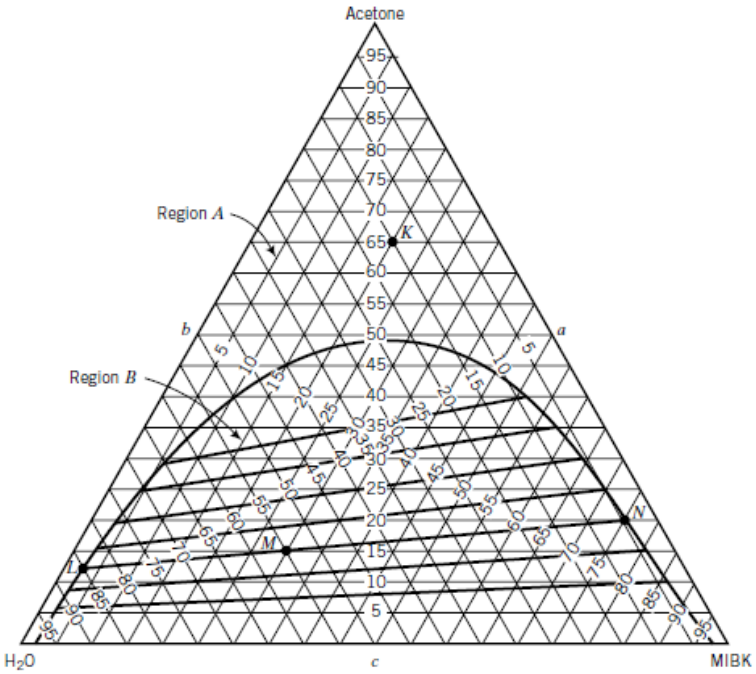
An excerpt of the steam tables(saturated water) is given below. Use it to calculate the saturation pressure and specific volume of the liquid phase at a temperature of 303K. **[3 marks]**

| T<br>K | Press.<br>kPa | Volume, $m^3/kg$<br>$V_t$ | <br>$V_g$ |
|---|---|---|---|
| 273.16 | 0.6113 | 0.001000 | 206.1 |
| 275 | 0.6980 | 0.001000 | 181.7 |
| 280 | 0.9912 | 0.001000 | 130.3 |
| 285 | 1.388 | 0.001001 | 94.67 |
| 290 | 1.919 | 0.001001 | 69.67 |
| 295 | 2.620 | 0.001002 | 51.90 |
| 300 | 3.536 | 0.001004 | 39.10 |
| 305 | 4.718 | 0.001005 | 29.78 |
| 310 | 6.230 | 0.001007 | 22.91 |
| 315 | 8.143 | 0.001009 | 17.80 |

**Question 2**

The ternary diagram below is for a system consisting of Acetone, Water and Methyl Isobutyl Ketone (MIBK).

a. On the diagram indicate where a mixture consisting of 10% Acetone, 75% $H_2O$ and 15% MIBK would lie. How many phase(s) constitute this mixture? **[4 marks]**
b. What is the composition of each phase? **[3 marks]**




## PART 4

**Question 1**

Two men are cooking rice in ***boiling water***. The former is located at sea level whereas the latter is located atop a high-altitude mountain. Whose rise will cook faster and why?**[3 marks]**

**Question 2**

Determine the normal boiling point of benzene from the Antoine equation.

*Hint*: Make sure to use the correct units for P and T based on your source of Antoine table of coefficients. **[7 marks]**