**Question 2: Hand Calculations - laboratory-scale of Yakult**

1. Assume broth solution has similar properties to water.
2. 97% of the Glucose has been consumed.
3. 97% of the Glucose has been consumed, thus 3% of the Glucose is in excess.  
     
   Assume density is constant, thus the final volume will be 750mL as well.
4. Total mass is conserved, thus mass of reactants must be the same as the mass of products.  
     
   None of the original Lactobacillus casei is consumed.
5. The optimal temperature for the reproduction of Lactobacillus casei is 37˚C. After the reaction with glucose takes place, it is cooled to 2˚C. This ensures that it does not reproduce which, in effect, produces more Lactic Acid - by consuming the excess Glucose. If the cooling system were to fail, the liquid would rise to room temperature (25˚C). With the increase in temperature, Lactobacillus casei will begin to consume more glucose. The concentration of Glucose will consequently decrease, resulting in an increase in concentration for both Lactic acid and Lactobacillus casei. The flavour of the drink will most likely taste more sour.