

**B.Sc (H) MICROBIOLOGY: SEMESTER-2**  
**CC3: BIOENERGETICS NUMERICAL PROBLEMS**  
**BY DR. PRIYADARSHINI MALLICK**

1. Suppose you want to make a pH 5.00 buffer using acetic acid (HA) and sodium acetate (A<sup>-</sup>). pK<sub>a</sub> of acetic acid = 4.76. What ratio of HA and A<sup>-</sup> should be used? 2.5 marks
  
2. Very popular buffer can be obtained from Tris-HCl salt, and Tris in pure forms. What is the pH of a solution when 12.43 g of Tris is mixed with 4.67 g of Tris-HCl (BH<sup>+</sup>) diluted to 1.00 liter? Calculate molarity of each species. 2.5 marks
  
3. Buffers can be prepared by starting with only one form of the two species and then adding a given amount of acid or base to form the conjugate acid or base needed to provide the buffer system. How many mL of 0.5 M NaOH should be added to 10 g of Tris-HCl salt to yield a pH of 7.60 buffer in final volume of 250 mL? 5 marks
  
4. (a) A solution was prepared by dissolving 0.02 moles of acetic acid (HOAc; pK<sub>a</sub> = 4.8) in water to give 1 liter of solution. What is the pH?  
  
(b) To this solution was then added 0.008 moles of concentrated sodium hydroxide (NaOH). What is the new pH? (In this problem, you may ignore changes in volume due to the addition of NaOH).  
  
(c) An additional 0.012 moles of NaOH is then added. What is the pH? 15 marks