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1. Consider the following situation: Two beakers labeled 1 and 2 are each filled with 50.0ml of neutral water. A chemist has two unknown solution of monoprotic acid dissolved in water. The chemist adds 5 drops of unknown solution A to beaker 1 and 5 drops of unknown solution B to beaker 2. The pH in beaker 1 drops to 6.2 and the pH in beaker 2 drops to 5.9. Classified True or False, explain why?
  - a. Unknown B is a stronger acid than unknown A.
  - b. The hydrogen ion concentration in beaker 1 is higher than the hydrogen ion concentration in beaker 2.
  - c. Unknown A and unknown B are both weak acids.
  - d. Unknown A and unknown B are both diluted solutions.
  - e. The pOH of the solution in beaker 1 is greater than the pOH of the solution in beaker 2.
  
2. An unknown organic acid is somewhat soluble in water. When 6.25g of the unknown acid is added to 1.20 L of neutral water, the freezing point decrease to  $-0.0793$  and the pH decrease to 2.79.
  - a. compute the molecular weight of the unknown acid
  - b. compute the  $K_a$  and  $pK_a$  of the unknown acid.
  - c. Find the unknown acid, using table of  $K_a$
  - d. Use an appropriate source to find the molecular weight of the compound for c. does this molecular weight match with what you compute for part a?
  
3. A mixture of 1.00mmol of  $H_2$  and 5.00mmol of  $I_2$  is placed in a .5L container at a certain temperature and allowed to come to equilibrium. Analysis of the mixture shows that the concentration of HI is .87mM.
  - a. Compute  $K_c$  for the reaction  $H_2 + I_2 \rightleftharpoons 2HI$
  
  - b. Compute  $K_p$  for the reaction.
  
  - c. Is the reaction product favored or reaction favored?
  
  - d. If some HI were added to the flask at equilibrium , would the reaction shift to the left, shift to the right or stay the same.
  
  - e. If some  $H_2$  were added to the flask at equilibrium , would the reaction shift to the left, shift to the right or stay the same?
  
  - f. If 1.200mmol of  $H_2$  and 1.200mmol of HI are added to the flask, will the equilibrium shift to the left, right or stay the same? Justify your answer by computing the reaction quotient.

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