Answer on Question #66385, Chemistry / Inorganic Chemistry

After a long night of carousing with some of his fellow "hounds" (consuming large quantities of rum, partaking in games of chance, and forming temporary alliances with young ladies to whom he had not been formally introduced) Mr. Baskerville Holmes wakes up the following morning feeling extremely dehydrated. He rushes down to the kitchen and drinks, in order, 850ml of orange juice, 700ml of grape juice, 650ml of cranberry-grape juice, and tops it all off with 900ml of pure distilled water. The citric acid (H3Cit) content in the juices was of 0.20 M for the orange juice, 0.27 M for the grape juice, and 0.25 M for the cranberry-grape juice. Prior to consuming all of this liquid, his stomach initially contains 90ml of gastric fluid with an HCI concentration of 0.10 M. What is the pH in Holmes' stomach after he has drank all of the liquids. Report your results to THREE significant figures.

Answer

$V_1(H_3Cit)=0.85L*0.2Mol/L=0.17Mol$

$V_2(H_3Cit)=0.7L*0.27Mol/L=0.189Mol$

$V_3(H_3Cit)=0.65L*0.25Mol/L=0.1625Mol$

$V_4(H_3Cit)=0.17+0.189+0.1625=0.5215Mol$

$V_{HCl}=0.09L*0.1Mol/L=0.009Mol$

$V=0.85+0.7+0.65+0.9+0.09=3.19L$

$C(H_3Cit)=0.5215Mol/3.19=0.16M$

$C(GCl)=0.009Mol/3.19L=0.0028M$

$[H^+]=C_{HCl}+\frac{\sqrt{C^2H^3Cit+4KaCH^3Cit}}{2}=0.1+\sqrt{0.0168^2+4*7.41*10^{-4}*0.0168/2}=0.0591$

$pH=-lg[H^+]=1.228$

Answer provided by https://www.AssignmentExpert.com