

**Marks**  
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- Citric acid,  $C_6H_8O_7$ , has three  $pK_a$  values:  $pK_{a1} = 3.13$ ,  $pK_{a2} = 4.76$  and  $pK_{a3} = 6.40$ . Explain, giving exact volumes and concentrations, how to make 1.0 L of a citrate-based buffer with pH 5.58.

**THE REMAINDER OF THIS PAGE IS FOR ROUGH WORKING ONLY.**