The framework of ph scale

1. Out of the seven different solutions tested, water was a control. Its serves as a standard ‘ liquid’ because of its neutral pH 7 at which concentration of H? is equal to that of OH? i. e, [proton donor] = [proton acceptor]. It controls for the buffer capacity of a particular buffer solution under examination. Moreover the framework of pH scale is based on the ionic product of water.
2. As we know buffering capacity of a buffer is the measure of its ability to resist change in pH when some acid or base is added to it. Buffering capacity is maximum at pKa when there are equal amounts of conjugate acid and conjugate base; [HA] = [A?]. When we compare buffer capacities of 0. 1M and 0. 001M buffer solutions of TRIS and phosphate, results are quite clear as per expectation. The buffering capacity of former is far better due to the fact that its 10X concentrated than latter or in a way we can say that proton acceptors/donors are rich in concentration in 0. 01M buffer solution. As we go on adding an acid or a base, H? and A? keep on depleting resulting in extinction of buffering capacity
3. Comparison of the results from addition of 0. 1M NaOH to 0. 1M HCl
4. For 0. 1M Tris of pH 7. 0 :

   In this case when we kept on adding NaOH, there was just a small increase in pH up to 7. 54 until 1. 50 ml of base was added. The reason is very simple and that’s pKa of this buffer à8. 2 which means it resists change in pH around this region. On addition of acid, initially the fall in pH was not abrupt but after 0. 5 ml the rise was very sharp and that was primarily due to increase in concentration of H? and depletion of

OH? (to counterbalance excess acid) For 0. 1M phosphate buffer of pKa 6. 82 As expected On addition of an acid and a base, an appreciable resistance to change in pH was offered until because its buffering capacity is maximum in range of 6. 82. So in nut shell we can say that 0. 1M phosphate buffer proved to better choice against 0. 1M Tris due to its strong buffering capacity around neutral pH

5. Both beef liver and cranberry juice can resist small changes in pH when some acid or a base is added. Such buffering systems are of vital importance in living systems because most of our enzymes have got a ‘ pH optima’ which means their catalytic activity is maximum at a particular pH. Even small changes in pH in their environment can impare their activity and hence rate of a chemical reaction. In most of the cases enzymes are stabelized by ionic interactions which inturn helps an enzyme to detect its substrate for binding. So these buffering systems play a major role in resisting changes in pH and ultimately co-ordination inside a biological system
6. pKa: It is the negative logarithm of an acid’s dissociation constant, Ka. Its gives us quantitative measure of an acid’s ability to dissociate. More the the pKa lesse will be the dissociation or stronger is the acid

   Just like the pH, the pKa tells us the acid or basic properties of a substance

   pKa <2 means strong acid

   pKa > 2 but <7 means weak acid

   pKa > 7 but <10 means weak base

   pKa > 10 means strong base

Equivalence point: It is a stage in a chemical reaction (in case of titrations) when amount of titrant becomes equal to that of analyte present in the solution under administration or in a simpler way we can say it is a point in a titration process when number of moles of an acid become equal to number of moles of a base. Somwtimes it is referred as a close approximation of an end point of a particular reaction

1. Representation of titration curve for cysteine
2. Around pH of 4, the removal of alpha carboxyl proton is effectively complete
3. The pH optima of B-galactosidase is 6-8 which means it works most efficiently in this particular pH range only. In case of Cysteine there are two different pKa value corresponding to carboxyl and amino group viz; 2. 1 and 9. 5 respectively which means its buffering capacity is maximum in this pH range(1. 5 – 4 and 9 – 11) only. So cysteine doesn’t seems to be a good buffer B-galactosidase enzyme assay
4. At a ph of 9. 2 the predominant form is negatively charged ion
5. After looking at the pKa values of Cysteine it is clear that it works maximum at 2 different pH ranges i. e, between 1. 5 – 4 and 9 – 11