I - Determination of pKa value of weak acid

Q) What is pH?

A) A figure denoting the acidity or alkalinity of a solution on a logarithmic scale is known as pH. It is the negative logarithm of hydrogen ion concentration. If a solution is more acidic, it has a lower pH value, and if a solution is more alkaline, it has a higher pH value. pH ranges from 1 - 14.

Q) What is pKa?

A) The acid dissociation constant of a solution is known as pKa. A low pKa value indicates a strong acid. Ka is the acidity/ionisation constant, it is the quantitative measure of an acid's strength in a solution.

Q) What is the Hendersen-Hasselbalch equation and what does it denote?

A) pH=pKa+log[salt]/[acid]. It gives us the relation between pH and pKa.

Q) Why do we take half equivalence point when finding pKa value?

A) At half-equivalence point, the concentration of [salt]=[acid], therefore the equation becomes pH = pKa.

Q) What happens at equivalence point?

A) At equivalence point, there will be a very sharp increase in pH for a very small quantity of added base. Once past the equivalence point, the pH increases only slightly nn adding excess base.

II - Colorimetric estimation of Iron (III)

Q) What happens when a monochromatic light is incident on a transparent medium?

A) A part of it is absorbed, a part of it is reflected and the remaining part is transmitted.

Q) What is transmittance?

A) The ratio of intensity of transmitted light to intensity of monochromatic light is known as transmittance.

Q) What is absorbance? What is its other name?

A) A measure of the capacity of a substance to absorb light of a specified wavelength is known as absorbance, it is equal to the logarithm of the reciprocal of transmittance. It is also known as 'Optical Density'.

Q) What is Beer-Lambert's law?

A) The relation between absorbance (A), concentration c (expressed in mol/L) and path length l (expressed in cm) is known as Beer Lambert's law.
$A = \log I_0/I_t = \varepsilon ct$ where ε is the molar extinction constant. If the path length is kept constant, A is directly proportional to ε.

Q) Why is iron (III) and dilute nitric acid used?

A) Iron (III) is used because Iron (II) does not react. Dilute nitric acid is used because a protective coating of Fe_2O_3 is formed on its surface which renders it inactive.

Q) Why should an excess of thiocyanate be used?

A) Excess of thiocyanate is used as this increases the intensity and as well as the stability of the colour.

III - Conductometric estimation of hydrochloric acid

Q)What is conductance?

A) The degree to which a substance conducts electricity is known as conductance, Its unit is siemens or mhos.

Q)Why does the conductance increase after the neutralisation point?

A) At the neutralisation point, the concentration of ions is minimum, hence the conductivity is less. After the neutralisation point, the concentration of highly mobile OH- ion concentration increases, hence the conductance increases.

IV - Determination of viscosity coefficient of a given liquid

Q) Why does viscosity arise?

A) Viscosity arises due to the internal friction between moving layers of molecules.

Q) Describe the properties of a liquid moving through a cylinder.

A) A liquid is expected to move in the form of molecular layers, a layer close to the surface is almost stationary while those at the axes moves faster than the intermediate layers. A slow moving layer exerts a drag on the it's nearest moving layer in the opposite direction.

Q) What is viscosity?

A) The property of a liquid by which it opposes/resists the motion between layers is known as viscosity. The unit is newton-second per square metre.

Q) What is the coefficient of viscosity?

A) It is the tangential force per unit area required to maintain a unit velocity gradient between any two successive layers of liquid situated unit distance apart. Its unit is 'Poise' in honour of J.L.M Poiseuille.

$\eta = (\pi * p * r^4 * t)/8 * V * l$

Viscosity of a liquid decreases markedly with increase in temperature.