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# **REDOX TITRATIONS - CONCEPTS AND PRINCIPLE**

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- **Oxidation-reduction reactions involve a transfer of electrons.**
- **The oxidising agent accepts electrons and the reducing agent gives electrons.**
- **In working out the equation for a redox reaction we can use the half-equation method. this method we use the half-equation for the oxidising agent and the half-equation for the reducing agent then add them together.**



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## **FORMAL POTENTIALS**

- **Standard potentials  $E^\circ$  are evaluated with full regard to activity effects and with all ions present in simple form: they are really limiting or ideal values and are rarely observed in a potentiometric measurement.**

**$E = E' + 0.0591/n \cdot \log [Ox]/[Red]$  at 25 degree celcius.**

**where  $E'$  is the formal potential and corresponds to the value of  $E$  at unit concentrations of oxidant and reductant, and the quantities in square brackets refer to molar concentrations**



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## Internal oxidation-reduction indicators.

**acid-base indicators** are employed to mark the sudden change in pH during acid - base titrations. Similarly an oxidation- reduction indicator should mark the sudden change in the oxidation potential in the neighbourhood of the equivalence point in an oxidation-reduction titration. The ideal oxidation-reduction indicator will be one with an oxidation potential intermediate between that of the solution titrated and that of the titrant, and which exhibits a sharp, readily detectable colour change. An oxidation-reduction indicator (redox indicator) is a compound which exhibits different colours in the oxidised and reduced forms:  $\text{In}_{\text{ox}} + n e \longrightarrow \text{In}_{\text{Red}}$



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- The oxidation and reduction should be reversible. At a potential  $E$  the ratio of the concentrations of the two forms is given by the Nernst equation:
- $E = E' + 0.0591/n \cdot \log [Ox]/[Red]$
- where  $E'$  is the standard (strictly the formal) potential of the indicator. If the colour intensities of the two forms are comparable a practical estimate of the colour-change interval corresponds to the change in the ratio  $[Inox]/[InRed]$  from 10 to 1/10 this leads to an interval.



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- **If the colour intensities of the two forms differ considerably the intermediate colour is attained at potential somewhat removed from  $E^\sim$ , but the error is unlikely to exceed 0.06 volt. For a sharp colour change at the end point,  $E_t$ ; should differ by about at least 0.15 volt from the standard (formal) potentials of the other systems involved in the reaction.**



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**THANK YOU**