|  |  |
| --- | --- |
| 9 Environmental Chemistry: WaterHighlighted section = TheoryNon highlighted = Experiments | Do I know it?? |
| **9.2 Hardness in Water (3 class periods)** |  |
| * define hardness in water
* define temporary hardness in water
* define permanent hardness in water
* identify the causes temporary and permanent hardness in water
* explain how deionisation is achieved using ion exchange resins
* describe a test that can be carried out on scale deposits in a kettle
* describe how hardness can be removed by boiling and by ion exchange
* account the relative purity of deionised and distilled water
 |  |
| **9.3 Water Treatment (5 class periods)** |  |
| * describe the treatment of water under the following headings: sedimentation, flocculation, filtration, chlorination, fluoridation and pH adjustment
* describe how sewage is treated (primary, e.g. settlement, screening; secondary, e.g. bacterial breakdown; tertiary, e.g. reduction of level of phosphates and nitrates)
* be aware of the high cost of tertiary treatment of water
* discuss the role of nutrients in the eutrophication of water
* discuss how pollution can be caused by uncontrolled use of nitrate fertilizers
* describe the polluting potential of heavy metals from batteries in the absence of recycling
* discuss pollution by heavy metal ions in water – especially Pb2+, Hg2+ and Cd 2+
* describe how heavy metal ions in water – especially Pb2+, Hg2+ and Cd 2+ can be removed from industrial effluent by precipitation
* recall that there are EU limits for various chemical species in water (two examples, e.g. nitrates, phosphates, specific metal ions)
 |  |
| * 1. **Water Analysis (11 class periods)**
 |  |
| * outline the basic principles of the following instrumental methods of water analysis:
1. pH meter (analysis of river and lake water)
2. AAS [cf. flame tests, absorption spectra (unit 1.4)] (analysis of
3. heavy metals in water e.g. lead, cadmium)
4. colorimetry (analysis of (i) lead in water (ii) fertilisers
* carry out a colorimetric experiment to estimate free chlorine in swimming pool water or bleach (using a colorimeter or a comparator)
* determine the total suspended and total dissolved solids (expressed as p.p.m.) by filtration and evaporation respectively
* determine pH and test water for anions (cf.unit 2.2)
* estimate the total hardness of water using ethylenediaminetetraacetic acid (edta) (balanced ionic equation required)
* define biochemical oxygen demand (BOD)
* estimate dissolved oxygen by redox titration
* describe the effect of organic chemical pollutants e.g. sewage industrial waste, silage, milk
 |  |