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| 9 Environmental Chemistry: Water  Highlighted section = Theory  Non 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 |  |