Water

Chemistry – Leaving Cert

Quick Notes

Water

Hard water is water that will not easily form a lather with soap. Hard water may be temporary (caused by calcium hydrogencarbonate or magnesium hydrogencarbonate) or permanent (caused by calcium or magnesium salts). There are certain ways to remove water hardness e.g. distillation, washing soda or ion exchange. Advantages of hard water is that it tastes nicer, its good for tanning and brewing and it contains calcium for healthy bones and teeth. However, the disadvantages of hard water is that it can block pipes, leave scale on kettles, wastes soap and produces scum. Distilled water is purer than deionised water because as well as ions, non-ionic substances and dissolved gases have also being removed from it. To determine the total hardness in a water sample, a titration may be carried out with edta solution in the burette and hard water, eriochrome black T and buffer solution in the conical flask. The colour change is from red to blue. The stages involved in water treatment are screening, flocculation, sedimentation, filtration, chlorination, fluoridation and pH adjustment. The Biochemical Oxygen Demand is the amount of dissolved oxygen consumed by biological action when a sample of water is kept in the dark at 20OC for five days. The more polluted the water is, the greater the amount of oxygen that is used up by micro-organisms. The standard temperature of 20OC is used as the rate at which micro-organisms consume oxygen is dependent on temperature and the standard temperature also allows for a more accurate comparison of results. The dark prevents photosynthesis taking place which would artificially increase the level of oxygen in the sample. The standard time of 5 days is needed for a valid comparison of results and it is also an appropriate amount of time for micro-organisms to adapt to their environment. When collecting the water sample for the BOD test, the bottle should be filled under the surface of the water and it also must be fully filled to prevent any oxygen entering the bottle. Eutrophication is the enrichment of water with nutrients. It may be caused by fertiliser run-off, silage or sewage entering the water and all of these lead to the growth of algae and this causes deoxygenation and therefore the death of aquatic life. The dumping of batteries in water leads to the presence of heavy metals such as mercury or lead. These are cumulative poisons so the EU has set limits e.g. a maximum of 50 ppm is allowed for both nitrates and lead. The Winkler method is used to determine the amount of dissolved oxygen in a water sample. Three solutions are added to the water which lead to the formation of iodine. The more oxygen present in the water, the more iodine that is produced. The amount of iodine formed is then found by titration against a standardised solution of sodium thiosulfate. When we know the amount of iodine present, we can

determine the amount of dissolved oxygen in the water sample. Sewage treatment is carried out in three stages – primary treatment involves screening and sedimentation, secondary treatment is a biological process that breaks down microorganisms and tertiary treatment removes phosphates and nitrates to prevent eutrophication. Other methods may be used to analyse water – pH meter, colorimetry or atomic absorption spectrometry. To estimate the concentration of free chlorine in swimming pool water, a substance known as DPD is used to react to give a pink product. The intensity of the pink colour in the water is an indication of the amount of free chlorine in the water. This amount of free chlorine may be measured using a comparator or colorimeter.