



HELLENIC REPUBLIC

UNIVERSITY OF CRETE

Academic English

Section: Water Treatment UOC Textbook

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One of the most alarming ways people can have a chemical impact on their environment is by ingesting a prescription medicine, a fraction of which may end-up in **wastewater**, and may pass right through the **sewage plant** unchanged to reach lakes or sediments showing up in drinking water. This is what renders water purification even more challenging.

Not all contaminants are removed by means of a single method. The presence of bacteria, pathogens, parasites, algae, viruses, fungi, minerals ask for multiple methods of water treatment although they are not classified as priority pollutants. Surprisingly, ingested pharmaceuticals, detergents (fig. 1) often reach lakes or streams completely unmetabolised ending up in drinking water. Man-made water contaminants such as acetone or



antibiotics are non-lipophilic, bioactive substances that have an adverse impact on aquatic organisms and can be converted back to their original compound even in the treatment plant.

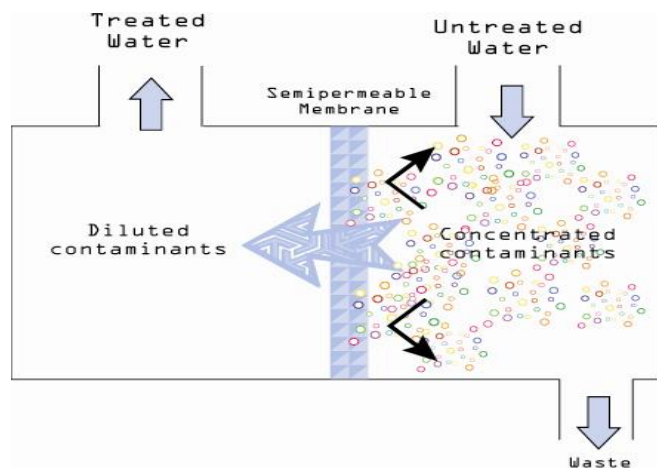
Water purification involves altering the physical and chemical composition of non-potable water to a potable one. Most water treatment plants must also determine parameters such as that of taste, water hardness, odor and contamination. Due to great demand, water-treatment industries are not only faced with the daunting task of investigating potential sources of pollution but also identify efficient purification methods for each contaminant such as reversed osmosis, filtration, chlorination and distillation. Some water treatment methods serve as mere disinfectants. Others serve as taste, odor and color removers.

Chlorination serves mainly as a disinfectant. In the form of chlorine, it exhibits bactericidal efficiency, either before any other treatment is applied (pre-chlorination) or as a supplement of another treatment (post-chlorination). For instance, when activated carbon filter applications are followed by chlorination, they remove hydrogen sulfide and dissolved iron and manganese, known to be responsible for water hardness. However, chlorination

efficiency often depends on its residual effect, which is the amount of chlorine maintained in the treatment plants within a designated time.

A distillation unit is often employed when water must be separated via desalination. Water boils in a chamber and vaporizes. Its steams traveling to the condenser cool down and retake their liquid form. Although heavy metals, nitrate, fluoride and salt are left behind, it doesn't work with equal efficiency on all the contaminants it removes. Volatile organic compounds can evaporate and travel through the condenser, which renders distillation dependent on additional treatments.

Reverse osmosis, on the other hand, is deemed to be a far more efficient and cost effective desalination technique than distillation. A semi-permeable membrane (fig.2) allows the water to be filtered leaving larger contaminants behind. This way, it removes inorganic



minerals such as phosphorous, calcium, radium as well as detergents and pesticides. One of the disadvantages, however, is frequent contaminant concentration whose reduction often relies on the use of activated carbon filters.

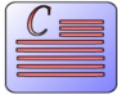
Figure 2

There are two main types of filters: sediment filtration and activated carbon filtration. They both share the principle of trapping and removing undesirable particles. Sediment filtration or turbidity entails the use of sand or wool for the removal of large foreign bodies such as dirt, insoluble iron and manganese. Although it may filter the water to a high degree of clarity, it may serve as a breeding ground for dissolved chemicals such as lead, mercury or trihalomethanes.

Activated carbon filters are mainly employed as disinfectants. They include adsorption which attracts contaminants and holds them attached on its surface. The pores of

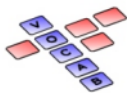
carbon materials act as a sorbent that captures largely polar contaminants at extremely low levels. Although the adsorption process depends on various factors, it is significantly effective.

By and large, the presence of even minute traces of organic substances is believed to be the causative agent of many diseases. This renders the application of water treatment methods even more imperative.



1. Read the text carefully and answer the questions:

1. What are the main factors threatening drinking water safety?
2. Which popular misconception contributes to the growth of water pollutants?
5. Which factors are determined after water is treated?
6. What is the main function of chlorination?
7. According to the example given in the text, is activated carbon a pre-chlorination practice or a post-chlorination one?
8. What may render distillation process inefficient?
9. What are the advantages and disadvantages of sediment filtration?
10. What is the function of a sorbent? Is it effective?



1. Match the terms with the definitions.

Disinfectant	the amount of a substance (e.g. chlorine) that remains in a water tank within a certain amount of time.
Sorbent	compounds evaporating at room temperature if in an open container
Adsorption	that only allows some substances to go through but not all of them
Semi-permeable	substance that removes germs and cleans

- Chlorinationby-products are often toxic.
- There is a popular misconception that tablets consumed by humans and then excreted in the urine have been thoroughly in our body.
- Sediment filtration entails the use of sand or filter paper that preventsparticles of the contaminants to go through.
- Reverse.....is a viable alternative for those who have alarmingly high levels ofinorganic contaminants in their drinking water.
- The combination of various water treatment methods including that of activated carbon filter provides the potential of greater
- Theaction of activated carbon comes to an end when the pores of thesurfaces clog with contaminants.
- Chlorination and activated carbon filters exhibit high efficiency.



Plurals

Besides the common plural suffixes –s, –es, –ies, there are those of words of Latin or Greek origin in English. They often end in –us, –a, –um, –on. The plural forms of these nouns can sometimes cause difficulty.

1. Some scientific terms have kept their original singular and plural forms:

e.g. bacillus, bacilli

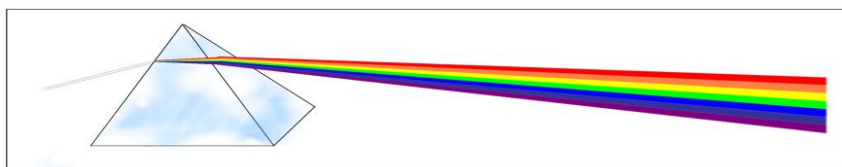
2. Many, especially those in general use, now only have a regular English plural form: e.g.

arena, arenas, circus, circuses, electron, electrons.

3. Some have alternative plural forms, which are both acceptable. The Latin form is more formal: e.g. focus, foci, formula, formulas/ formulae, spectrum, spectra.

4. There is uncertainty with some nouns as to whether they are singular or plural:

e.g. medium/ media, media. This data is correct. These data are correct.



the visible spectrum

A. Write the plural form of the following words.

Atom	Fungus	Stratum	Erratum
Alga	Locus	Surplus	Radius
Alumin(i)um	Latex	Vacuum	Vortex
Embryo	Nucleus	Virus	helix
Infinitesimal calculus	Quantum mechanics		

B. Fill each of the gaps with words listed in task A.

1. The protons and the neutrons form a compact, central body called the nucleus..... of an atom.
2. Blue paper turns red in the presence of an acid. These dyes are called indicators because they indicate whether a substance is an acid or a base.
3. Isaac Newton found that the prism separated a beam of light into a series of different colors, which we call the visible Stratum
4. The distance from the center of the nucleus to the outermost electron is the atomic The atomic decrease as the nuclear charges increase.
5. Deadly such as that of AIDS are affecting the very existence of countries.

Notes

Reference Note

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