



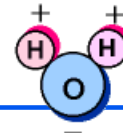
Drinking Water Treatment

Ref:

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Importance of Water



- *Looking at water, you might think that it's the most simple thing around.*
- *Pure water is colorless, odorless, and tasteless.*
- *But it's not at all simple and plain and it is vital for all life on Earth.*
- *Where there is water there is life, and where water is scarce, life has to struggle or just "throw in the towel."*

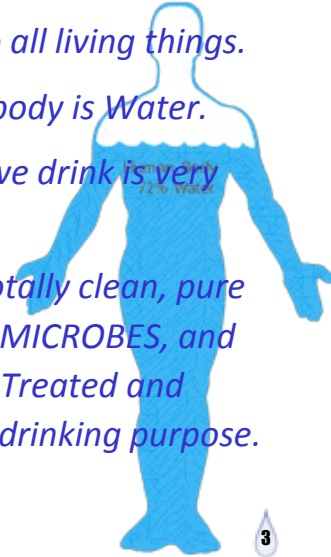
“Water is life”





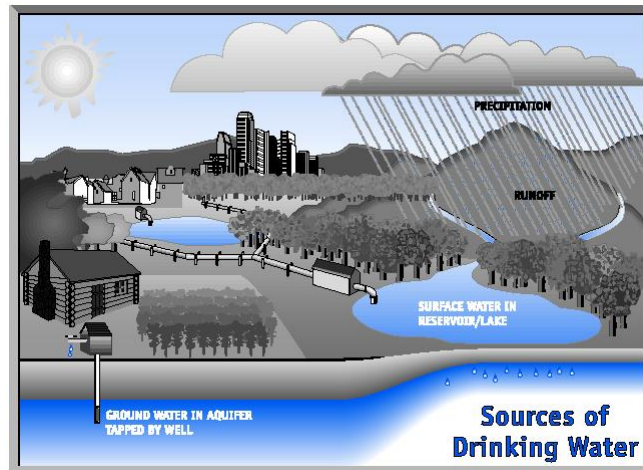
So What Is It About Water That Makes It So Important To Us?

- Water is of major importance to all living things.
- Up to 60 percent of the human body is Water.
- Therefore the quality of Water we drink is very important.
- The Drinking Water should be totally clean, pure and free of any disease-causing MICROBES, and that's why it should be properly Treated and DISINFECTED before using it for drinking purpose.



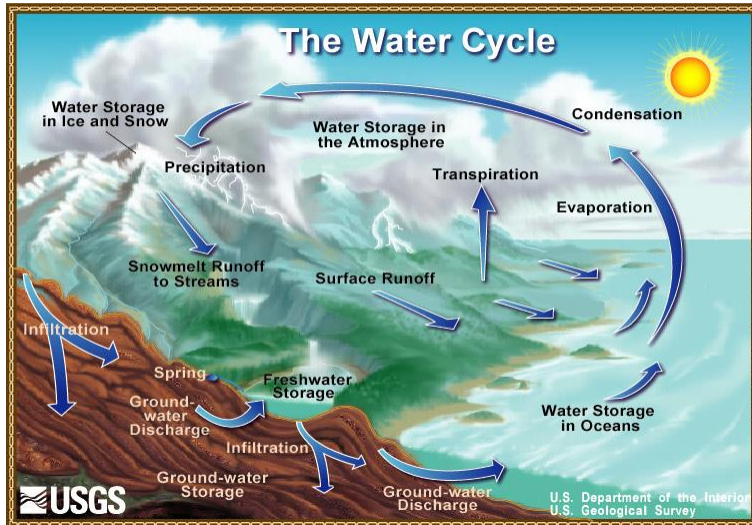
Where does the Water come from?

- **surface waters** (lakes, rivers, and reservoirs)
- **groundwater** (wells).





The Water Cycle



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Drinking Water

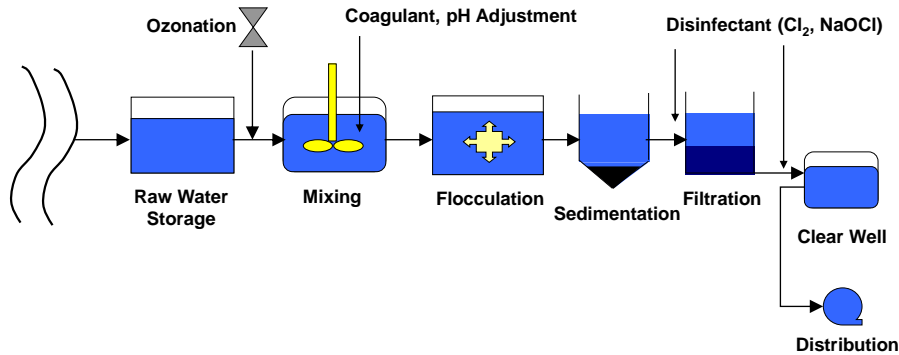


- *Jordan has scarce water supplies in the world.*
- *In recent years, microbial contamination of the water supply has led to highly publicized outbreaks of disease, causing illness and even death.*
 - *How safe is our water?*
 - *Where do these infectious microbes come from?*
 - *How is water treated now and what's being done to make it even safer?*

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Surface Water Treatment Plant



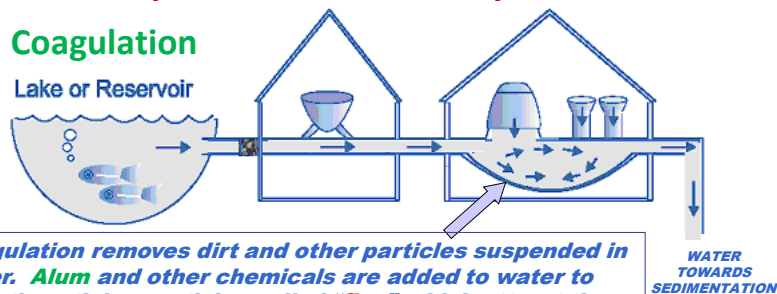
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Water Treatment

- Water treatment transforms raw surface and groundwater into safe drinking water.
- Water treatment involves two major processes: **physical removal of solids** and **chemical disinfection**.

- **Coagulation**



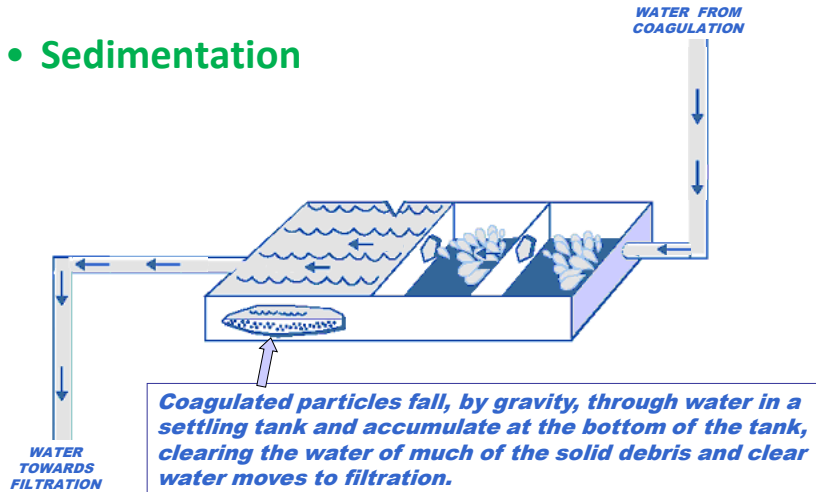
*Coagulation removes dirt and other particles suspended in water. **Alum** and other chemicals are added to water to form tiny sticky particles called "**floc**" which attract the dirt particles. The combined weight of the dirt and the **alums (floc)** becomes heavy enough to sink to the bottom during sedimentation.*

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Water Treatment

- Sedimentation

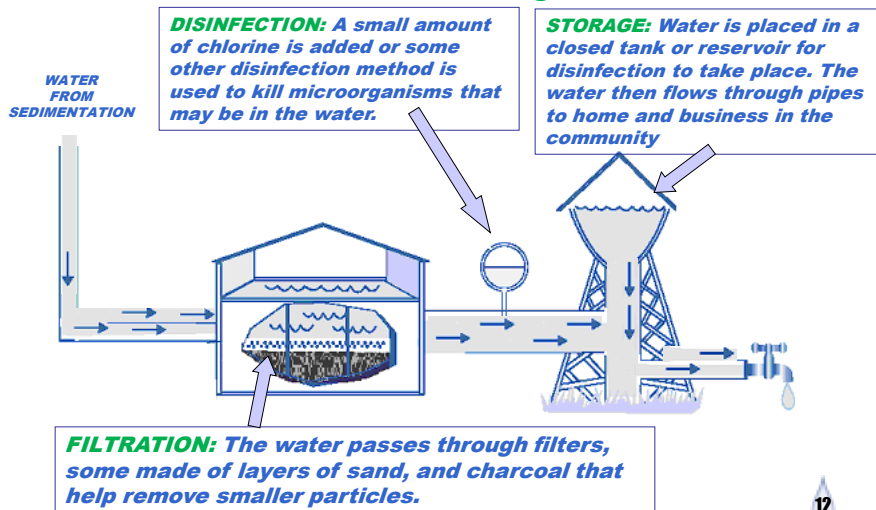


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Water Treatment

- Filtration, Disinfection & Storage



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Water Disinfection

◆ Purpose of Disinfection

- To make Drinking water free of any disease causing bacteria and microbes.

◆ Methods of Disinfection

- 3 mainly used disinfection methods at large scale:
 - **CHLORINATION**
 - **OZONATION**
 - **ULTRAVIOLET RADIATION**

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Water Disinfection Chlorination

- Chlorine is the most common cost-effective means of disinfecting water.
- The addition of a small amount of chlorine is highly effective against most bacteria, viruses, and protozoa.
- But cysts (durable seed-like stages) formed by parasitic protozoa such as **Cryptosporidium** and **Giardia** can survive chlorine.
- Chlorine is applied to water in one of three forms: **elemental chlorine** (chlorine gas), **hypochlorite solution** (bleach), or **dry calcium hypochlorite**. All three forms produce free chlorine in water

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Water Disinfection Ozonation

- OZONE is the strongest oxidant/disinfectant available.
- More effective against microbes than chlorination.
- But, costly and difficult to monitor and control under different condition.

◆ Ozonation Process

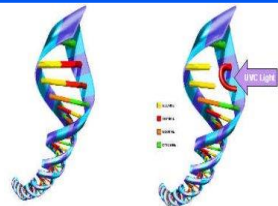
- Ozone (O_3) is generated on-site at water treatment facilities by passing dry oxygen or air through a system of high voltage electrodes.





Water Disinfection **Ultraviolet Radiation**

- When UV radiation penetrates the cell wall of an organism, it damages genetic material, and prevents the cell from reproducing.
- Now a days emerging technology made UV radiation to find a place in both household and large scale drinking water disinfection.

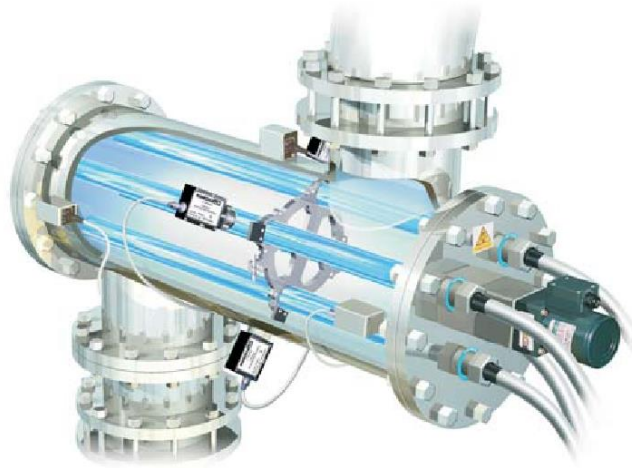


◆ **How is UV light generated?**

- Ultraviolet light is most typically generated from a low pressure or a medium pressure lamp generating UV light.



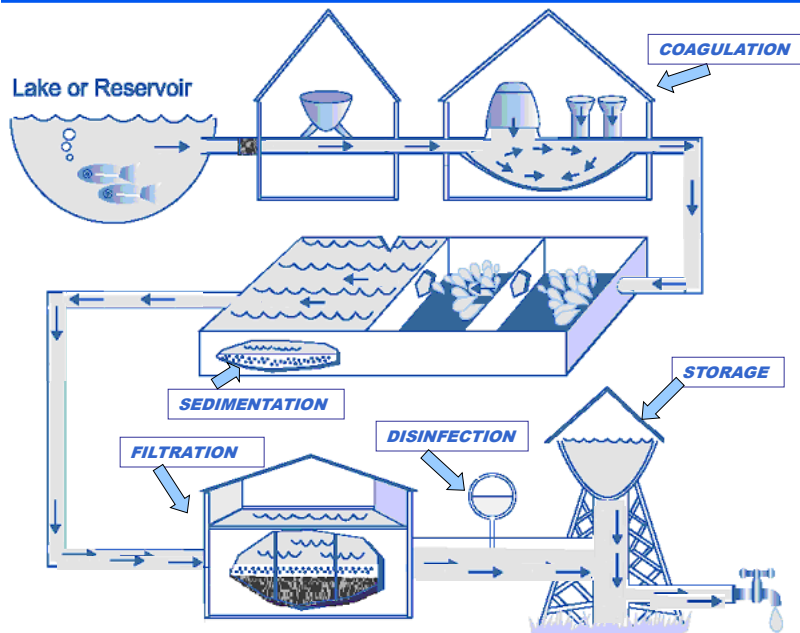
ULTRAVIOLET RADIATION



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COMPLETE CYCLE OF WATER TREATMENT



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