**SUBMITTED to mam Bakthawar Tufail**

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Resreach Methodolgy

**Question no.1**

**Part a**

**You want to carry out your bachelor’s research what are the first five steps?**

**ANS.**

For research you need to follow some steps

1. **Select the topic**

First you need to select the topic of research, find out the problem.

1. **Search articles about it**

Then you have to search all the latest articles, read the articles, find solution to the problem.

1. **Do experimental work**

Do experimental work if any.

1. **Collect the data**

Collect the data from your experimental work. Make a conclusion of your experimental work.

1. **Write all about the topic**

First you need to write a literature review. Then write the process and methodology of experiment you have conducted. At the end write the conclusion to the problem and references.

 **QUESTION 1. Part b**

**Write a literature review**

**Ans**

The topic that I have selected for literature review is

**Waste water treatment**

**LITERATURE REVIEW**

One of the biggest problem of today’s industrial world is to deal with the water pollution, created by different agents. Water should be treated to clean and purify to reuse. Many years ago water was cleaned by natural methods, no artificial or manmade treatment plants were involved, that method involved dumping of water, some of the waste water diluted by large volume of water, some of the organic components and sewage present were consumed by the bacteria present in water and converted into carbon dioxide and new cells of bacteria. For the treatment of wastes of water, here introduced two basic methods *primary treatment* and *secondary treatment. In* Primary treatment,as sewage enters the plant for treatment first it is allowed to pass through *screening* in order to remove the large floating solid wastes like rags, sticks, etc. Now its turn to pass through *grit chamber* where usually cinders, sand, and small stones etc can be removed. Now the sewage contain inorganic, organic components and suspended solid particles to be removed, for this purpose it is allowed to pass through a sedimentation chamber where tinny or small suspended particles used to sediment. Further removal of waste is not possible therefor It is usually directed to secondary treatment. During this treatment about 85% of organic components can be removed by producing numbers of bacteria. Now effluent is allowed to pass through trickling filter in order to remove organic compounds, after this it is lead to pass through sedimentation tank to remove excess bacteria (1). Other than primary and secondary or (biological) treatments scientist then found another treatment, which is called tertiary or chemical treatment, used to remove the inorganic particles. By precipitation, neutralization (in which PH is maintained by adding alkali or acid), adsorption, disinfection and ion exchange method all the remaining inorganic particles is possibly removed. Other than these methods, one of the advance method can also be used to purify the water that is, bioremediation in which by introducing microorganisms to convert hazardous substances into less or non-hazardous.it involves the following techniques, phytoremediation, bio augmentation, rhizofiltration and bio stimulation. The microorganisms involved are termed as bioremediators. It can be autotrophs or heterotrophs (that is unable to fix carbon and to use as source of food for its growth), heterotrophs are of two types on the basis of energy source, one use energy of sunlight termed as photo heterotroph, other which utilize energy of organic or in organic compounds, is known as chemo heterotroph. Similarly autotrophs have three types on the same basis, one is called photo autotroph which use sunlight as energy source, other is known as chemo autotroph due to utilization of organic source of energy third one is called lithoautotroph because of the ability to convert inorganic compounds into organic compounds which can be utilized as source of energy. Another advance method is aerobic treatment in which through aeration, trace organic compounds or dissolved gases can be removed from waste water. Anaerobic treatment is also used to remove biodegradable organic matter which is better technique than aerobic because it is difficult to fulfill the demand of elevated oxygen. Another, kind of unique process, is vermifiltration involve the potential use of the earth worm and microorganism, which is used to rundown the sewage sludge. Earth worms act as mechanical blenders, acts on organic matter change its chemical and physical composition, consequently surface area become increased for microbial activity and purification become possible (2). Today’s scientists are more focusing on the removal of phosphorus and nitrogen rather than pathogens, because these elements are responsible for the deterioration and eutrophication of our ecosystems of natural water. This article involved the biological phosphorus removal (3). In recent years enhanced biological phosphorus removal has been popular because of its cost effectiveness and environmental sustainable features (4).Beside this phosphorus precipitation is another technique of phosphorus removal from waste water. This method involves addition of salts like; trivalent metal salts, ferric chloride etc, which precipitates the phosphorus from waste water and the solid residuals are ready to remove under the gravity, by settling or by filtration. In recent years phosphorus precipitation is usually done by active media, it involves the phosphorus-sorption property containing material, which is able to remove phosphorus in targeted style (5). Industrial water contain more hazardous waste than other waste water; mainly *phenol containing water* that can be remove either by recycling (used to remove low concentrated phenol water) or by recovering (used to remove high concentrated phenol water). Recycling phenol comprises of methods of bio oxidation, chemical oxidation, or physiochemical oxidation. Recovering phenol involves methods of steam stripping, solvent extraction, adsorption and closed loop. *Mercury containing water* can be treated by sulfide precipitation, chemical coacervation, activated carbon adsorption, metal reduction, ion exchange and microbial methods. *Heavy metals containing* water can be purified, divided into the following categories; one involves the conversion of waste water containing metals, into soluble metals which can be removed by floating or by precipitation. Other involves the following methods such as reverse osmosis, electro dialysis, evaporation and ion exchange. *Cyanide containing waste water* purification involves the alkaline chlorination, electrolytic oxidation method, pressurized hydrolysis, bio chemical method, bio iron method and ferrous sulfate method (6). Electron beam treatment is the most advance and latest method for purification of waste water. ELT reduction of pollutants by e- and H is directed to apply on the following specific cases. 1When the pollutant itself is a good oxidizing agent, the redox potential of the pollutant is nearly equal to redox potential of oxygen, so pollutants can easily be removed. 2When pollutant in reduced form, is in gaseous state can be easily removed. 3When reduced form is sparingly soluble, pollutants are now able to convert into sparingly soluble state, to be removed. 4When redox process is not reversible, reduced form on oxidation gives product other than its oxidized product. ELT is useful in both to neutralize the residual chemical components of pollutants and to cause inactivation to the residual microorganism (7).

REFRENCES

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