**Acid rain**

**1.1 Acid Rain**

**1.1.1 Definition:**

Acid rain is a popular term refining to the deposition of wet and dry. Rain fall made so acidic by atmospheric pollution that it causes environmental harm; chiefly to forest and lakes. The main cause is the industrial burning of coal and other fossil fuels, the waste gases from which contain Sulphur and nitrogen oxides which combine with atmospheric water to form acids.**(1)**

Normal rain =5.7

PH of acid rain =below 5

The unpolluted rain PH value = 5.6 due to CO₂

H₂0 + CO₂ → H₂CO₃

**1.2 Types of Acid rain:**

* Wet deposition
* Dry deposition

**1.2.1 Wet deposition:**

Wet deposition refers to acidic rain, fog and snow. As this acidic water flows over and through the ground, it affects a variety of plants and animals.

**1.2.2 Dry deposition:**

Dry deposition refers to acidic gases and particles. About half of the acidity in the atmosphere falls back to the earth through dry deposition**.** **(2)**

**1.3 Formation of acid rain:**

Acidity is measure of concentration of H₂ ion in a solution (e.g. rain water) and to described in until of PH. The PH is measured on an logarithm scale where a change of one PH until is a 10 folds of decreased and increased of H₂ ion concentration **e.g.** rain fall with a PH of 4 has 100 micro equivalents per liter but a PH of 5 has only 10 micro equivalent per liter of H₂ ion PH of 3 has 1000 micro equivalent per liter of H₂ ion.

So the higher the PH value the lower the H₂ ion concentration. Acidity is important because H₂ ion can be highly reactive with the other chemicals and materials in environment. Atmospheric CO₂ dissolved in pure water produce carbonic acid with the PH of about 5.6. Naturally occurring carbonic acid can also produce some week acidity in an unpolluted environment. The natural acidity has a PH of log5.1 which is different value for rain water in region remotes for human activity and with very clean air. **(3)**

Acidity can also be effected by neutralizing agents such as ammonia gas and calcium carbonate dust. These would be reduced acidity and raise PH of soil such as rain water. Gases such as Sulphur dioxide and ammonium oxides emitted by human activity provide ingredient to week acidity. In their simplest form chemical reaction or formation of sulpheric acid in atmosphere are:

SO₂ + ½O₂ → SO₃

SO₃ interact with H2O to form aqueous H₂SO₄:

SO₃ + H₂O → H₂SO₄

In H₂0, H₂SO₄ dissociate to 2H+ ion and sulphate ion. The simple reaction which form nitric acid are:

2NO₂ + H₂O → HNO₃ + HNO₂

HNO₂ can also undergo chemical transformation to produce HNO₃. In H₂0 and HNO₃ dissociate to H˖ ion and nitric ion. Another reaction can be**: (4)**

3NO₂ + H₂O → 2HNO₃ + NO

**1.4 Emission of chemicals leading to acidification**

The most important gas which lead to acidification is sulfur dioxide. Emission of nitrogen oxides which are oxides to form nitric acid are of increasing importance due to strict controls on emission of sulfur compounds.

* Natural phenomena
* Human activity

**1.4.1 Natural phenomena**

The principle natural phenomena that contribute acid producing gases to the atmosphere are emission from volcanoes. Thus for example, fumaroles create extremely high amount of acid rain and fog, with acidity as high as PH of 2, clearing an area of any vegetation and frequently causing irritation to the eyes**.**

Nitric acid in rain water is an important source of fixed nitrogen for plant life, and is also produced by electrical activity in the atmosphere such as lightning. Acid deposition have been detected in glacial ice thousands of years of old in remote parts of the globe**.**

**1.4.2Human activity**

The Principe cause of acid rain is sulfur and nitrogen compounds from human sources, such as electricity generation, factories and motor vehicles. Electrical power generation using coal is among the greatest contributors to gaseous pollution responsible for acidic rain**.**

The gases can be carried hundreds of kilometers in the atmosphere before they are converted to acids and deposited. In the past, factories had short funnels to let out smoke but this caused many problems locally: thus, factories now have taller some funnel. However, dispersal from these taller stacks causes pollutants to be carried farther, causing widespread ecological damage**. (5)**

**1.5 Affected areas:**

* Acid rain is a problem in Canada. Water and soil systems lack natural alkalinity such as lime base cannot neutralize acid.
* Industrial acid rain is a substantial problem in china, Eastern Europe and Russia and areas down-wind from them.
* Acid rain from power plants in the Midwest United States has also harmed the forests of upstate New York and New England.
* This shows that the effects of acid rain can spread over a large area, far from the source of the pollution. **(6)**

**1.6 Causes**

Acid rain is caused by acids mixing with air. The largest sources of acid is Sulphur dioxides. Carbon dioxides and various oxides of nitrogen also make acid in the atmosphere. These chemicals are both natural and artificial

These are various natural causes, such as gases from volcanoes. However, it is thought that air pollution by people now causes most acid rain. People started producing more acidic gases when they started building factories and PowerStation. These buildings as well as houses and vehicles burn coal or oil that have sulfur in them. This releases gases into the air that produce acid rain. **(7)**

Tress are destroyed by acid rain .Fish are also killed by acid rain. Acid rain can also be caused naturally. For example: acids can be caused by nitrogen compound made by lightning and volcanic eruption a can released sulfur dioxides not the atmosphere**.**

**1.7 Conclusion:**

Acid rain is slowly destroying our planet. It is our responsibility to make sure that we protect the earth for future generation to enjoy.

Individual can also help to prevent acid rain by conserving energy. The less electricity people use in our homes, the small number of chemicals power plant will emit. **(8)**

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