

# Acid Rain



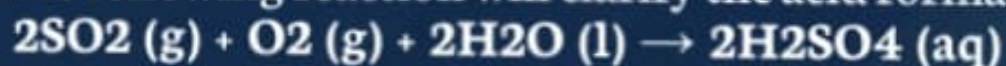
**Brought to you by:**

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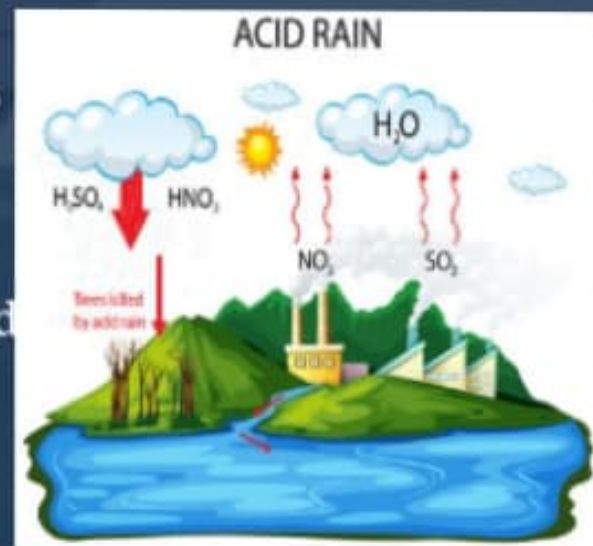
# WHAT IS ACID RAIN?

Acid rain, or acid deposition, is a broad term that includes any form of precipitation with acidic components, such as sulfuric or nitric acid that fall to the ground from the atmosphere in wet or dry forms. This can include rain, snow, fog, hail or even dust that is acidic.

The gases, sulphur dioxide and nitrogen dioxide undergo oxidation, and then they react with water resulting in the formation of sulphuric acid and nitric acid respectively. The following reaction will clarify the acid formation reaction:



According to the Royal Society of Chemistry, which considers him the “father of acid rain,” the word acid rain was invented in 1852 by Scottish chemist Robert Angus Smith.



## CAUSES OF ACID RAIN:

Acid rain results when sulphur dioxide ( $\text{SO}_2$ ) and nitrogen oxides ( $\text{NO}_x$ ) are emitted into the atmosphere and transported by wind and air currents. The  $\text{SO}_2$  and  $\text{NO}_x$  react with water, oxygen and other chemicals to form sulfuric and nitric acids. These then mix with water and other materials before falling to the ground.

While a small portion of the  $\text{SO}_2$  and  $\text{NO}_x$  that cause acid rain is from natural sources such as volcanoes, most of it comes from the burning of fossil fuels. The major sources of  $\text{SO}_2$  and  $\text{NO}_x$  in the atmosphere are :

- Burning of fossil fuels to generate electricity. Two thirds of  $\text{SO}_2$  and one fourth of  $\text{NO}_x$  in the atmosphere come from electric power generators.
- Vehicles and heavy equipments.
- Manufacturing, oil refineries and other industries.

Sulphur and Nitrogen particles which get mixed with water are found in two ways either man-made i.e as the emissions are given out from industries or by natural causes like how a lightning strike in the atmosphere releases nitrogen ions and sulphur is released from volcanic eruptions. Winds can blow  $\text{SO}_2$  and  $\text{NO}_x$  over long distances and across borders making acid rain a problem for everyone and not just those who live close to these sources.



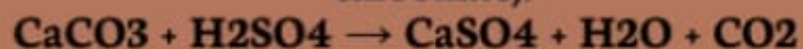
## EFFECTS OF ACID RAIN:

- Acid rain is very harmful to agriculture, plants, and animals. It washes away all nutrients which are required for the growth and survival of plants. Acid rain affects agriculture by the way how it alters the composition of the soil.
- It causes respiratory issues in animals and humans.
- When acid rain falls down and flows into the rivers and ponds it affects the aquatic ecosystem. As it alters the chemical composition of the water, to a form which is actually harmful to the aquatic ecosystem to survive and causes water pollution.
- Acid rain also causes the corrosion of water pipes. Which further results in leaching of heavy metals such as iron, lead and copper into drinking water.
- It damages the buildings and monuments made up of stones and metals.
- Acid rain leads to loss in soil fertility.
- It reacts with limestone and marbles of the historical monuments and corrodes their smooth surface.



# REAL-LIFE EXAMPLES AND PREVENTIONS OF ACID RAIN

- Taj Mahal, one of the 7 wonders of the world, is largely affected by acid rain. The city of Agra has many industries which emit the oxides of sulphur and nitrogen in the atmosphere. People continue to use low-quality coal and firewood as a domestic fuel, adding to this problem. Acid rain has the following reaction with the marble (calcium carbonate).



The formation of calcium sulphate results in the corrosion of this beautiful monument.

- Statue of Liberty which is made of copper has also been damaged by the cumulative action of acid rain & oxidation for over 30 years and is, therefore, becoming green.
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- The only precaution that we can take against acid rain is having a check at the emission of oxides of nitrogen and sulphur.
  - We have so far seen the details of acid rain and its harmful effect on animals, plants and the monuments.
  - Being responsible citizens, one should be aware of the harmful effects they cause and of the industries which give out nitrogen and sulphur compound wastes unethically.





Thank You!

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