Monday 8th Oct. 2018

# Chapter: 14
## "Environmental Chemistry I: ATMOSPHERE"

- **Review Exercise:**

Q2: Give short answers.

(i) List two main sources of acid rain.

Two main sources of acid rain are:

- **Natural Sources:**

Many natural processes such as forest fires and dust storms release smoke and dust particles into the air.

**Volcano Eruption:**

Volcanos emit clouds of dust and poisonous gases along with ash.

- **Human activities:**

Most of the air pollution is the result of burning fossil fuels, such as coal, petroleum and natural gas. Nearly half of the air pollution comes from cars and other motor vehicles.

Monday 8th oct. 2018

(ii) List four human activities which contribute to air pollution.

Four human activities which contribute to air pollution are:

(i) Burning of fossil fuels.
(ii) Incineration
(iii) Automobiles
(iv) Use of refrigerant in fridges and air-conditioning units.

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(iii) What is the importance of stratospheric ozone?

Importance of Stratospheric Ozone:

The presence of ozone is responsible for the rise in temperature in stratosphere. Ozone saves us from harmful effects of incoming ultraviolet radiations from the Sun. The ozone layer protects the living things on the Earth from dangerous ultraviolet radiation from the Sun.

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(iv) What is the role of automobile in air pollution?

Lead particles ~~ith~~ in the air come mainly due to the combustion

of leaded petrol or fuel used in motor vehicles.

(v) Define atmosphere.

**Atmosphere:**

Atmosphere is defined as:

> "The envelope of gases and water vapour surrounding the planet earth is called atmosphere."

Q3: Explain temperature variation in stratosphere and troposphere.

In troposphere the temperature varies from +17°C to -55°C and in stratosphere the temperature varies from -5°C to -55°C due to the presence of ozone. When ozone absorbs energy from the Sun, the energy is converted into heat, warming the air.

Q4: List the components of stratosphere and troposphere.

Monday 8th oct. 20

- **The Troposphere:**

Troposphere contains most of the mass (75-80%) of the atmosphere. It is the layer of atmosphere in which we live. Nearly all the dust particles and water vapour are in the troposphere. Weather occurs in this layer. Most of clouds are formed in the troposphere.

- **The Stratosphere:**

This layer contains little water vapour. It contains maximum amount of ozone. The presence of ozone is responsible for the rise in temperatur in stratosphere.

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**Q10: Explain formation of ozone.**

Atomic oxygen is very reactive. Atomic oxygen reacts readily with an oxygen molecule to form ozone, there by releasing heat.

$$O_{2(g)} + O_{(g)} \longrightarrow O_{3(g)} + heat$$

These reactions maintain level of ozone in the stratosphere. Both the destruction and the reformation of ozone are powered by UV radiation.

Wednesday 10th. oct.

# Chapter: 14
## "Environmental Chemistry I: Atmosphere"

- **Review Exercise:**

**Q11: Why is global warming often referred to as the greenhouse effect?**

- **Global Warming:**

The increasing use of fossil fuels and the deforestation have led to an increase in the levels of $CO_2$ in the air. Gases like water vapour, methane and CFCs also act in a similar way in the atmosphere. These gases are called **greenhouse gases**. Molecules of these gases absorb much of the infrared radiation given out by the surface of the earth. This increases their kinetic energy. So the atmosphere becomes hotter. The higher the concentration of greenhouse gases in the air, the greater is the green house effect, the greater will be the increase in temperature. The green-house effect is a natural phenomenon

of the energy distribution mechanism of the earth.

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Q12: There is a scientific evidence that CFCs contribute to the depletion of ozone. Why?

Chloroflourocarbons (from aerosol cans, air conditioning systems, refrigerators etc) escape into the atmosphere. CFCs are gases or low boiling liquids. They are so inert that they donot react with any other chemicals in the troposphere. They slowly diffuse into the ozone layer. UV radiation break CFCs molecule producing chlorine free radicals.

$$CCl_3F_{(g)} \xrightarrow{UV} \dot{C}Cl_2F + Cl^{\cdot}$$

Chlorine free radical reacts with ozone to form chlorine monoxide (ClO) and molecular oxygen. ClO reacts with oxygen produced by the decomposition of ozone by UV radiations.

$$^{\cdot}Cl + O_3 \longrightarrow \dot{ClO} + O_2$$
$$\dot{ClO} + O \rightarrow Cl + O_2$$

Net reaction: $O_3 + O \rightarrow 2O_2$.

The chlorine free radical that reacts in step 1 is regenerated

wednesday 10.oct.12

in step 2. One Cl can, ~~destroy~~ therefore, destroy thousands of ozone molecules.

Q13: Sulphur dioxide is a common pollutant from burning coal. State two effects caused by this pollutant.

Sulphur dioxide is colourless gas with unpleasant and irritating odour which causes:

(i) coughs, headache and lung diseases
(ii) acid rain and green house effect (global warming).

## Think-Tank:

Q14: Dibenzothiophene ($C_{12}H_8S$) is a common sulphur containing compound of coal. It is responsible for acid rain. Elaborate this statement.

On burning it releases sulphur dioxide. In the air sulphur dioxide is converted into sulphur trioxide, which is responsible for acid rain.

$$2SO_2 + O_2 \longrightarrow 2SO_3$$

It reacts with water to form

wednesday 10.oct.18

sulphuric acid

$$SO_3 + H_2O \longrightarrow H_2SO_4$$

which is responsible for acid rain.

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Q18: Examine the option there are some ways to reduce pollution caused by cars?

A catalytic converter transforms CO into $CO_2$, NO into $N_2$ and $O_2$, and unburned hydrocarbons to $CO_2$ and $H_2O$. Metals like platinum, palladium and rhodium are used as catalyst in the convertey.

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