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# UNIT 4 SOIL, NOISE AND RADIOACTIVE POLLUTION

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## 4.0 OBJECTIVES

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After studying this unit, you should be able to:

- define soil pollution and soil pollutant;
- list the sources of soil pollution;
- describe the effects of soil pollution;
- define noise and noise pollution;
- list the sources of noise pollution;
- describe the effects of noise pollution;
- describe the prevention and control measures of noise pollution;
- define radioactive substances, radioactivity, radioactive pollution and radiation;
- list the sources of radioactive pollution;
- describe the effects of radiation;

- describe the prevention and control of radioactive pollution; and
- identify the role of ANM in prevention and control of soil pollution, noise pollution, radioactive pollution.

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## 4.1 INTRODUCTION

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In Unit 3, you have studied about air and water pollution. You have seen that how air and water pollution effects plant and animal life. Similarly, soil pollution can destroy the soil and reduce productive capacity of soil. Noise pollution can cause hearing loss and other problems such as behavioural problems, cardiovascular problems and irritability etc. Similarly radioactive pollution can lead to various diseases in human beings and can pollute food, water and soil. In this unit, we will discuss about soil pollution, noise pollution and radioactive pollution. We shall focus on definition, sources, effects, prevention and control of soil, noise and radioactive pollution. This knowledge will help you to educate the community regarding prevention and control of soil, noise and radioactive pollution.

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## 4.2 SOIL POLLUTION

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Land is the most important resource for animals and plants on the earth planet. Human beings use land for making houses, agriculture, forests, urbanization, industrialization, mining, buildings, highways, rail, roads, etc. Misuse of land causes soil pollution leading to destruction of soil, soil erosion, creates dust, dirt and deteriorates environment. Let us learn the definition, sources and effects of soil pollution and prevention and control of soil pollution as given below:

### 4.2.1 Definitions

- i) **Soil Pollution:** It refers to the presence of unwanted substances both chemicals and organic matters, which destroy the soil, reduce productive capacity and deteriorate the environment. Soil pollution is different from air and water pollution. Soil pollution is localized while air and water pollution are widespread.
- ii) **Soil Pollutants:** Soil pollutants are the substances which get added in the soil and destroy the soil, cause soil erosion and deteriorate the environment. The major soil pollutants include the pollutants washed out of the atmosphere e.g. acid rain, pesticides and biocides, fertilizers, household refuse, garbage, trash, ashes, building materials and rubbish, empty bottles, cans, plastic bags, plastic papers etc.

### 4.2.2 Sources of Soil Pollution

The various sources of soil pollution are as under:

- a) **Waste matter from living organisms:** It is already discussed in Unit 3, Sub-section 3.3.3 (i) and reproduced here. These include sewage, excreta and kitchen waste from households; solid waste from stable and butcher houses; dry and wet refuse from streets and roads etc. The solid waste is usually disposed off by burying in the land fills. The problem arises when the burial of the waste matter is not done properly and the waste matter gets into the soil and contaminates it. The sewage may be directly thrown on to the land, to be disposed off in some places and contaminates the soil. The effluent which is the byproduct of sewage disposal may also be thrown on the surface of the earth and contaminate soil. All these conditions serve breeding ground for flies, mosquitoes, rats and microorganisms which can cause various diseases.

- b) **Waste matter from industries:** There are variety of industries which produce variety of toxic substances as mentioned in the previous unit [Sub-section 3.3.3 (ii)]. Often these are discharged directly in the streams, rivers etc. or through drainage system. But in some places, it is thrown on the surrounding land or at some distances, which pollutes the soil.
- c) **Waste matter from agriculture:** Agriculture practice largely pollute the soil. The waste matters which pollute the soil include fertilizers, pesticides and biocides. These get washed away into water.
- d) **Increasing population and growth of cities:** Due to increasing population and growth of cities and towns, large quantities of sewage and soil waste are produced. Usually facilities for their safe disposal are inadequate which result in delayed removal and inadequate disposal of waste matter. Thus there are more chances for the soil to get polluted.
- e) **Socio-cultural practices:** Open field defecation is culturally accepted and practiced in rural areas. This pollutes and contaminates the soil with some micro-organisms and worms which get transmitted to man and cause some specific diseases.

### 4.2.3 Effects of Soil Pollution

Soil pollution contaminates the soil and water with micro-organisms that can cause gastro-intestinal diseases especially by eating vegetables which are eaten raw and by drinking contaminated water. These include diarrhoeal diseases, typhoid, dysentery, poliomyelitis, hepatitis, worm infestation especially hook worm.

Clostridium Tetani are usually present in the soil, which get transmitted to human beings through the deep skin injuries and may cause tetanus, a fatal disease. These organisms may also enter the new born through the umbilicus stum or through the vagina to the uterus by using dirty hands and instruments.

In addition to harmful effects on human beings, soil pollution can help in pollution of water and air and can cause various harmful effects to plants, animals as discussed in previous unit. You are expected to revise and learn these.

Soil pollution with household waste, waste matters from stables and butcher house etc. can deteriorate environment and cause sanitation problem resulting in health problems due to breeding of flies, rats, mosquitoes etc. e.g. gastro-intestinal problems, plague etc.

Soil polluted with various toxic chemical substances is very harmful for plants and vegetations.

### 4.2.4 Prevention and Control of Soil Pollution

It is very important to preserve and maintain the quality of soil to prevent harmful effects on man, animals and plants. Some of the measures which need to be followed are as under:

- i) Safe disposal of excreta and sewage both in rural and urban areas. Revise it from Unit 3, Sub-section 3.3.6(i).
- ii) Use of garbage (animal and plant waste) for producing manure, biogas etc. especially in rural areas.

- iii) Avoid using of material which cannot be reused or recycled.
- iv) Controlled use of artificial fertilizers and pesticides.
- v) Improvement of slums
- vi) Recycling of wastes and used metals like iron, copper, aluminium etc. can be melted and used to make useful products.
- vii) Waste paper, glass, rubber and plastics can also be recycled.

**Check Your Progress 1**

i) Define soil pollution.

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ii) List the major soil pollutants.

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iii) List the sources of soil pollution.

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iv) State the effects of soil pollution.

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v) What measures should be taken to prevent and control soil pollution?

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### **4.3 NOISE POLLUTION**

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Noise is another pollutant present in our environment. It is a threat to our health and the health of all other living things. It is a serious problem in all big cities. Before we deal with various aspects of noise pollution let us clarify with the meaning and nature of sound and mechanism of hearing in brief.

Sound is a form of energy that causes the sensation of hearing. Sound is the basis of speech and is our main mode of communication.

Sound travels through the air or any other substance in the form of longitudinal waves. These waves are produced by the vibrations of sound producing source. These sound waves reach our ear and cause the eardrums to vibrate. These vibrations then pass through the middle ear to inner ear. From here nerve messages travel to the brain and we hear the sound (see Fig. 4.1).

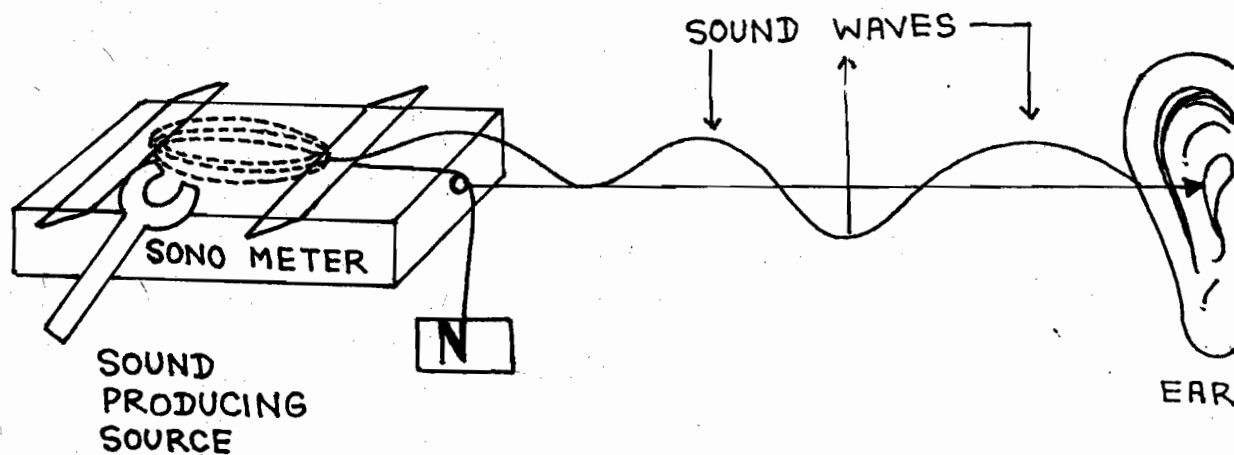


Fig. 4.1: Mechanism of sound production

There are three conditions necessary for hearing of sound. There should be a vibrating sound producing body, a medium for the sound waves to travel and an ear to detect the sound. Intensities of sounds are measured in decibels. The sound can be soft, pleasant and musical or harsh, loud, and unpleasant noise. Let us now discuss the various aspects of noise.

#### 4.3.1 Definitions

- i) Noise is unpleasant and unwanted sound. It is produced by irregular and non periodic vibrations of sound producing sources. Noise produces irritating and unpleasant sensation on the ears.
- ii) Noise pollution refers to the pollution of environment with high intensity of sound which causes effects on human beings, animals and plants. Noise intensity up to 80 decibels is safe for human beings. A noise of 90 decibels can produce temporary hearing loss but a noise of 160 decibels sound can cause total deafness. The sound from the jet aircraft during take off at close range can cause total deafness by rupture of the eardrum.

#### 4.3.2 Sources of Noise Pollution

There are various sources of noise pollution which differ at various places. These are as under:

- i) **Domestic noise producing sources:** These include radio, television, tape recorder, loudspeakers, coolers, mixers, grinders, airconditioners, grass cutters, generators, tullu pump etc. which are used in the homes and neighbourhood etc.
- ii) **Road side noise producing sources:** These include various types of automobiles such as scooters, cars, buses, trucks. Their engines and horns produce high intensity sounds which are harmful to us.
- iii) **Noise producing sources at construction site:** These include thundering and roaring sounds produced by bulldozers, concrete mixers, hammer strikes and crushing sounds from crushers. All these produce noise pollution and are very risky to workers and people living in and around.
- iv) **Sources of noise in the factories:** These include various types of machines e.g. drill machines, milling machines etc. and are very risky to workers.
- v) **Other sources:** Air planes, trains, rock music, crackers and fireworks, loudspeakers used in various cultural and religious events.

### 4.3.3 Effects of Noise Pollution

Noise pollution can cause several harmful effects to human beings. These are as under:

- i) The noise can cause temporary and permanent hearing loss. It depends upon the intensity of sound and duration of exposure to the sound. Usually a noise of 90 decibels can produce temporary hearing loss. If the ears do not get a chance to recover, the impairment can become permanent. A sound of 160 decibels such as sound from the jet aircraft and noise from factories can cause total deafness either by rupture of eardrum or damage of the inner ear. It can cause pain in the middle ear, loss of equilibrium and nausea.
- ii) The noise can cause harmful effects on psychosocial behaviour of human beings. It causes annoyance, irritability, tension, nervousness and anxiety. It causes fatigue, insomnia and inefficiency at work and impairs concentration.
- iii) The noise affects the cardio-vascular system. It increases heart rate, causes high blood pressure, and decreases peripheral circulation.
- iv) The noise pollution can also affect digestive system and can produce peptic ulcer.

### 4.3.4 Prevention and Control of Noise Pollution

There are various ways of prevention and control of noise pollution. Some of these are listed as under:

- i) Reducing of noise at source: Use of silencers and mufflers in the vehicles, use of insulating material at places where noise is produced e.g. planting of trees and hedges along the roads and streets, reducing the volume of musical devices such as radios, televisions, record player etc. and loudspeaker.
- ii) Use of ear shield and other barriers in the industrial set up, airplanes etc.
- iii) Limiting noise producing activities during specified hours of the day and night e.g. air flights, construction work etc.
- iv) Installation of industries away from residential area.
- v) Ban on pressure horn and use of loudspeaker in residential areas.
- vi) Limited exposure of workers to high intensity sound in the industries.
- vii) Proper maintenance of motors and machines.
- viii) Education of people regarding sound pollution.

#### Check Your Progress 2

- i) Define noise and noise pollution.

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ii) List the sources of noise pollution in:

a) Domestic areas

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b) Factories

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iii) List the effects of noise pollution on human beings.

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iv) List the measures of prevention and control of noise pollution.

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## 4.4 RADIOACTIVE POLLUTION

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The atmospheric pollution with radioactive substances is the result of advance technology and modernization of man's activities. Our food and drinking water is also getting contaminated with radioactive substances. The radioactive substances are very risky to all living beings. Let us understand about it. It will be helpful to you in taking some precautionary measure and creating awareness among the community people.

### 4.4.1 Definitions

- i) **Radioactive substances:** The substances (elements) which emit invisible electromagnetic waves (radiation) are called as radioactive substances e.g. radium, uranium etc.
- ii) **Radioactivity:** The emission of invisible radiations from radioactive substances is known as radioactivity.
- iii) **Radioactive pollution:** The presence of invisible electromagnetic waves i.e. radiation produced from radioactive substances in the atmosphere, food, water etc. which are harmful refers to radioactive pollution.

### 4.4.2 Types of Radiations Emitted and their Measures

There are three different types of radiations which are emitted by radioactive substances. These include Alpha, Beta and Gamma rays (Fig. 4.2).

Out of these three radiations Gamma rays are very dangerous because of their high penetrating power.

The measurement unit of radiation is "Roentgen" which is named after a great scientist William Roentgen who discovered x-rays. The safest limit of radiation to human beings is 0.25 Roentgen per week. A dose more than 0.25 Roentgen can be dangerous if taken regularly and can cause many diseases.

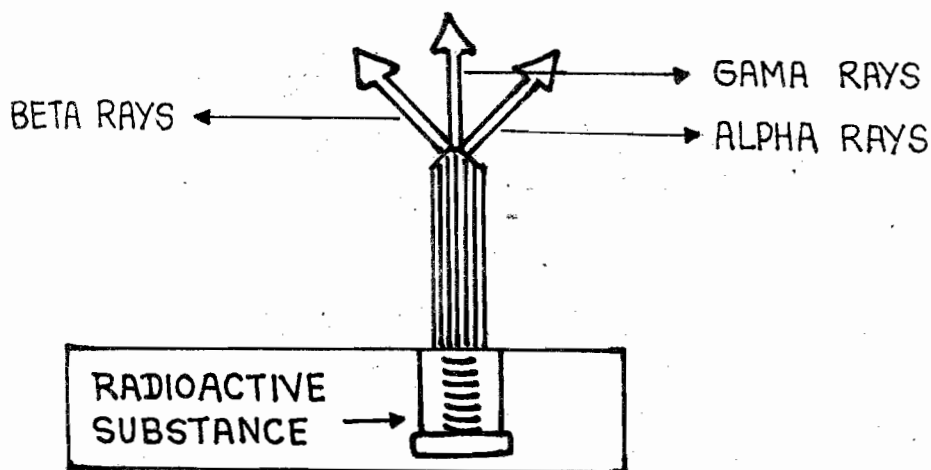


Fig. 4.2: Radioactive rays: Alpha, Beta and Gamma Rays

#### 4.4.3 Sources of Radioactive Pollution

There are two major sources of radioactive pollution. These are natural and artificial (manmade) resources.

- i) **Natural resources:** The natural resources of radioactive pollution include soil, rocks, sun and stars. The radioactive gases are released from soil, rocks e.g. coal contains radioactive material which is released into air when coal is burned. Water can also get contaminated when it passes through the soil and rocks.

Cosmic radiation from the sun and stars produces radioactive radiation in the atmosphere.

- ii) **Artificial (manmade) resources:** The artificial resources of radioactive pollution include nuclear power plants, testing of atom bombs, nuclear weapons etc., use of radioactive substances in industries, medicine, agriculture, ships, satellites, rockets etc. and mining and refining resources. All these resources produce various radioactive gases which pollute atmosphere and radioactive waste which may contaminate water and soil if not disposed off properly. Radioactive waste from nuclear plants can stay dangerous for millions of years.

Radioactive pollution can also take place by electronic devices such as colour T.V., computers, radium watches, mobile phones etc.

#### 4.4.4 Effects of Radioactive Pollution

Though radioactive substances have been responsible for advancement in medical, informatics, agriculture, industries, space technologies, but has many harmful effects on human health. Chronic exposure to low level of radiation can cause various problems. In early stages it can cause depigmentation of skin and loss of hair. In the long run it can cause diseases like blood cancer, cancer of various parts of the body like thyroid, lungs, bones etc. and genetic changes in future generation. Thus it reduces life expectancy of people.

Because of radioactive pollution of atmosphere, food, water, soil etc. there are increasing incidence of these diseases.

Acute exposure to radiation causes radiation sickness, which is characterised by vomiting, sore throat, diarrhoea, bleeding under the skin and other organs etc.



One of the example of devastating effects of radiation in the 20th century was use of nuclear bomb on Hiroshima and Nagasaki (cities in Japan) in 1945. Thousands (15-20%) of people died of radiation, 20-30% died of fire of the explosion. Even after years people kept suffering from cancer of lungs, breast, thyroid, bones, cataract etc. Babies born in that period also had many genetic problems.

#### 4.4.5 Prevention and Control of Radioactive Pollution

The following measures are implemented for prevention and control of radioactive pollution:

- i) Proper disposal of radioactive waste from industries, nuclear plants, hospitals, laboratories etc. The methods used are releasing the radioactive gases high up in the air where these get diluted and dispersed; storing the waste until its radioactivity is reduced; and chemical treatment before disposal.
- ii) Efforts to stop nuclear bomb explosion.
- iii) Use of radiation therapy within safe limits and when absolutely essential.
- iv) Underground testing of nuclear bombs and weapons.
- v) Application of protective measures while carrying diagnostic or therapeutic procedures.
- vi) Controlled exposure of workers in the industries, labs and nuclear units of hospitals.
- vii) Monitoring of level of concentration in the industries, labs and nuclear units of hospitals.
- viii) Creating awareness among people regarding radioactive radiation and use of such electronic devices at home.

#### Check Your Progress 3

- i) Define radioactivity, radioactive pollution and radiation.  
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- ii) List the types of radiation from radioactive substances.  
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- iii) List the manmade resources of radioactive pollution.  
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- iv) List the effects of chronic exposure to radiation.

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## **4.5 ANM'S ROLE IN PREVENTION AND CONTROL OF SOIL, NOISE AND RADIOACTIVE POLLUTION**

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As explained in Section 4.3 ANMs are directly in contact with people in the community and get opportunities to communicate with them and be able to give information on various aspects including prevention and control of soil, noise and radioactive pollution.

### **4.5.1 ANM's Role in Prevention and Control of Soil Pollution**

ANM's can take following actions in prevention and control of soil pollution. They can:

- i) Help families and community people to identify the soil pollutants at the neighbourhood and community level e.g. household refuse, garbage, trash, ashes, building materials and rubbish etc.; solid and wet wastes from cowsheds, stables etc.; dry and wet refuse from streets and roads.
- ii) Create awareness about the mechanism of soil pollution and how it can be prevented and controlled by proper collection, removal and disposal of waste matter of their houses, neighbourhood and community.
- iii) Also create awareness regarding the effects of improper and inadequate collection, removal and disposal of waste from their community.
- iv) Educate people on maintenance of environmental sanitation.
- v) Help families relate increasing community's population with sanitation problem and educate them regarding small family norms.

### **4.5.2 ANM's Role in Prevention and Control of Noise Pollution**

The following actions can be taken by ANM's. They can:

- i) Help families and community people to identify sources of noise pollution in their families and communities e.g. loud noise from radio, television, grudgers, grass cutters, generators, rollers, water pumps etc.
- ii) Create awareness among people regarding the harmful effects of noise on health.
- iii) Educate people regarding prevention and control of noise pollution at their household and community level as discussed under Sub-section 4.3.3.

### **4.5.3 ANM's Role in Prevention and Control of Radioactive Pollution**

ANMs can take the following actions for prevention and control of radioactive pollution. They can:

- i) Help family and community people to identify sources of radioactive pollution in their homes and community e.g. use of colour T.V., Computers, radium watches, mobile phones etc.

- ii) Create awareness among people regarding harmful effects of radioactive pollution on health.
- iii) Educate people regarding the controlled use of such electronic devices in homes.

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## 4.6 LET US SUM UP

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In this unit you have learnt about soil, noise and radioactive pollutions of our environment.

Soil pollution is due to the addition of unwanted chemical and organic substances, which destroy the soil, cause soil erosion and deteriorate the environment. The soil pollutants include pesticides, biocides, fertilizers, acid rains, household refuses, garbage etc. The sources of such pollutants are living organisms and their activities, industries, agricultural activities and increasing population. Soil pollution can cause various types of gastrointestinal diseases, tetanus to human beings and harmful effects to other animals and plants. It also destroys environment in general. Soil pollution can be controlled by safe disposal of waste matter, recycling of materials used, and improvement of sanitation.

Noise pollution is pollution of environment by unpleasant and unwanted sounds causing harmful effects to living and non-living things. The noise producing sources can be at homes, roadside, construction sites, factories and other sources. A noise above 90 decibels can cause harmful effects. It can cause hearing loss, behavioural problems, cardiovascular problems and digestive problems. Noise pollution can be prevented and controlled by reducing noise at its source e.g. use of silencers in motor vehicles by plugging the ears, limiting noise-producing activities, monitoring of noise levels in industries, use of mechanical devices by workers and their controlled exposure to noise etc.

Radioactive pollution is pollution of atmosphere, food, water, soil etc. with invisible electromagnetic waves produced from radioactive substances such as radium, uranium etc. There are three types of rays, which are emitted from these substances such as alpha, beta, and gamma rays. A regular dose of more than 0.25 roentgens can cause harmful effects on human beings and other animals. The sources of radioactive pollution include both natural and man-made sources. Radioactive sources are present at homes also and these include all sorts of electronic devices. Radiation can cause many harmful effects depending upon duration and the amount of radiation. These include changes in the skin, hair loss, cataract, blood cancer and cancer of various parts of body, genetic disorders in future generation etc. Radioactive pollution can be controlled by proper disposal of radioactive wastes, stopping of nuclear bombs and weapons, safe use of diagnostic and therapeutic procedures, limited exposure etc.

ANM's can contribute a lot in prevention and control of soil, noise and radioactive pollution at the household and community level. They can help community people to identify these pollutants, create awareness among people regarding their harmful effects and educate them how they can protect themselves from these pollutions.

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## 4.7 GLOSSARY

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**Cosmic Radiation** : High energy radiations originating in outer space.

**Insulating Material** : The material which can absorb sound.

- Radiation** : It refers to emissions of energy as electromagnetic waves from radioactive substances like radium and uranium etc.
- Soil erosion** : It refers to removal of upper fertile layer of soil by defective agricultural practices, overgrazing, deforestation etc.
- Sludges** : Thick greasy mud, sewage, muddy or slushy sediment or deposit.
- Trash** : Waste or worthless stuff, rubbish.
- Urbanization** : Rendering the living area into city or town (urban) by removing rural quality of district.

## 4.8 MODEL ANSWERS

### Check Your Progress 1

- i) It is defined as the presence of unwanted substances both chemical and organic matter, which destroy the soil, reduce productive capacity of the soil and deteriorate the environment.
- ii) Pesticides and biocides, fertilizers, household refuse, garbage, trash, ashes, building material, rubbish, empty bottles, cans, plastic wares etc.
- iii) ● Waste matter from living organisms.  
● Waste matter from industries.  
● Waste matter from agriculture.  
● Increasing population and growth of cities.  
● Socio-cultural practices.
- iv) ● Gastrointestinal infections, Diarrhoeal diseases, typhoid, dysentery, poliomyelitis, hepatitis A, worm infestation especially hookworm.  
● Tetanus  
● Pollution of water causing harmful effects to plants and animals.  
● Deterioration of environment.  
● Breeding of flies, rats and mosquitoes resulting in gastrointestinal problems, plague, malaria etc.
- v) ● Safe disposal of solid and water waste.  
● Use of garbage for preparing manure and biogas etc.  
● Avoid use of material, which cannot be recycled.  
● Recycling of waste matter and metals.  
● Controlled use of artificial fertilizers and pesticides.  
● Improvement of slums

### Check Your Progress 2

- i) Noise is unpleasant and unwanted sound produced by irregular and non-periodic vibration of sound producing sources.  
Noise pollution refers to the pollution of environment with high intensity of sound and which causes harmful effect on human beings, animals and plants.

- ii) a) Sources of noise pollution in domestic areas:
  - Radio, television, loudspeaker, coolers, mixers, grinders, air conditioners, grass cutters, generators etc.
- b) Sources at factories: Various types of machines e.g. drill machines, milling machines etc.
- iii) ● Temporary and permanent hearing loss
  - Effects on psychological behaviour
  - Effects on digestive system
  - Effect on cardio-vascular system
- iv) ● Reducing of noise at source.
  - Use of shield and other barriers in the ear
  - Limiting noise producing activities
  - Installation of industries away from residential areas
  - Ban on-pressure horn and loudspeaker
  - Limited exposure of workers to high intensity sound
  - Proper maintenance of motor and machines
  - Education of people regarding noise pollution

### Check Your Progress 3

- i) ● Radioactivity: The emission of invisible radiations from radioactive substances is known as radioactivity.
  - Radioactive pollution: It refers to presence of invisible electromagnetic waves i.e. radioactive, which are produced from radioactive substances in the atmosphere, food, water, soil etc. which cause harmful effects.
  - Radiation: It refers to emission of energy as electromagnetic waves from radioactive substances like radium, uranium etc.
- ii) Alpha rays, Beta rays and Gamma rays.
- iii) Nuclear power plants, testing of atom bombs and nuclear weapons, use of radioactive substances in industries, medicine, agriculture, satellite etc., electronic devices at home.
- iv) ● At early stage: Skin pigmentation and hair loss
  - In the long run: Blood cancer, cancer of various parts of the body, genetic changes in future generation and birth defects.
  - Reduction in life span.

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## 4.9 FURTHER READINGS

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Garg, Rajeev, *Environment Quiz Book*, Pustak Mahal, New Delhi-1992.

Kumar, H.D., *Modern Concepts of Ecology*, Vikas Publishing House, New Delhi.