Ratna Sagar

RATNA SAGAR | PRIMUS | BYWORD | E-LIVE

Education, Our Mission

As per the latest ICSE syllabus

Rama Sagar
Education, Our Mission!

Revised and Updated

LIVING SCIENCE BIOLOGY

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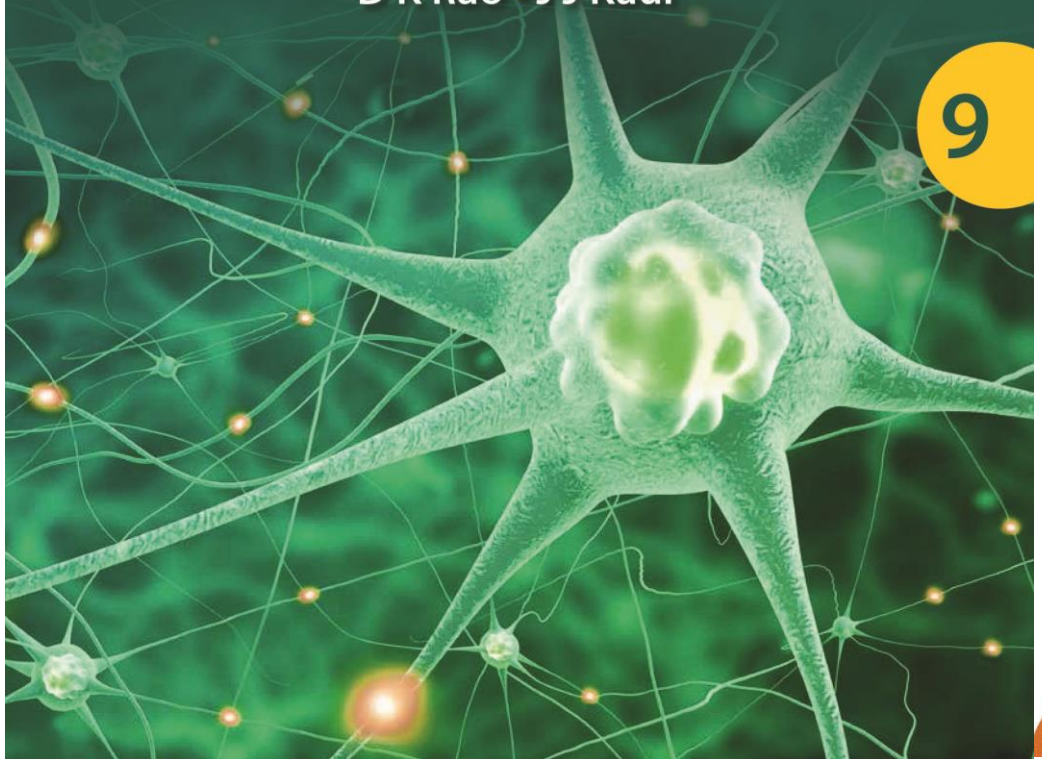

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ICSE
Living Science
Biology

Class 9

Chapter 19 Waste Generation and Management

LEARNING OBJECTIVES

Categories of Waste

- Domestic waste
- Industrial waste
- Agricultural waste
- Commercial waste
- Municipal waste
- E-waste

Segregation of domestic waste

- Biodegradable waste materials
- Non-biodegradable waste materials

Recycling of biodegradable waste

- Advantages of recycling

Methods of safe disposal of waste

- Segregation, Dumping
- Composting, Drainage
- Treatment of effluents before discharge
- Sludge treatment – composting and incineration
- Use of scrubbers and electrostatic precipitators

What is a waste?

Waste is unwanted or useless material left over after an activity. Waste is also known as trash, refuse, garbage and junk. The waste may be biodegradable or non-biodegradable.

Categories of Waste

Waste can be categorized into following types on the basis of source of its generation.

1. Domestic waste **2.** Industrial waste **3.** Agricultural waste **4.** Commercial waste **5.** Municipal waste **6.** E-waste

Domestic waste – waste from homes

Domestic waste includes waste generated by our domestic or household activities. It includes kitchen drainage, bathroom/toilet drainage, sewage, excretory waste of humans and animals . Domestic waste can be liquid or solid.

Industrial waste

Industrial waste is waste produced by industrial activities such as that of factories, mills and mines.

Sources of industrial waste are as follows:

- ❖ Industrial plants and power stations using coal and crude oil
- ❖ Furnaces using coal, firewood, kerosene and cow dung cakes
- ❖ Cement, ceramics, glass and asbestos industries
- ❖ Mining and metallurgical operations

- Oil refineries
- Construction units
- Paper, textile and steel manufacturing units
- Nuclear power plants

Agricultural waste

Wastes generated during agricultural activities and by livestock are called agricultural waste.

Sources of agricultural waste are as follows:

- Minerals and organic wastes from agriculture fields with phosphate and nitrogen fertilizers that reach lakes, rivers and seas.
- Chemical fertilizers, pesticides, insecticides and herbicides
- Agricultural residue like plant parts, rice husk, etc., remained after obtaining the usable portion. It is usually used as animal feed.
- Bagasse (residue of sugar cane after extracting sugar cane juice) is the plant residue. It is mostly used as firewood or in paper manufacturing.
- Waste from food processing
- Animal waste as faecal matter, cow dung, etc.

Commercial waste

Commercial waste consists of waste from premises used for the purpose of trade or business or for the purpose of sports, recreation, education or entertainment. Commercial waste includes the following:

- **Waste generated in hospitality industry** like restaurants and hotels. This includes glass and plastic bottles, aluminium cans, plastic containers, tetrapacks, leftover foods, other paper and clothing waste.
- **Waste generated from printing press**, photocopiers, etc. This includes empty ink cartridges, paper, plastic covers, emulsions/developing solutions.
- **Waste from computer peripherals**, used floppy diskettes and stationery.
- **Medical waste** such as used syringes, needles, soiled cotton swabs, body tissues, saline bottles, medicines and medicine wrappers, etc.

Municipal waste

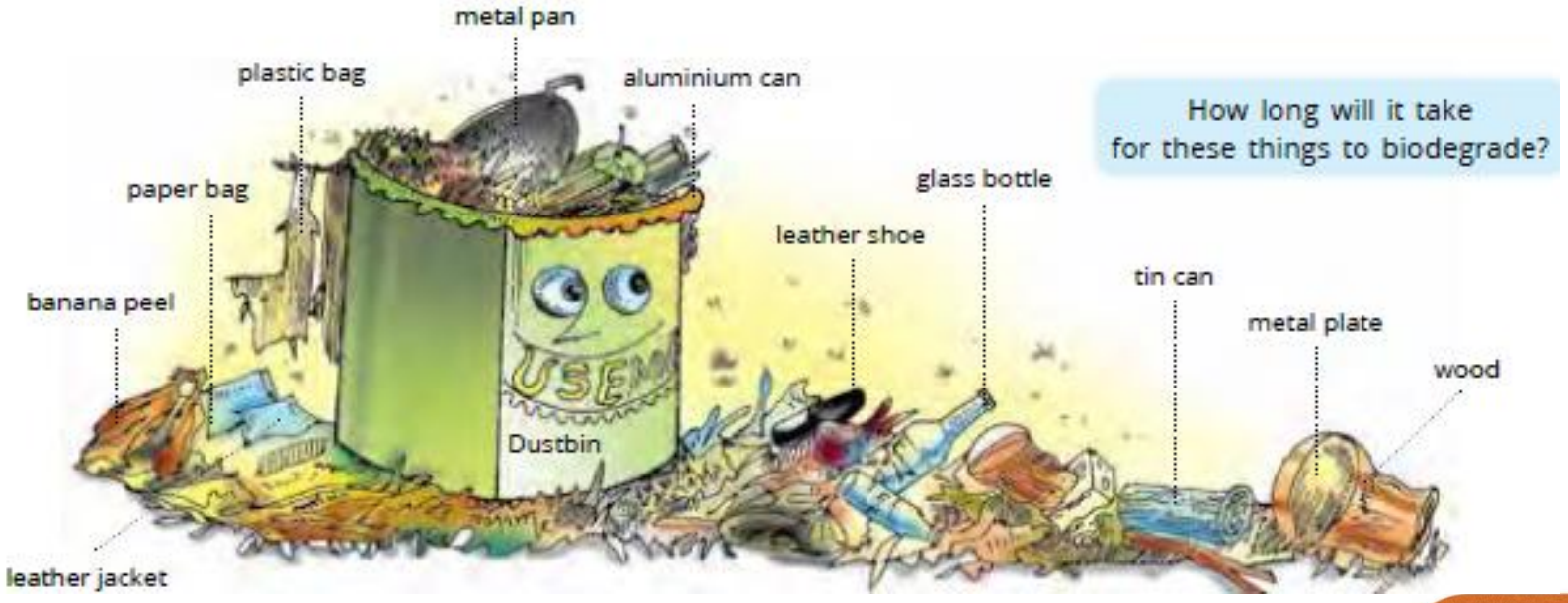
Municipal waste or municipal solid waste (MSW) includes municipal sewage, household and office waste and other waste collected by municipality within a given area. Municipal waste includes both degradable (that can be broken down chemically into non-toxic parts) and non-degradable waste from households and offices.

Electronic waste or e-waste

Electronic waste or e-waste is mainly loosely discarded, surplus, obsolete or broken electrical or electronic devices. Obsolete and broken refrigerators, mobile phones, computers, mixer grinders, stereo systems, electric irons, radios, television sets, etc., are some examples of e-waste. The processing of e-waste causes serious health and pollution problems.

segregation of domestic waste

On the basis of degradation of materials in nature, the waste materials can be broadly classified into two types – biodegradable and non-biodegradable



Biodegradable waste materials

The waste materials that can be broken down or decomposed into simpler harmless substances in the nature in due course of time, by the action of microorganisms, such as bacteria are called biodegradable waste materials. The biodegradable waste decomposes naturally and becomes harmless to humans, other organismsand environment after some time.

Non-biodegradable waste materials

The waste materials that cannot be decomposed to simpler non-poisonous substances in the nature by the action of microorganisms are called non-biodegradable waste materials. For example, plastic, polythene bags, synthetic fibres, glass objects, metal articles like aluminium cans, silver foils, certain detergents, fertilizers and pesticides like DDT and radioactive wastes. The non-biodegradable waste cannot be decayed or decomposed by microorganisms like bacteria.

Recycling of biodegradable waste

Some of the biodegradable wastes can be recycled to restore our natural resources and ecological balance. We may again use the products of recycled materials for our day-to-day activities.

Advantages of recycling

❖ Recycling is a better alternative to either dumping or burning. It reduces the environmental pollution. It saves money, energy, raw materials and land space.

❖ It replenishes the natural resources by returning various nutrients to soil, water and air, which can be used by organisms for their growth.

❖ It cuts down the waste volume drastically, thereby reducing the pressure on disposal systems.

❖ Recycling also reduces energy consumption and air pollution. The recycling of plastic bottles could save 50–60% of the energy needed to make new ones.

Methods of safe disposal of waste

The methods used for safe disposal of the waste are as follows:

Segregation

Segregation of the waste is the first step towards waste disposal. Segregation means separating the waste into reusable, degradable and nondegradable parts.

Dumping

Dumping, (also known as landfill) is the most common method of waste disposal. A landfill is a site for the disposal of waste by burial in areas that have minimum human inhabitation . The nondegradable waste can be dumped.

Composting (Farm and domestic waste)

Compost is prepared from farm and domestic waste like vegetable waste, livestock excreta (cow dung), animal refuse, weeds, crop stubble, sewage, straw, etc. This organic waste can be decomposed by microorganisms so that it can be used as manure in agriculture land. This is called **composting**. It takes about 3 to 6 months in compost formation. **Compost is rich in organic matter and nutrients.**

Compost is also prepared with the help of earthworms. Earthworms speed up the process of decomposition of plant and animal refuse. This process is known as **vermicomposting**.

Drainage

The draining of waste material is one of the most common methods of waste removal, specially by industries. The drain carries sewage in pipes made of plastic or inert material like vitreous pipes. Inert material is used because it does not decompose or react with chemicals, etc., present in waste material. Before drainage, the water carrying waste is treated and returned to system. The water containing waste/ sewage is first collected. It is then filtered and solids are removed. The water is then treated biologically or chemically.

Treatment of effluents before discharge

Sewage treatment, or domestic wastewater treatment, is the process of removing contaminants from wastewater and household and domestic sewage before discharge.

It includes processes to remove physical, chemical and biological contaminants to produce an environmentally-safe fluid stream and a solid waste (or treated sludge) which can be disposed off or reused.

Sludge treatment – composting and incineration

Sludge is generated through the sewage treatment process. The sludge is treated to reduce odour, to decompose the organic matter and to disinfect the sludge.

Composting of sludge is an aerobic process that involves mixing the sludge with sources of carbon such as sawdust, straw or wood chips. In the presence of oxygen, bacteria digest both the wastewater solids and the added carbon source and, in doing so, produce a large amount of heat

Incineration

Incineration of sludge includes combustion or burning of organic substances contained in waste materials at very high temperature. Incineration is also called **thermal treatment**. Waste is incinerated in the open or in closed incinerators.

Advantages of incineration:

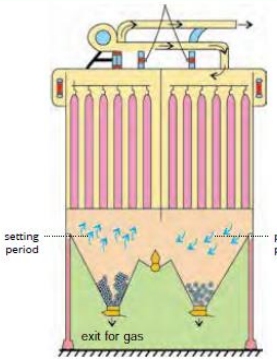
❖ Incineration reduces solid mass of the waste by 80–85% and the volume by 90–95%, depending on type of waste . Thus, it requires less landfill space.

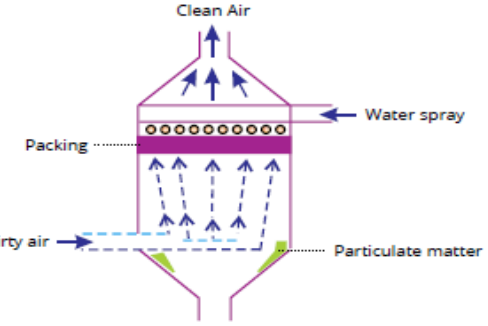
❖ The heat generated in the process can be used to generate electricity, which is known as waste to energy (WtE).

Use of scrubbers and electrostatic precipitators

There are some other devices such as scrubbers, fabric filters and electrostatic precipitators to clean up the waste before releasing into the atmosphere.

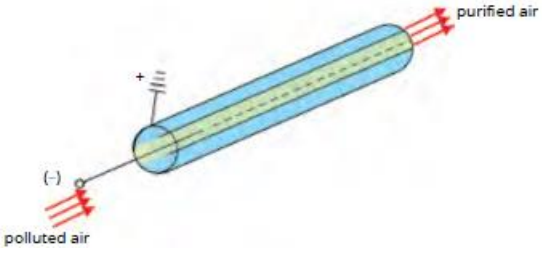
❖ **Fabric filters:** In this technique, gaseous emission containing dust, soot and fly ash is passed through porous fabric filters made of fabric (woven or filled fabric). The particles of pollutants present in the gas get trapped in this fabric and are collected in the filter and the gases free from the pollutant particles are discharged.





❖ **Wet scrubbers:** The wet scrubbers are used in chemical, metallurgical and mining industries to trap and remove gaseous and particulate air pollutants. The wet scrubbers trap SO_2, NH_3 and metal fumes in their tank and clean gases are discharged in atmosphere.

❖ **Electrostatic precipitators:** An electrostatic precipitator is a device containing a chamber that induces an electric charge on the particles of polluted air. These particles are then attracted to the oppositely charged electrode and are deposited there. In this technique, a gas or air stream containing aerosols in the form of dust, mist or fumes, is passed between the two electrodes of the electrostatic precipitator. During this process, the aerosol particles get precipitated on the electrode.



SUMMARY...

❖ Waste is unwanted or useless material left over after an activity. Waste can be categorized into domestic, industrial, agricultural, commercial, municipal and e-waste.

❖ Domestic waste includes waste generated by our domestic and household activities.

❖ Industrial waste is waste generated by industrial activities such as that of factories, mills and mines.

❖ Agricultural waste may be minerals, organic waste, chemicals, pesticides, fertilizers and biomass waste from plant and animal remains.

❖ Commercial waste consists of waste from premises used for the purpose of trade or business or sports, education, recreation and entertainment.

❖ Municipal waste or municipal solid waste is waste that includes municipal sewage, household and office waste or other waste collected by the municipality in a given area.

❖ E-waste is mainly loosely discarded, surplus, obsolete or broken electrical or electronic devices.

❖ On the basis of degradation of waste material in nature, the waste can be broadly classified into two types – biodegradable and non-biodegradable waste material.

❖ The waste material that can be broken down or decomposed into simpler harmless substances in nature by the action of microorganisms are called biodegradable waste material.

❖ The waste material that cannot be decomposed to simpler, non-poisonous substances in the nature by the action of microorganisms are called non-biodegradable waste material.

❖ There are various methods of safe disposal of waste. These include segregation, dumping, composting, drainage and incineration.

❖ Sewage treatment is the process of removing contaminants from wastewater and domestic and household sewage before discharge.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