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## 16.1 LEVELS OF ECOLOGICAL ORGANIZATION

### LONG QUESTIONS

**Q.1** Write a note on components of an ecosystem. (K.B) (LHR 2014)

**Ans:** COMPONENTS OF AN ECOSYSTEM

**Definition:**

“The self sufficient unit of an environment that is formed as a result of interactions between its biotic community and the abiotic components is known as an ecosystem.”

**Examples:**

- Pond
- Lake
- Forest

**Parts:**

An ecosystem comprises of **two basic** parts:

- Abiotic components
- Biotic components

**Abiotic Components:**

“The **non-living** factors present in ecosystem are called **abiotic components**”.

**Examples:**

The important non-living factors are:

- **Light**
- **Air**
- **Water**
- **Soil**
- **Basic elements**
- **Compounds**

**Biotic Components:**

“All the **living parts** (organisms) of the ecosystem are called as **biotic components**”.

**Classification:**

Biotic components are further **classified** as:

- **Producers**
- **Consumers**
- **Decomposers**

**Producers:**

The producers are the **autotrophs** present in an ecosystem. These organisms are able to **synthesize complex organic compounds** (food) from **inorganic raw materials**. Producers form the basis of any **ecosystem**.

The **minerals**, which are **released** by **decomposers**, are used as **nutrients** by the produces.

**Examples:**

Producers include:

- **Plants**
- **Algae**
- **Photosynthetic bacteria**

**Terrestrial Ecosystem:**

In **terrestrial ecosystems**, **plants** are the **main producers**.

**Aquatic Ecosystem:**

In **aquatic ecosystems**, the **main producers** are the **floating photosynthetic** organisms (mainly algae) called **phytoplankton** and **shallow water rooted plants**.

**Consumers:**

The **consumers** are **heterotrophs**. They cannot **synthesize** their **food** and so **depend** upon **producers** for food.

**Examples:**

Consumers include:

- All animals
- Fungi
- Protozoans
- Many of the bacteria

**Major Consumers of Ecosystems:**

The **animals** are the **major consumers** of ecosystems. They are further classified as:

- Herbivores
- Carnivores

**Herbivores (Primary Consumers):**

The animals that feed on plants are called **herbivores**. The herbivores are the **primary consumers**. They feed **directly** on **plants** or products of plants.

**Examples:**

- Cattle
- Deer
- Rabbit
- Grasshopper

**Carnivores:**

The animals that **feed** on other **animals** are called **carnivores**.

**Types:**

The types of carnivores are as follows:

- **Primary carnivores**
- **Secondary carnivores**
- **Tertiary carnivores**

**Primary Carnivores:**

Primary carnivores (**secondary consumers**) feed on **herbivores**.

**Examples:**

- Fox
- Frog
- Predatory birds
- Fish
- Snakes

**Secondary Carnivores:**

Secondary carnivores (**tertiary consumers**) feed on **primary carnivores**.

**Examples:**

- Wolf
- Owl

**Tertiary Carnivores:**

Tertiary carnivores feed on **secondary carnivores**. Tertiary carnivores are not **eaten** by any other animals. They are also called **top carnivores**.

**Examples:**

- Lion
- Tiger

**Decomposers:**

Decomposers or reducers **break down** the **complex organic** compounds of **dead matter** (of plants and animals) into **simple compounds**. They **secrete digestive enzymes** into dead and **decaying** plant and animal remains to **digest** the organic material. After digestion, decomposers absorb the products for their **own use**. The **remaining** substances are added to **environment**.

**Examples:**

- Bacteria

- Fungi

**16.1 SHORT QUESTIONS**

**Q.1 Differentiate between ecosystem and ecology. (K.B)**

**Ans:**

**DIFFERENTIATION**

The difference between ecosystem and ecology is as follow:

Ecology	Ecosystem
<ul style="list-style-type: none"> <li>• The study of the interrelationship between organisms and their environment is called ecology.</li> </ul>	<ul style="list-style-type: none"> <li>• The self-sufficient unit of an environment that is formed as a result of interaction between its biotic community and the abiotic components are known as an ecosystem.</li> </ul>

**Q.2 Differentiate between population and community? (K.B)**

(MTN-15, SWL-14, BWP-15, DGK-14, LHR-16)

**Ans:**

**DIFFERENTIATION**

The differences between population and community are as follows:

Population	Community
<b>Definition</b>	
<ul style="list-style-type: none"> <li>• A group of the organisms of the same species inhabiting a specific geographical area at a particular time is called a population.</li> </ul>	<ul style="list-style-type: none"> <li>• All the population that live in a habitat and interact in various ways with one another are collectively called a community</li> </ul>
<b>Example</b>	
<ul style="list-style-type: none"> <li>• The human population in 2010 is 173.5 million.</li> </ul>	<ul style="list-style-type: none"> <li>• Forest community</li> </ul>

**Q.3 Define biosphere. Write its range. (K.B)**

(LHR 2015)

**Ans:**

**BIOSPHERE**

**Definition:**

“All ecosystems of the world together form the biosphere. It includes all the ecosystems of the planet earth.”

The biosphere makes a thin layer surrounding the planet earth.

**Range:**

Biosphere range from the floor of oceans to the tops of the highest mountain. It is about “20” kilometer thick.

**Q.4 Define ecosystem. Give example of natural and artificial ecosystem? (K.B)**

(GRW 2014)

**Ans:** Page no 198.

**Q.5 What are abiotic components of ecosystem? (K.B)**

(MTN 2015, LHR 2016, GRW 2015)

**Ans:** Page no 198.

**Q.6 What are biotic components of ecosystem? (K.B)(DGK 2015, LHR 2016, MTN 2015, GRW 2015)**

**Ans:** Page no 198.

**Q.7 What are producers? Give example? (K.B)**

(LHR 2014)

**Ans:** Page no 198.

**Q.8 Write the names of producers in terrestrial and aquatic ecosystems. (K.B)**

(DGK 2014)

**Ans:** Page no 198

**Q.9 What is consumer? Give example. (K.B)**

(DGK 2014, SWL 2015)

**Ans:** Page no 198, 199.

**Q.10 What are reducers? Give example. (K.B)**

(BWP 2014, SWL 2015)

**Ans:**

**REDUCERS**

Decomposers or reducers break down the complex organic compound of dead matter (of plants and animals) into simple compounds.

**Example:**

Many types of bacteria and fungi are the principal decomposers of biosphere.

**Q.11 What are omnivores? (K.B)**

**Ans:** Page no 206.

**16.1 MULTIPLE CHOICE QUESTIONS**

1. **A group of organisms which can interbreed freely in nature and produce fertile offspring: (K.B)**  
 (A) Community (B) Population  
 (C) Biosphere (D) Species
2. **All populations collectively are called \_\_\_\_\_ . (K.B) (GRW 2013)**  
 (A) Species (B) Biome  
 (C) Community (D) Ecosystem
3. **An example of artificial ecosystem: (K.B)**  
 (A) River (B) Ocean  
 (C) Rain forest (D) Aquarium
4. **Thickness of biosphere: (K.B)**  
 (A) 10 Km (B) 15 Km  
 (C) 20 Km (D) 25 Km
5. **Interrelationship between organisms and environment is called: (K.B) (LHR 2015)**  
 (A) Mycology (B) Ecology  
 (C) Physiology (D) Morphology
6. **Which one is not a biotic component: (K.B)**  
 (A) Producer (B) Consumer  
 (C) Decomposer (D) Air
7. **The consumers that feed on plants: (K.B)**  
 (A) Omnivores (B) Carnivores  
 (C) Herbivores (D) Insectivores
8. **The first trophic level is made up of: (U.B)**  
 (A) Consumers (B) Producers  
 (C) Herbivores (D) Carnivores
9. **Man is: (K.B)**  
 (A) Omnivore (B) Carnivore  
 (C) Insectivore (D) Herbivore
10. **Human is a \_\_\_\_\_ consumer. (U.B)**  
 (A) Primary (B) Secondary  
 (C) Tertiary (D) Quaternary
11. **All the ecosystem of the world together form the \_\_\_\_\_. (K.B) (LHR 2016)**  
 (A) Population (B) Biosphere  
 (C) Community (D) Habitat
12. **Study of the relationship between organism and their environment is called: (K.B) (LHR 2016, GRW 2017)**  
 (A) Histology (B) Ecology  
 (C) Genetics (D) Anatomy

## 16.2 FLOW OF MATERIALS AND ENERGY IN ECOSYSTEMS

## LONG QUESTIONS

Q.1 Describe flow of energy in an ecosystem. (K.B)

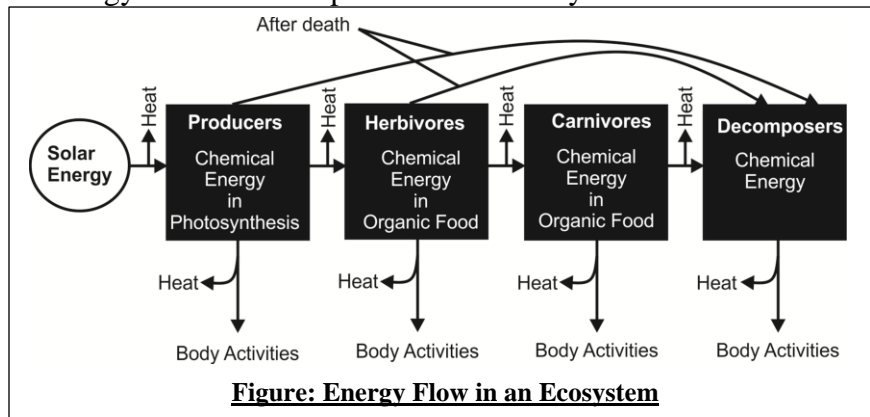
Ans:

FLOW OF ENERGY

In an ecosystem, energy as well as materials travel from one trophic level to the next. Trophic (food) level is the level at which an organism feeds in food chain. The first trophic level is made of producers; the second of primary consumers and so on.

Flow of Energy:

The flow of energy in different trophic levels of ecosystem is unidirectional.



**Figure: Energy Flow in an Ecosystem**

Source of Energy:

The sun is the primary source of energy for all ecosystems.

Energy in Producers:

Producers get solar energy and transform it into chemical energy by the process of photosynthesis. They store this energy in their tissues and also transform it into mechanical and heat energy during their metabolic activities.

Energy in Herbivores:

The energy in producers' tissues flows to herbivores when producers are eaten. Herbivores transform it into mechanical and heat energy during their metabolic activities and store the rest in their tissues.

Energy in Carnivores:

Carnivores eat herbivores and get energy. They also use it for their body activities and store the rest in their tissues.

Energy in Decomposers:

After the death of producers and consumers, the energy stored in their tissues is used by decomposers.

Law of Thermodynamics:

The storage and expenditure of energy in an ecosystem is in accordance with the basic law of thermodynamics.

Statement:

"Energy can neither be created nor destroyed but can be transformed from one form into another".

Energy within Ecosystem:

In an ecosystem there is:

- Constant flow or transfer of energy from the Sun through producers to consumers and decomposer.

- A **significant decrease** in useful energy during **transfer** of energy at each **trophic level**.

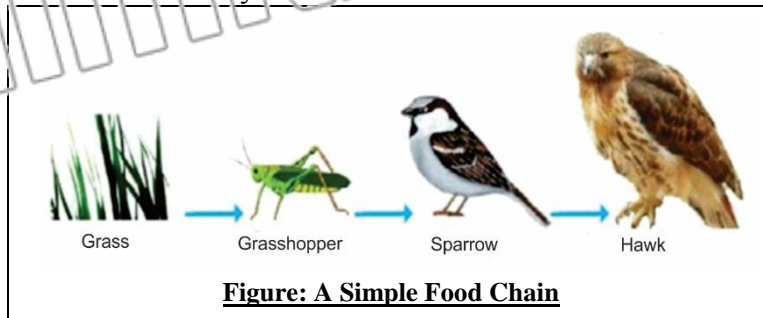
**Q.2 Describe flow of material in an ecosystem. (K.B)**

**Ans:** **FLOW OF MATERIALS**

The **material flow** from one trophic level to the next by means of food chains and food webs.

**Food Chain:**

“A food chain is a series of **organisms** within an **ecosystem**, in which each **organism** feeds on the one before it and is fed by the one after it”.



**Figure: A Simple Food Chain**

- The base of food chain is always formed by a plant (producer).
- It is eaten by a **primary consumer**, which is **preyed upon** by a **secondary consumer**.
- The **secondary consumer** may be eaten by a **tertiary consumer**.

**Representation:**

A food chain, can therefore, be represented as:

**Producer – Primary Consumer – Secondary Consumer – Tertiary**

**Nutritive Interaction:**

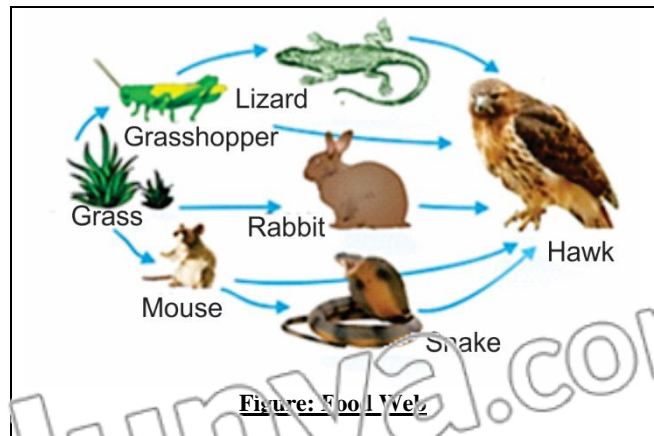
A food chain involves a **nutritive interaction** among the **biotic components** of an ecosystem. Usually there are 4 or 5 trophic levels. Shorter food chain provides greater available energy and vice versa.

**Food Web:**

“A network of food chains which are **interconnected** at various trophic levels”.

**Explanation:**

In nature, food chain is **very complex**, as an organism may be the **food source** of many other organisms. Thus, instead of a simple linear food chain, there is a web-like structure formed by these **interlinked** food chains. Such **interconnected** food chains collectively make food web



**Figure: Food Web**

**Q.3 Write a note on ecological pyramids.**

(GRW 2017)

OR

**Explain what do you mean by the pyramids of number and biomass.**

(A.B)

(Understanding the Concept Q.1)

Ans:

**ECOLOGICAL PYRAMIDS**

**Definition:**

“A representation of the number of individuals or amount of **biomass** or **energy** present in various **trophic levels** of a **food chain**.”

**Explanation:**

In **1927**, **Charles Elton** (an English ecologist) developed the concept of **ecological pyramids**.

**Observation of Charles Elton:**

He noted that the animals present at the **beginning** of food chain are **abundant** in number while the animals **present** at the end of food chain are **fewer** in number.

**Types:**

Ecological pyramids are of **three types**.

- Pyramid of Numbers
- Pyramid of Biomass
- Pyramid of Energy

The two are given below:

**Pyramid of Numbers:**

“The **graphic representation** of the number of individuals per unit area at **various trophic levels** are called pyramid of numbers.”

**Explanation:**

Usually, producers are present in large number, primary consumers are in lesser number, and **secondary consumers** are fewer, and so on. So, the producers are of smallest size but maximum in number, while the **tertiary consumers** are larger in size but lesser in number.

**Pyramid of Biomass:**

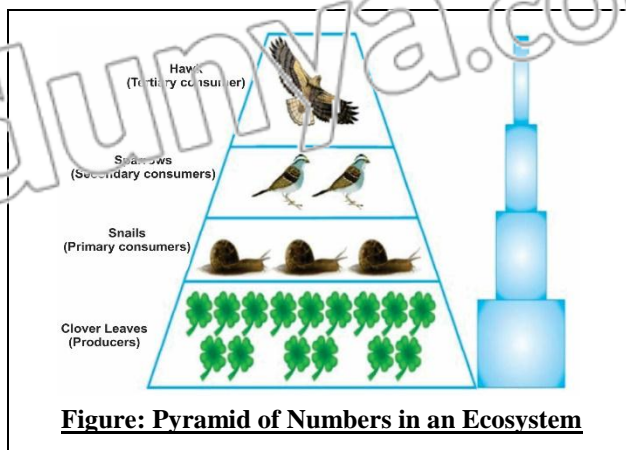
“The **graphic representation** of **biomass** present per unit area at different trophic levels is called **pyramid of biomass**”.

**Biomass:**

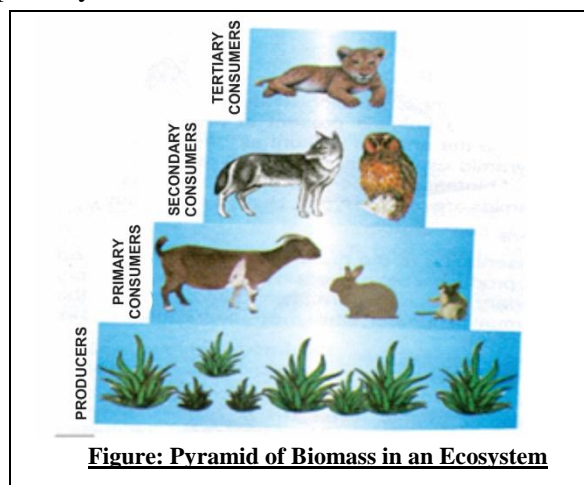
“The total amount of **living or organic matter** in an **ecosystem** at any time is called biomass”.

**Explanation:**

In a **terrestrial ecosystem**, the maximum biomass occurs in producers, and there is progressive decrease in biomass from lower to higher trophic levels.



**Figure: Pyramid of Numbers in an Ecosystem**



**Figure: Pyramid of Biomass in an Ecosystem**

**16.2 SHORT QUESTIONS**

**Q.1 Define trophic level. What are first and second trophic levels? (K.B) (LHR 2015, SWI 2015)**

**Ans:** TROPHIC LEVEL

**Definition:**

Trophic (food) level is the level at which an organism feeds in food chain

**First Trophic Level:**

- The first trophic level is made of producers

**Second Trophic Level:**

The second trophic level is made of primary consumers.

**Q.2 State law of thermodynamics. (A.B)**

**Ans:** LAW OF THERMODYNAMICS

**Statement:**

Energy can neither be created nor destroyed but can be transformed form one from into another. Energy in an ecosystem is in accordance with the basic law of thermodynamics.

**Q.3 How law of thermodynamics is used in energy expenditure in an ecosystem? (A.B)**

**Ans:** LAW OF THERMODYNAMICS IN ECOSYSTEMS

In an ecosystem there is:



- Constant flow or transfer of energy from the Sun through producers to consumers and decomposers.
- A significant decrease in useful energy during transfer of energy at each trophic level.

**Q.4 Define food chain. Give example. (K B)**

(LHR 2016, 17, GRW 2016, MTN 2015, BWI 2014,15, SWL 2014, 15)

**Ans:** Page no 203.

**Q.5 Define Food Web. Give example. (K.B)**

(MTN 2015, SWL2014, 15, GRW 2014, DGK 2014)

**Ans:** Page no 203.

**Q.6 How food chain can be represented? (K.B)**

**Ans:** Page no 203.

**Q.7 Define ecological pyramid. (A.B)**

(LHR 2015)

**Ans:** Page no 203.

**Q.8 Define pyramid of number. (A.B)**

(LHR 2013)

**Ans:** Page no 204.

**Q.9 Define pyramid of biomass. (A.B)**

**Ans:** Page no 204.

## 16.2 MULTIPLE CHOICE QUESTIONS

**1. Which one is the primary source of energy? (K.B)**

- (A) Moon (B) Mars  
(C) Sun (D) Mercury

**2. A network of food chains which are interconnected at various trophic levels: (K.B)**

- (A) Community (B) Population  
(C) Species (D) Food web

**3. Who developed the concept of ecological pyramids? (K.B)**

(LHR 2013)

- (A) Charles Darwin (B) Charles Elton  
(C) Charles Brown (D) Charles Asker

## 16.2.4 BIOGEOCHEMICAL CYCLES

### LONG QUESTIONS

**Q.1 Write a note on carbon cycle. (K.B) (Understanding the Concept Q.2) (LHR 2015, 17, GRW 2015)**

**Ans:** CARBON CYCLE

**Definition:**

“The biogeochemical cycle in which carbon flows between the organisms and the environment”.

Carbon cycle is a perfect cycle in the sense that carbon is returned to atmosphere as soon as it is removed.

**Explanation:**

Carbon atom is the principal building block of many kinds of biomolecules. Carbon is found as graphite and diamond in nature. It also occurs as carbon dioxide in atmosphere.

**Sources of Carbon:**

Major source of carbon for the living world is carbon dioxide present in atmosphere and water. Carbonates of Earth's crust also give rise to carbon dioxide.

Fossil fuels also contain carbon like:

- Peat

- Coal
- Natural gas
- Petroleum

**Photosynthesis:**

The **major process** that brings carbon from **atmosphere** or water into living world is **photosynthesis**. Producers take in carbon dioxide from atmosphere and convert it into organic **compounds**. In this way, **carbon** becomes a **part** of the **body** of producers.

**Carbon in Animals:**

This carbon enters food chains and is passed to:

- **Herbivores**
- **Carnivores**
- **Omnivores**
- **Decomposers**

**Respiration:**

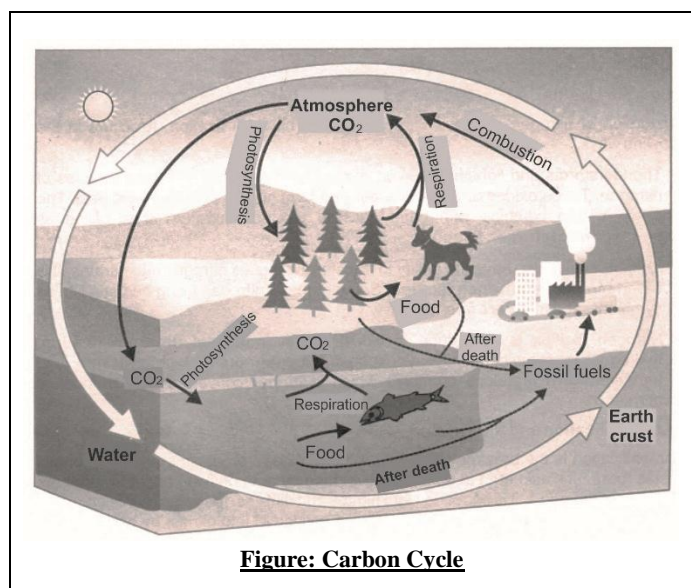
Carbon dioxide is **released** back to environment by **respiration** of producers and consumers.

**Decomposition:**

It is also released by the **decomposition** of **organic wastes** and **dead bodies** by **decomposers**.

**Combustion:**

**Burning** of wood and **fossil fuels** also adds **large amount** of **carbon dioxide** in atmosphere.



**Figure: Carbon Cycle**

**Disturbance of Carbon Cycle:**

The **balance** of carbon cycle has been **upset** by **human activities** such as:

- **Deforestation**
- **Excessive burning of fossil fuels**

**Consequences:**

As a result, the amount of **carbon dioxide** in atmosphere is **increasing**, causing:

- **Greenhouse effect**
- **Global warming**

**Q.2** Write a note on nitrogen cycle. (K.E)

(LHR 2015)

OR

What are the different stages of nitrogen cycle? (K.B)

(Understanding the Concept Q.3)

**Ans:**

**NITROGEN CYCLE**

**Definition:**

“It is the flow of **nitrogen** between the **organisms and environment**”.

**Occurrence:**

Nitrogen is an important component of many biomolecules, like:

- **Proteins**
- **Nucleic acids** (DNA and RNA)

- Atmosphere is the **reservoir of free gaseous nitrogen**

Living organisms **cannot** pickup this gaseous **nitrogen directly** from atmosphere **except for nitrogen fixing bacteria**. It has to be **converted** into **nitrates** to be utilized by plants.

### STAGES OF NITROGEN CYCLE

Nitrogen cycling involves several stages.

- Formation of nitrates
- Assimilation
- Denitrification

#### Formation of Nitrates:

It is done by the following ways:

#### Nitrogen Fixation:

The conversion of **nitrogen** gas into **nitrates** is called **nitrogen fixation**. It occurs in the following ways.

#### Atmospheric Nitrogen Fixation:

**Thunderstorms** and lightning convert atmospheric gaseous nitrogen to **oxides of nitrogen**. These oxides **dissolve** in water and form nitrous acid and **nitric acid**. The acids in **turn combine** with other salts to produce '**nitrates**'. It is called as atmospheric nitrogen fixation.

#### Biological Nitrogen Fixation:

Some bacteria also have the **ability** to transform gaseous nitrogen into nitrates. It is called biological nitrogen fixation. Some of these **nitrogen fixing bacteria** live as **symbionts** and many are **free-living**.

#### Industrial Nitrogen Fixation:

Nitrogen fixation is also **done** in industries. In industrial nitrogen fixation, **hydrogen** is **combined** with atmospheric nitrogen under **high pressure** and **temperature**. It produces ammonia which is further **converted** into **ammonium nitrate**.

#### Ammonification and Nitrification:

##### Ammonification:

"The **breakdown** of the **proteins** of dead organisms and **nitrogenous wastes** (urea, uric acid etc.) to ammonia is called ammonification".

It is done by **ammonifying bacteria**.

##### Nitrification:

"The process of **conversion** of ammonia into nitrites and **nitrates** is called **nitrification**."

It is done by **nitrifying bacteria**".

##### Formation of Nitrites:

First, ammonia is converted into nitrites by bacteria like:

- Nitrosomonas

##### Formation of Nitrates:

The nitrites are then **converted** into **nitrates** by other bacteria like:

- Nitrobacter

##### Assimilation:

"The **utilization** of **nitrates** by organisms is called assimilation".

##### Explanation:

The **nitrates** formed by the processes of **nitrification**, are absorbed by plants and are **utilized** for making proteins etc. Animals take **nitrogenous** compounds from plants.

**Denitrification:**

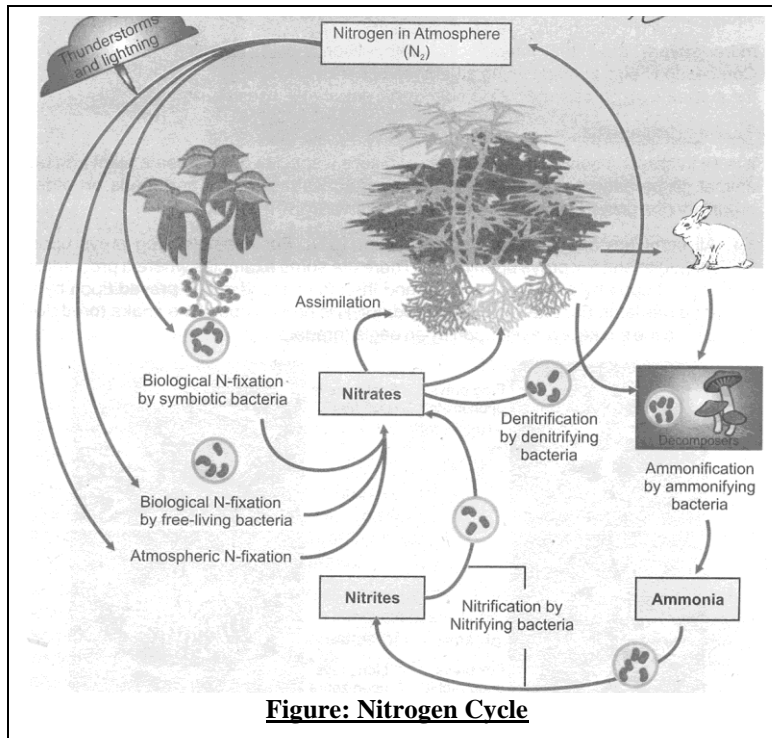
“The **biological** process in which **nitrates** and **nitrites** are reduced to **nitrogen** gas by **denitrifying bacteria** is called **denitrification**”.

**Explanation:**

By this process, nitrogen is returned to **atmosphere**

Excessive denitrification **reduces soil fertility** and is stimulated by:

- **Water logging**
- **Lack of aeration**
- **Accumulation of organic matter in the soil.**



**Figure: Nitrogen Cycle**

**16.2.4 SHORT QUESTIONS**

**Q.1** Write a note on biogeochemical cycles. (K.B)

OR

Define biogeochemical cycles. (K.B)

(LHR 2013,14, GRW 2014)

Ans: Page no 205.

**Q.2** Write a note on nitrogen fixation. (K.B)

(LHR 2016)

OR

What is meant by nitrogen fixation? (K.B)

(LHR 2017)

OR

Define atmospheric nitrogen fixation. (K.B)

OR

**What is industrial nitrogen fixation? (K.B)**

**(LHR 2014)**

**Ans:** Page no 207.

**Q.3 Differentiate between nitrification and denitrification.**

**(GRW 2016)**

**Ans:** **DIFFERENTIATION**

The difference between nitrification and denitrification is as follows:

Nitrification	Denitrification
<ul style="list-style-type: none"> <li>The process of conversion of ammonia into nitrites and nitrates is called nitrification. It is done by nitrifying bacteria.</li> </ul>	<ul style="list-style-type: none"> <li>The biological process in which nitrates and nitrites are reduced to nitrogen gas by denitrifying bacteria is called denitrification.</li> </ul>

**Q.4 Write ways to convert nitrogen gas into nitrates? (K.B)**

**Ans:** Page no 207.

**Q.5 How balance of carbon cycle has been upset by human activities? (K.B)**

**Ans:** **BALANCE OF CARBON CYCLE**

The balance of carbon cycle has been upset by human activities such as deforestation and excursive burning of fossil fuels. As a result, the amount of carbon dioxide in atmosphere is increasing, causing the greenhouse effect and global warming.

**Q.6 What is the effect of excessive denitrification? (A.B)**

**(GRW 2017)**

**Ans:** **EFFECT OF EXCESSIVE DENITRIFICATION**

Excessive denitrification reduces soil fertility and it is stimulated by:

- Water logging
- Lack of aeration
- Accumulation of organic matter in the soil

### 16.2.4 MULTIPLE CHOICE QUESTIONS

**1. Excessive denitrification \_\_\_\_\_ soil fertility. (K.B)**

**(LHR 2014)**

- (A) Increase (B) Reduces  
(C) Bad (D) Finished

**2. Which one cycle is a perfect cycle in nature? (U.B)**

- (A) Carbon (B) Oxygen  
(C) Nitrogen (D) Water

**3. The greenhouse effect and global warming are due to the increase in the concentration of: (U.B)**

- (A) Sulphur (B) Carbon dioxide  
(C) Water vapours (D) Oxygen

**4. Ammonia is converted into nitrites by: (K.B)**

- (A) Streptococcus (B) Penicillium  
(C) Nitrobacter (D) Nitrosomonas

**5. The biological process in which nitrates and nitrites are reduced to nitrogen gas: (K.B)**

- (A) Ammonification (B) Nitrification  
(C) Denitrification (D) Assimilation

**6. Naturally found in graphite and diamond: (K.B)**

**(LHR 2016)**

- (A) Nitrogen (B) Carbon  
 (C) Oxygen (D) Hydrogen
7. The total amount of living matter in an ecosystem at any time is called: (K.B) (LHP 2017)
- (A) Food web (B) Food chain  
 (C) Energy (D) Biomass

**16.3 INTERACTIONS IN ECOSYSTEMS**

**LONG QUESTIONS**

**Q.1** What do you mean by competition? Give an example.

(K.B) Understanding the Concept Q.4

(GRW 2016)

Ans:

COMPETITION

In **ecosystems**, the natural resources e.g. nutrients, space etc. are usually in short supply. So there is a **competition** among the **organisms of ecosystem** for the utilization of resources. The competition may be **intraspecific** or **interspecific**.

Severity of Competition:

**Intraspecific** competition is always **stronger** and more **severe** than interspecific competition.

Need of Competition:

Competition helps in **maintaining** a balance between **available resources** and number of individuals of a species.

Competition in Plants:

Plants also show **competition** for:

- Space
- Light
- Water
- Minerals

**Q.2** Define predation. Explain with examples. (K.B)

(Understanding the Concept Q.4)

Ans:

PREDATION

Definition:

“It is an **interaction** between **two animals** of **different species** or between a **plant** and an **animal**”.

OR

“The relationship between **predator** and **prey** is called **predation**”.

Explanation:

- The organism **attacks**, kills and feeds on other organisms is called predator.
- The organism that is being **hunted upon** is called **prey**.

Examples:

All **carnivore** animals are **predators**. Some examples of predation are given below:

- Frog preys upon mosquito
- Fox preys upon rabbit

There are some examples where a predator is preyed upon by a second predator and then the second one is preyed upon by a third predator.

For example, frog (predator 1) is preyed upon by a snake (predator 2) and the snake is preyed upon by an eagle (predator 3).





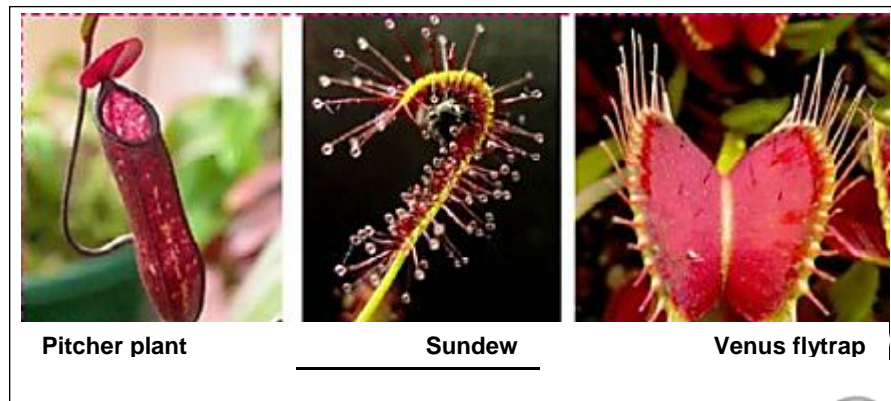
Figure: Examples of Predators and their Preys

### Carnivorous Plants:

**Certain plants** are carnivorous and live as **predators**. Such plants live in the areas where **minerals** and other **nutrients** are lacking. They feed on **insects** to fulfill their **nitrogen requirements**. These plants have **mechanism to attract insects**. For example, they secrete sweet nectar that attracts the **insects searching** for food. Their leaves are also modified to capture the prey.

### Examples:

- **Pitcher plant**
- **Sundew**
- **Venus flytrap**



Pitcher plant

Sundew

Venus flytrap

### Advantages:

- **Predation** keeps the **prey population** under check, so as to **maintain an ecological balance**.
- **Humans benefit** from this interaction in the biological control of **weeds and pests**.
- In order to **control pests** in an area, their predators are released there.

**Q.3** What is parasitism? Explain its two types with examples (K.B)

(Understanding the Concept Q.4) (LHR 2016)

### PARASITISM

#### Definition:

“A type of symbiosis between members of **different species**, in which **smaller partner** (parasite) derives food and shelter from the body of **larger partner** (host) and, in turn, harms it is called parasitism”.

### TYPES OF PARASITISM

There are **two types** of parasitism

- Temporary Parasitism
- Permanent Parasitism

**Temporary Parasitism:**

In **temporary parasitism**, the parasite **spends** most of its **life cycle** as **independent free-living** organisms. Only a part of its life cycle is **spent** as a **parasite**. Some common temporary parasites of humans are:

- Leech
- Bed bug
- Mosquito

**Permanent Parasitism:**

In **permanent parasitism**, the parasites **spend** their **whole life cycle** as parasites. Some examples of permanent parasites are:

- Disease causing bacteria
- All viruses

**Types of Parasites:**

Parasites may also be **classified** as:

- Ectoparasites
- Endoparasites

**Ectoparasites:**

“The parasites that **live outside** i.e. on the surface of host's body and get food from there are called Ectoparasites”.

**Examples:**

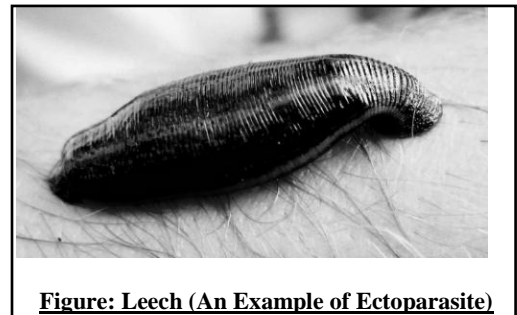
- Mosquitoes
- Leeches
- Lice

**Endoparasites:**

The parasites that **live inside the body** of host and get food and shelter are called Endoparasites.

**Examples:**

- Bacteria
- Viruses
- Tapeworm
- Ascaris
- Entamoeba
- Plasmodium



**Figure: Leech (An Example of Ectoparasite)**



**Figure: Endoparasites**

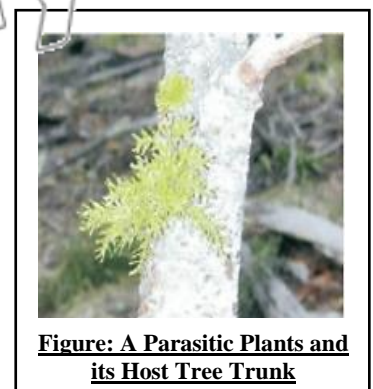
**Parasitic Plants:**

Some plants are **parasites** on other plants. Parasitic plants **grow** special **types of roots** called (haustoria) into **host body** and **suck** the **required nutrients** from the **vascular tissues** of host.

**Example:**

**Cuscuta plant** which is also called **dodder**:

**Survival of Host and Parasite:**



**Figure: A Parasitic Plants and its Host Tree Trunk**



Host can survive without parasite, but parasite cannot survive without host.

**Q.4 Write a note on mutualism. (K.B)**

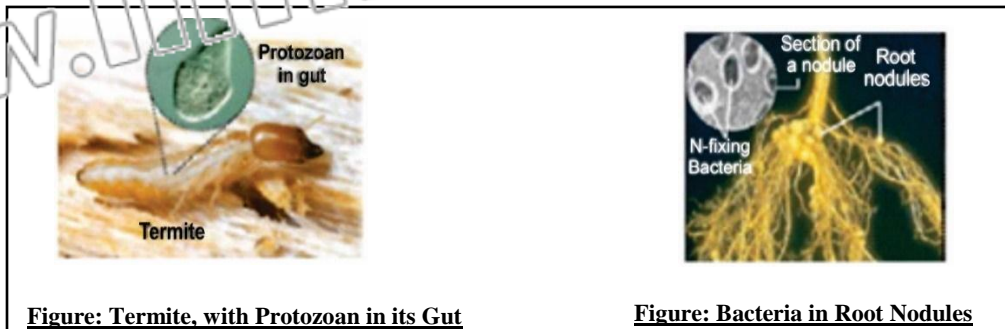
(Understanding the Concept Q.4)

Ans:

**MUTUALISM**

**Definition:**

“The type of **symbiotic interaction** in which **both partners** of different species get benefit and **neither is harmed** is called mutualism.”



**Figure: Termite, with Protozoan in its Gut**

**Figure: Bacteria in Root Nodules**

**Examples:**

- Termites and Protozoan
- Bacteria and Plants

**Termites and Protozoan:**

**Termites eat wood** but are **not able to digest** it. A **protozoan** lives in its **intestine**. It secretes '**cellulase**' enzyme to **digest** the **cellulose of wood**. In return, the **termite provides food** and shelter to the **protozoan**.

**Bacteria and Plants:**

The nitrogen fixer **bacteria Rhizobium** live in the **root nodules** of **leguminous plants** like pea, gram etc. The bacteria **obtain** food and shelter from plants while in return they **fix gaseous nitrogen** into **nitrates** for the plant which is **required** for their growth.

**Q.5 Explain commensalism with example. (K.B)**

Ans:

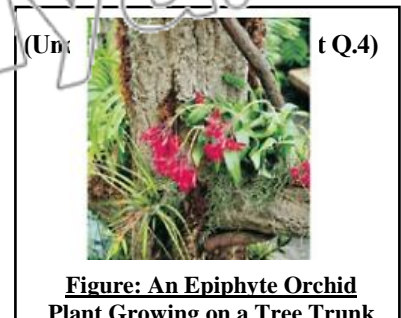
**COMMENSALISM**

**Definition:**

“It is a type of **symbiosis** in which **one partner** is **benefited** while the other is **neither benefited nor harmed**”.

**Examples:**

- Epiphytes
- Sucker Fish



**Figure: An Epiphyte Orchid Plant Growing on a Tree Trunk**

**Epiphytes:**

**Epiphytes** are **small plants** found growing on other **larger plants** for space only. They **absorb water** and minerals from **atmosphere** and prepare their own food. The larger plants are **neither benefited** nor harmed in any way.



Figure: A sucker fish attached with shark

**Sucker Fish:**

**Sucker fish** attaches to the surface of **sharks** by its sucker. In this way, the shark **provides easy transport** to the sucker fish to **new feeding grounds**.

**16.3 SHORT QUESTIONS**

**Q.1 Describe different interactions in ecosystems. (K.B)**

**Ans:** INTERACTIONS IN ECOSYSTEMS

In all ecosystems, there are many kinds of interactions among living organism i-e. Intraspecific interaction and interspecific interaction.

Some important interaction among living organisms in ecosystems are given below:

- Competition
- Predation
- Symbiosis
  - Parasitism
  - Mutualism
  - Commensalism

**Q.2 Differentiate between intraspecific and interspecific interaction? (K.B)**

(LHR 2015, 17, GRW 2017)

**Ans:** DIFFERENTIATION

The differences between intraspecific interaction and interspecific interaction are as follows:

Intraspecific interaction	Interspecific interaction
<b>Definition</b>	
<ul style="list-style-type: none"> <li>• The interactions between the members of the same species are called intraspecific interactions.</li> </ul>	<ul style="list-style-type: none"> <li>• The interactions between the members of different species are called interspecific interactions.</li> </ul>
<b>Example</b>	
<ul style="list-style-type: none"> <li>• Competition</li> </ul>	<ul style="list-style-type: none"> <li>• Predation</li> <li>• Symbiosis</li> </ul>

**Q.3 Define predation. Give example. (K.B)**

(LHR 2015,16, 17, GRW 2016, MTN 2015, BWP 2014)

**Ans:** Page no 210.

**Q.4 Define symbiosis. Write its different types. (K.B)**

(LRH 2014, GRW 2017)

**Ans:** SYMBIOSIS

**Definition:**

“A relationship between members of different species, in which they live together for longer or shorter periods of time, is called symbiosis”.

**TYPES OF SYMBIOSIS**

Symbiosis is of three types:

- Parasitism
- Mutualism
- Commensalism

**Q.5 How carnivores plants are predator? Give examples? (U.B)**

(LHR 2013)

**Ans:**

**CARNIVORES PLANTS**

Certain plants are carnivorous and live as predators. Such plants live in the areas where minerals and other nutrients are lacking. They feed on insects to fulfill their nitrogen requirements. These plants have mechanism to attract insects. For example, they secrete sweet nectar that attracts the insects searching for food. Their leaves are also modified to capture the prey.

**Examples:**

- Pitcher plant
- Sundew
- Venus flytrap

**Q.6 What are temporary parasitism and permanent parasitism? (U.B)**

**Ans:** Page no 211, 212.

**Q.7 What are ectoparasites and endoparasites? (K.B)**

(DGK 2014, LHR 2013, GRW 2015)

**Ans:** Page no 232.

**Q.8 Define mutualism. Give example. (K.B)**

(GRW 2016)

**Ans:** Page no 212, 213.

**Q.9 How Rhizobium bacteria and leguminous plants are mutualistic in interactions? (U.B)**

**Ans:** Page no 213.

**Q.10 Define commensalism give one example. (K.B)**

**Ans:** Page no 213.

**Q.11 What is the relationship of honeyguide bird and badgers? (U.B)**

**Ans:**

**RELATIONSHIP OF HONEYGUIDE BIRD AND BADGERS**

The honeyguide bird feeds on wax and the larvae present in honeycombs. It flies around looking for honeycombs, but it is not strong enough to open the comb. Badgers are large mammals that feed on honey. When a honeyguide bird goes to find honeycombs, the badger follows it. When the bird finds a honeycomb, it calls the badger. Sometimes the bird has to stop and wait for the slow-moving badger. After reaching there, the badger opens the honeycomb and both of them eat their foods together. This relationship is the best example of mutualism.

**16.3 MULTIPLE CHOICE QUESTIONS**

**1. Types of symbiosis: (K.B)**

- |       |       |
|-------|-------|
| (A) 1 | (B) 2 |
| (C) 3 | (D) 4 |

**2. Plants show competition for: (K.B)**

- |           |                  |
|-----------|------------------|
| (A) Space | (B) Light        |
| (C) Water | (D) All of these |

**3. Which one is an ectoparasite? (K.B)**

- |               |                 |
|---------------|-----------------|
| (A) Leech     | (B) Liver fluke |
| (C) Tape worm | (D) Ascaris     |

**4. Example of ectoparasite is: (K.B)**

(LHR 2015)

- |             |                |
|-------------|----------------|
| (A) Ascaris | (B) Entamoeba  |
| (C) Lice    | (D) Plasmodium |

**5. Parasitic plants have special roots called: (K.B)**

- |              |                  |
|--------------|------------------|
| (A) Rhizoids | (B) Adventitious |
| (C) Tap      | (D) Haustoria    |

**6. An example of carnivore plants is: (K.B)**

(LHR 2014)

- |                |            |
|----------------|------------|
| (A) Rose plant | (B) Mosses |
|----------------|------------|

- (C) Pitcher plant (D) Ferns
7. **Small plants found growing on the other larger plants: (K.B)**  
 (A) Lichens (B) Parasites  
 (C) Epiphytes (D) Barnacles
8. **Large mammals that feed on honey: (K.B)**  
 (A) Lions (E) Badgers  
 (C) Deer (D) Zebras
9. **An example of endoparasites: (K.B)** (LHR 2017, GRW 2017)  
 (A) Mosquito (B) Leeches  
 (C) Ascaris (D) Lice

## 16.4 ECOSYSTEM BALANCE AND HUMAN IMPACT

### LONG QUESTIONS

- Q.1 Write a note on global warming. (K.B) (LHR 2017)

OR

- What is global warming? Describe its causes. (K.B) (GRW 2017)

Ans:

#### GLOBAL WARMING

##### Definition:

“The **increase** in the **temperature** of the earth due to the **accumulation** of **greenhouse gases** is called **global warming**”.

##### Causes:

The addition of greenhouse gases in atmosphere **increases** the temperature of the **Earth**. These greenhouses gases are:

- **Carbon dioxide**
- **Methane**
- **Ozone**

##### Reflecting Back of Solar Radiations:

These **gases remain** in the **lowest part** of Earth's **atmosphere** and do **not allow** solar **radiations** to **reflect back** into space. As a result, heat remains within the **Earth's atmosphere** and **increases** its temperature.

##### Effects:

Due to **global warming:**

- **Polar ice-caps** and **glaciers** are **melting faster** than the time taken for new ice layers to form.
- **Sea water** is also expanding causing sea levels to rise.
- Due to **melting glaciers**, rivers overflow and cause **floods**.

- Q.2 Describe greenhouse effect. (K.B)

Ans:

#### GREEN HOUSE EFFECT

**Definition:**

“The term '**Greenhouse Effect**' refers to the phenomenon in which certain gases called **greenhouse gases trap heat in the atmosphere**”.

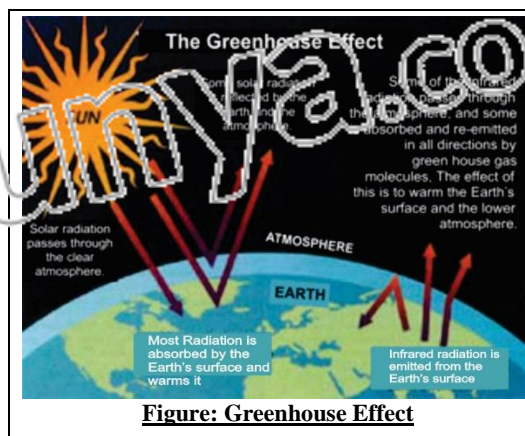
**Escape of Heat:**

These **gases act** like the glass in a **greenhouse**, which **does not allow** the inner heat to escape. When **sunlight reaches** the surface of the Earth, much of its energy is transformed into **heat energy**. The **Earth surface** reflects this heat energy towards space as **infrared radiation**. The greenhouse gases trap **infrared radiation** and send it back to **Earth**.

**Green House Gases:**

Some important greenhouse gases are:

- **Carbon dioxide**
- **Methane**
- **Nitrous oxide**



**Figure: Greenhouse Effect**

**Increase Concentration of Greenhouse Gases:**

Since **1800**, there is remarkable **increase** in the **amount** of the following **gases** in atmosphere:

- **Carbon dioxide 30 %**
- **Methane Doubled**
- **Nitrous oxide 8%**

**Q.3** Describe adverse effects acid rain. (K.B)

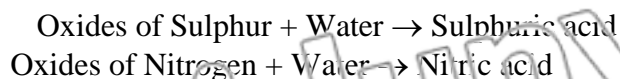
**Ans:**

**ACID RAIN****Definition:**

“The rain consisting of **sulphuric acid** and **nitric acid** with pH range of **3 to 6**”.

**Formation of Acids:**

When **rain falls** through **polluted air**, it comes across **chemicals** such as **oxides of sulphur** and **nitrogen**. These chemicals **interact** with **water vapors** in the presence of **sunlight** to form **sulphuric acid** and **nitric acid**. These acids remain as **vapors** at **high temperatures**.

**pH Level:**

As **temperature** falls, the **acids** begin to **condense** into **liquid** form and mix with **rain** or **snow**, on the way down to the Earth. This makes **rain acidic** with **pH** range of **3 to 6**.

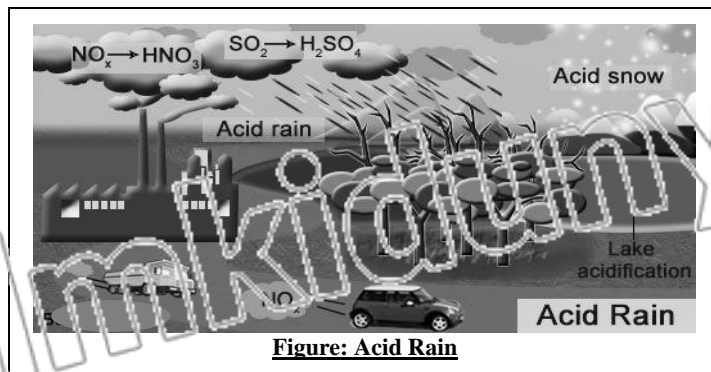


Figure: Acid Rain

**ADVERSE EFFECTS OF ACID RAIN**

Some of the significant ill effects of acid rain are:

**Destruction of Nutrients:**

Acid rain **destroys** the necessary **nutrients** present in the **waters** of rivers and lakes. Acid rain washes **nutrients** out of **soil**.

**Lowering pH Level:**

It also lowers the **pH** of **water**. Most of the **aquatic animals** cannot survive at this pH.

**Damage to Trees:**

It **damages** the bark and leaves of trees and **harms root hairs**. Leaf pigments like **chlorophyll** are also **destroyed**.

**Corrosion:**

**Metallic surfaces** exposed to acid rain are easily **corroded**.

**Loss of Strength:**

The following products **lose** their **material strength** or **disintegrate** easily due to acid rains:

- **Fabrics**
- **Paper**
- **Leather**

**Damage to Building Materials:**

**Building materials** are **weakened** with acid rains because of the **formation** of **soluble compounds** such as:

- **Limestone**
- **Marble**
- **Dolomite**
- **Mortar**
- **Slate**

**Damage to Historical Monuments:**

Acid rain is **dangerous** for **historical monuments**. The building of famous **Taj Mahal** has been **corroded** at **many places**, due to acid rains.

**Q.4** Write a note on deforestation. (K.B)

**Ans:**

**DEFORESTATION****Definition:**

“The clearing of forests by **natural causes** or **humans** is called **deforestation**”.

**Causes:**

**Large areas** of forests have been **cleaned** for:

- **Agriculture**
- **Factories**
- **Roads**

- **Rail tracks**
- **Mining**
- Humans cut trees for **getting wood** (lumber), which is then used for making structures and for heat production.
- Humans **prey upon** forest **animals** which are the **predators** of many **insect pests**. In this way, insect pests destroy forests by eating the shoots and spreading diseases.

**Effects:**

The effects of deforestation include:

- **Floods**
- **Droughts**
- **Landslides**
- **Soil erosions**
- **Global warming**
- **Loss of habitat** of many species

**Q.5 Write a note on overpopulation. (K.B)**

**Ans:** **OVERPOPULATION**

**Population:**

“A **group** of the **organisms** of the **same species inhabiting** a specific geographical area (**habitat**) at a **particular** time is called a population”.

**World Population:**

- When the **industrial revolution** started some 250 years ago, the world population was **600 million**.
- Now the **world population** is almost ten times at **6 billion**.
- The population will grow to **8 billion** by **2025**.

**Reasons:**

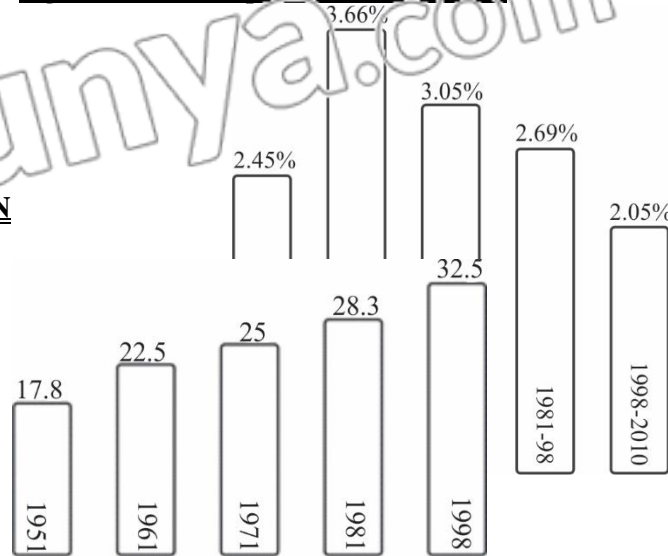
The following things have **contributed** in population growth:

- **Better health facilities**
- **Lowered mortality rates**

<b>Year</b>	<b>Population</b>	<b>Year</b>	<b>Population</b>
1981	85,096,00	1999	134,790,00
1984	92,284,301	2002	144,902,409
1987	99,933,232	2005	155,772,000
1990	107,075,060	2008	166,111,487
1993	116,444,165	2009	169,708,303
1996	125,409,851	2010	173,510,000

		2015	189,000,000
--	--	------	-------------

Figure: Pakistan Population Growth Rates



Q.6 Write a note on urbanization. (A.B)

Ans:

**URBANIZATION**

**Definition:**

“The growing of cities is called urbanization”.

**Reasons:**

People move from rural areas to cities in search of:

- Better jobs
- Education opportunities
- Higher standards of living

**Problems for Government:**

If there is rapid urban growth, the governments find it difficult to provide even the basic facilities like:

(%age)

- Health
- Education
- Shelter
- Water
- Electricity

**Urban Poverty:**

Most of the migrants in cities do not find good jobs and become the part of urban poor.

**Overcrowding:**

There is overcrowding in schools, hospitals etc. The slum areas increase in number and people living there are at greater risk of diseases.

**Global Problem:**

Urbanization is a global problem and cannot be stopped but it can be managed.

**Urbanization in Pakistan:**

The current level of urbanization in Pakistan is about 32% which is not high by global standards.

**Planned Urbanization:**

A planned urbanization can solve many problems.

- The cities should have thick green belts in their surroundings to control pollution.
- The open spaces in cities should be reserved through zoning and land plans.
- The urban spread-out should also be controlled.
- Utilization of public transport instead of individual transports also proves effective way to manage urbanization.

**16.4 SHORT QUESTIONS**

Q.1 What are the different impacts of human on ecosystem? (A.B)

Ans:

**ECOSYSTEM BALANCE AND HUMAN IMPACT**

The interactions among organisms and between organisms and the abiotic components of their environment produce steady and balanced ecosystems. Biogeochemical cycles also maintain the balance in ecosystems by recycling natural resources so that they do not deplete. Humans try to modify environment (e.g. cutting of trees) to fulfil their needs. This has upset the delicate balance in ecosystem and nature as well.

Some of the human impacts on the balance of ecosystems and nature are:



- Global warming
- Acidic rain
- Deforestation
- Overpopulation
- Urbanization

**Q.2 What are causes of deforestation? (A.B)**

**Ans:** Page no 218

**Q.3 What are causes of urbanization? (A.B)**

**Ans:** Page no 219

**Q.4 How planned urbanization can solve many problems? (U.B)**

**Ans:** PLANNED URBANIZATION

Planned urbanization can solve many problems. The cities should have thick green belts in their surroundings to control pollution. The open space in cities should be reserved through zoning and land plans. The urban spread-out should also be controlled. Utilization of public transport instead of individual transports also proves effective way to manage urbanization.

**Q.5 How much the population of Pakistan in year 1993, 2010? (K.B)**

**Ans:** Page no 219.

**Q.6 What do you mean by IPCC? (K.B)**

**Ans:** IPCC

In 1990, the United Nations established intergovernmental Panel on Climate Change (IPCC). It provides scientific advice to the world leaders on issues like the build-up of greenhouse gases and its prevention. According to IPCC, Earth's surface temperature has increased  $\approx 0.2^{\circ}\text{C}$  per decade in the past 30 years.

**Q.7 What do you know about Maldives Survival? (K.B)**

**OR**

**What is the threat for Maldives due to Oceans? (K.B)**

(GRW 2016)

**Ans:** MALDIVES SURVIVAL

Scientists fear that the sea level is rising up to 0.9cm a year. Rise in sea level has worst effects on coastal countries. Most of the islands of the Maldives are less than 1 metre above sea level. It is estimated that within 100 years, the Maldives might become uninhabitable and the citizens would be forced to evacuate.

**Q.8 What are the effect of global warming? (A.B)**

(LHR 2016)

**Ans:** Page no 216.

**Q.9 What is greenhouse effect? (K.B)**

(GRW 2017)

**Ans:** Page no 216.

### 16.4 MULTIPLE CHOICE QUESTIONS

1. **Average sea level rising in a year: (K.B)**

- (A) 0.6 cm (B) 0.7 cm  
(C) 0.8 cm (D) 0.9 cm

2. **Since 1800, the amount of carbon dioxide in atmosphere has increase up to: (K.B)**

- (A) 20% (E) 25%  
(C) 30% (D) 35%

3. **Clearing of forests by natural causes or humans is: (K.B)**

- (A) Deforestation (B) Afforestation  
(C) Forestation (D) Acidic Rain

4. **IPCC was established in: (K.B)**

- (A) 1990 (B) 1992  
(C) 1996 (D) 1998

5. **Increase in Earth's temperature for the last 30 years. (K.B)**

- (A)  $0.1^{\circ}\text{C}$  (B)  $0.2^{\circ}\text{C}$   
(C)  $0.3^{\circ}\text{C}$  (D)  $0.4^{\circ}\text{C}$

6. **Height of the most of the islands of the Maldives is less than above sea level: (K.B)**  
 (A) 4 meters (B) 3 meters  
 (C) 2 meters (D) 1 meters
7. **Acid rain contains: (K.B)**  
 (A) Sulphuric acid (B) Nitric acid  
 (C) Sulphuric acid, Nitric acid (D) Hydrogen
8. **pH of acidic rain ranges from: (K.B)**  
 (A) 1 to 4 (B) 2 to 6  
 (C) 2 to 5 (D) 3 to 6
9. **Effects of deforestation include: (A.B)**  
 (A) Floods (B) Droughts  
 (C) Soil erosions (D) All of these
10. **Population of Pakistan in 1981: (K.B)**  
 (A) 107,975,060 (B) 99,953,232  
 (C) 92,284,301 (D) 85,096,000
11. **Population of Pakistan in 1984: (K.B)**  
 (A) 107,975,060 (B) 99,953,232  
 (C) 92,284,301 (D) 85,096,000
12. **Population of Pakistan in 1996: (K.B)**  
 (A) 116,444,165 (B) 125,409,851  
 (C) 134,790,000 (D) 144,902,409
13. **Population of Pakistan in 1999: (K.B)**  
 (A) 116,444,165 (B) 125,409,851  
 (C) 134,790,000 (D) 144,902,409
14. **Population of Pakistan in 2009: (K.B)**  
 (A) 173,510,000 (B) 169,708,303  
 (C) 166,111,487 (D) 155,772,000
15. **Population of Pakistan in 2010: (K.B)**  
 (A) 173,510,000 (B) 169,708,303  
 (C) 166,111,487 (D) 155,772,000

## 16.5 POLLUTION ITS CONSEQUENCES AND CONTROL

### LONG QUESTIONS

Q.1 Describe different types of pollution. (K.B)

Ans:

#### POLLUTION

#### Definition:

“Any **undesirable change** in the **physical, chemical or biological characteristics** of air, water and land that may **harmfully affect** living organisms and **natural resources** is called **pollution**.”

#### Explanation:

For better life, **human society** is becoming more and more **dependent** on technologies and **industries**. Technology and industry are making the life **easier** and **convenient** for humans but are also **contributing towards** the pollution of **environment**.

#### Pollutants:

The **substances** that actually **cause pollution** are called the **pollutants**. They may be the **industrial effluents, domestic waste, medical wastes** etc. Pollutants are of two types i.e. **biodegradable** and **non-biodegradable**.

**Types of Pollution:**

- Air pollution
- Water pollution
- Land pollution
- Noise pollution

**Q.2 Write a note on air pollution. (I.B) (Understanding the Concept Q.6)**

**Ans:**

**AIR POLLUTION****Definition:**

“The change of composition of air by the addition of **harmful substances** is called air pollution”.

**Major Issue:**

Air pollution is one of the **major** environmental **issues** of today.

**Harmful Substances:**

The **harmful substances** causing air pollution may be:

- **Industrial gases**
- **Automobile gases**
- **Particulate matter**

**Sources:**

All sources of **air pollution** are related to **human activities**.

**Combustion:**

**Burning** of coal produces a lot of **smoke** and **dust** whereas **burning** of **petroleum** produces **sulphur dioxide**.

**Air Pollutants:**

In addition to these, **air pollutants** include:

- **Carbon monoxide**
- **Carbon dioxide**
- **Nitrogen oxides**
- **Hydrocarbons**
- **Particulate matter**
- **Traces of metals**

**Industrial Air Pollution:**

Different **industries** produce air pollution in the following way:

**Fertilizer Industries:**

**Fertilizer** industries release:

- **Oxides of sulphur**
- **Oxide of nitrogen**
- **Hydrocarbons**
- **Particulate matter**
- **Fluorine**

**Thermal Industries:**

**Thermal industries** are **coal based** and their pollutants are:

- **Fly ash**
- **Soot**
- **Sulphur dioxide**

**Textile Industries:**

Textile industries release:

- **Cotton dust**

- Nitrogen oxides
- Chlorine
- Smoke
- Sulphur dioxide

**Steel Industries:**

Steel industries release:

- Carbon monoxide
- Carbon dioxide
- Sulphur dioxide
- Phenol
- Fluorine
- Cyanide
- Particulate matter

**EFFECTS OF AIR POLLUTION**

The effects of air pollution are as follows:

- Global Warming
- Smog Formation
- Acid Rain
- Ozone Depletion

**Global Warming:**

Global warming is one of the **consequences** of air pollution.

**Smog Formation:**

**Smoke + Fog = Smog**

When pollutants like **hydrocarbons** and **nitrogen oxides** combine in the presence of sunlight, smog is formed. This is a mixture of gases. It forms a **yellowish-brown haze** especially during **winter**.

**Effects of Smog:**

The **bad effects** of smog are:

- It **hampers visibility** during winter.
- It causes many **respiratory disorders**.
- It causes **allergies** as it contains polluting gases.

**Acid Rains:**

The air pollutants like **sulphur dioxide** and **nitrogen oxides** react with water in the atmosphere producing **acid rains**.

**Ozone Depletion:**

The upper layer (**stratosphere**) of the atmosphere has **ozone (O<sub>3</sub>)** which **absorbs ultraviolet (UV)** rays present in the **sun's radiation**. However, the air pollutants like **chlorofluorocarbons (CFCs)** **destroy** the **ozone** molecules and so break the **ozone layer**. **Ozone holes** are created which permit UV rays to reach the **Earth's surface**. The UV rays increase the temperature and also cause skin **cancers**.

**CONTROL OF AIR POLLUTION**

For effective **control** of air pollution, it is important to create **public awareness** about the ill-effects of air pollution. Air pollution can be controlled by the following ways:

**Afforestation:**

The **establishment** of new forests by **planting** on **non-forest** areas is called afforestation. Forests are effective means to **control air pollution** because plants can **filter** and **absorb air pollutants**.

**Modification of Industrial Effluents:**

The **air pollutants** coming from **industries** should be passed through **filters** and other

devices, so that the **particulate matter** is **removed** before the **waste gases** are **released out**. The smoke producing units should have long chimneys to take the polluting gases far above and then disperse over a larger area.

Industries should also invest for solar cookers or for producing bio gas.

**Environment Friendly Fuels:**

Lead-free fuels should be used in automobiles. Similarly, sulphur-free fuel should be used in coal-based industry to reduce pollution by sulphur dioxide.

**Q.3** Write a note on water pollution. (K.3) (Understanding the Concept Q.6)

**Ans:**

**WATER POLLUTION**

**Definition:**

"The change in the composition of water by the addition of harmful substances is called water pollution."

**Sources of Water Pollution:**

Following are the sources of water pollution:

**Sewage:**

Sewage is one of the major pollutants of water. It contains organic matter and the excreta of human and other animals. Organic matter encourages the growth of micro-organisms which spread diseases.

**Industrial Wastes:**

The wastes of industries (acids, alkalis, dyes and other chemicals) are disposed in nearby water bodies. These wastes change the pH of water and are harmful or even fatal to aquatic organisms.

**Hot Water:**

Certain industries release a lot of hot water from their cooling plants. It results in heating up of water bodies and kills aquatic life.

**Fertilizers and Pesticides:**

Fertilizers and pesticides enter into water bodies with the rain water flow and the ground water by seepage. These chemicals remain in water for a long time and can enter food chains. They cause a number of diseases in animals.

**Oil Leakage:**

Oil tankers and offshore petroleum refineries cause oil leakage into water. Oil floats on the water surface and prevents atmospheric oxygen from mixing in water. So, aquatic animals begin to die due to oxygen shortage.

**Heavy Metals:**

Some heavy metals e.g. lead, mercury, arsenic and cadmium also make the water polluted. Such metals can be present in the water, released from industrial and urban areas.

**EFFECTS OF WATER POLLUTION**

Water pollution severely affects the health of people.

The following are major effects of water pollution

**Eutrophication:**

The enrichment of water with inorganic nutrients like nitrates and phosphates is called eutrophication.

**Algal Blooms:**

The sewage and fertilizers contain large amount of inorganic material (**nutrients**). When sewage and fertilizers reach water bodies, the nutrients present in them promote algal blooms (excessive growth) there. Rich algal growth leads to increase in the number of the decomposers. Decomposers use the oxygen present in water and it results in the depletion of oxygen. Algal bloom also reduces the light reaching the lower layers in water.

**Food Chain Contamination:**

The non-biodegradable **water pollutants** may stay in water for long times. From water, they

enter into small organisms, which are fed upon by fish. The fish in turn are fed upon by land animals including human.

**Epidemics:**

**Organic pollutants** in water facilitate the growth of germs. Such polluted water causes **epidemics** like cholera, **gastroenteritis** etc.

**Effect of Heavy Metals:**

If water with such heavy metals is given to plants, the metals enter the vegetables that grow on these plants. Such contaminated vegetables are harmful for human health. Following are the adverse effects of heavy metals:

- Reduce growth and development
- Cause cancer
- Damage to nervous system

**Effect of Mercury and Lead:**

Mercury and lead can cause:

- Joint diseases such as **rheumatoid arthritis**
- Diseases of kidneys
- Diseases of circulatory system and nervous system

**CONTROL OF WATER POLLUTION**

**Public Awareness:**

Public should be made aware of the dangers of water pollution.

**Sewage Treatment:**

Before releasing the sewage into water bodies, it must be purified through sewage treatment techniques.

**Industrial Waste Treatment:**

Industrial wastes should also be treated before they are released into water bodies.

**Q.4 Write a note on land pollution. (K.B)**

**Ans:**

**LAND POLLUTION**

**Definition:**

The change in the composition of soil by the addition of harmful substances is called land pollution.

**Importance of Land:**

Land (soil) is an important resource as it is the basis for the growth of producers. In the recent times, soil has been subjected to pollution.

**Sources of Land Pollution:**

Following are the main sources of land pollution:

**Pesticides:**

The pesticides used in agriculture have chemicals that stay in soil for long times.

**Acid Rains:**

The acid rains change the pH of soil making it unsuitable for cultivation.

**Garbage:**

The household and other city garbage lies scattered in soil in the absence of a **proper disposal system**.

**Polythene Materials:**

Materials like polythene block the passage of water into soil and so decrease the **water-holding capacity of soil**.

**Industrial Wastes:**

Many industries produce harmful chemicals which are disposed of without being treated.

**Nuclear Wastes:**

Improper disposal of nuclear wastes also causes radioactive substances to remain in soil for a long time.

**Improper Sewerage System :**

Open latrines in villages and some parts of cities are also the source of land pollution.

**CONTROL OF LAND POLLUTION**

**Disposal of Wastes:**

There should be suitable and safe disposal of wastes including nuclear wastes.

**Recycling:**

Non-biodegradable materials like plastic, glass, metals etc. should be recovered and recycled.

**Less use of Inorganic Pesticides:**

Inorganic pesticides should be replaced by organic pesticides.

**16.5 SHORT QUESTIONS**

**Q.1 Define noise pollution? (K.B)**

**Ans:** NOISE POLLUTION

**Definition:**

“Unwanted, unpleasant and annoying sounds are termed as noise. Noise is also considered as a form of pollution”.

**Effects:**

Immediate effects of noise pollution are annoyance and aggression and the long term effects are hearing loss, depression, hypertension etc.

**Q.2 In which country harmful effects of UV rays visible? (K.B)**

**Ans:** EFFECTS OF UV RAYS

The harmful effects of the UV rays are visible in the countries such as Australia and New Zealand where the rate of skin cancer is higher than the other regions of the world.



**Q.3 Explain Kasur Tannery pollution control project. (A.B)**

**Ans:** TANNERY POLLUTION CONTROL PROJECT

There are more than 200 tanneries (industry where raw skin is treated to make leather) operating in Kasur city. The industry discharges 9000 cubic meters of waste water daily into the nearby water bodies. This water contains heavy metals and becomes a part of the underground water.

In 2003, a survey showed that two-thirds of residents and 72 percent of tannery workers suffered cancer, infections of the kidney, or loss of eyesight. These showed that the drinking water was contaminated with lead, mercury and chromium.

The Pakistan government and the United Nations Development Programmed (UNDP) launched the Kasur Tannery Pollution Control Project. The project has established and effluent treatment plant, chromium plant and a solid waste disposal site.

**Q.4 What are pollutants? Give example. (K.B)**

**Ans:** POLLUTANTS

**Definition:**

“The substances that actually cause pollution are called the pollutants”.

**Example:**

May be industrial effluents, domestic waste and medical waste are of its example.

**Q.5 What are the types of pollutants? (K.B)**

**Ans:**

**POLLUTANTS**

The types of pollutants are as follows:

- Biodegradable
- Non-Biodegradable

**Q.6 Define pollution. (K.B)**

**Ans:** Page no 225.

**Q.7 Define air pollution. (K.B)**

**Ans:** Page no 222.

**Q.8 Write the two sources of air pollution. (A.B)**

**Ans:** Page no 222.

**Q.9 How air pollution relates to human activities? Comments. (U.B)**

**Ans:**

**AIR POLLUTION AND HUMAN ACTIVITIES**

Air pollution are related to human activities.

- Burning of coal produces a lot of smoke and dust
- Burning of petroleum produces SO<sub>2</sub> It will harm the environment.

**Q.10 What are air pollutants of fertilizer industry? (U.B)**

(LHR 2013)

**Ans:** Page no 223.

**Q.11 Define smog. (K.B)**

**Ans:** Page no 223.

**Q.12 What are the effects of smog? (A.B)**

**Ans:** Page no 223.

**Q.13 Define acid rain. (K.B)**

(GRW 2015, BWP 2014)

**Ans:** Page no 217.

**Q.14 Differential between deforestation and afforestation. (K.B)**

**Ans:**

**DIFFERENTIATION**

The difference between deforestation and afforestation is as follows:

Deforestation	Afforestation
Deforestation means clearing of forests by natural causes or humans.	Afforestation means the establishment of new forest by planting on non-forest areas.

**Q.15 Define the term eutrophication. (K.B)**

**Ans:** Page no 225.

**Q.16 What are causes of land pollution? (A.B)**

**Ans:** Page no 226.

**Q.17 What are control measures of land pollutions? (A.B)**

**Ans:** Page no 226.

**Q.18 Write side effect of tanneries in Kasur city (A.B)**

**Ans:**

**SIDE EFFECT OF TANNERIES**



In 2003, a survey showed that two-thirds of resident and 72 percent of tannery workers suffered cancer, infections of the kidney, or loss of eyesight. Tests showed that the drinking water was contaminated with lead, mercury and chromium.

**Q.19 Write names of some heavy metals. (K.B)**

**Ans:** HEAVY METALS

Some heavy metals are given below

- Mercury
- Arsenic
- Cadmium
- Lead

### 16.5 MULTIPLE CHOICE QUESTIONS

1. **Non-biodegradable materials like \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_ should be recovered recycled. (K.B)**  
 (A) Plastics, Glass, metals (B) Plastics, metals, pesticides  
 (C) Plastics, metal, Fertilizes (D) None
2. **Improper disposal of nuclear wastes also causes radioactive substances to remain in soil for a \_\_\_\_\_. (K.B)**  
 (A) Shorter time (B) Longer time  
 (C) Not a shorter time (D) None
3. **Kasur Tannery industry discharges \_\_\_\_\_ cubic meter of waste water daily into nearby water bodies. (K.B)**  
 (A) 7000 cubic meter (B) 8000 c.m  
 (C) 9000 c.m (D) 10000 c.m
4. **In 2003, a survey showed that two-thirds of residents and \_\_\_\_\_ percent of tannery worked suffered cancer, infection of Kidney etc. (K.B)**  
 (A) 70% (B) 72%  
 (C) 73% (D) 75%
5. **Mercury and lead can cause, diseases: (A.B)**  
 (A) Rheumatoid arthritis (B) Disease of kidney  
 (C) Circulatory system (D) Rheumatoid arthritis, Disease of kidney
6. **Steel industries release: (K.B)**  
 (A) CO (B) CO<sub>2</sub>  
 (C) SO<sub>2</sub> (D) CO, CO<sub>2</sub>, SO<sub>2</sub>
7. **Textile industries release: (K.B)**  
 (A) Cotton dust (B) Chlorine  
 (C) Cotton dust, Chlorine (D) Cyanide
8. **Thermal industries release: (K.B)**  
 (A) Coal (B) Fly ash  
 (C) Soot (D) SO<sub>2</sub>, Soot
9. **Fertilizer industries release: (K.B)**  
 (A) Hydrocarbons (B) Fluorine  
 (C) Hydrocarbons, Fluorine (D) Chlorine
10. **According to estimates the increase in average global temperature in the next 100 years: (U.B)**  
 (A) 1°C to 3°C (B) 3°C to 7°C  
 (C) 3°C to 8°C (D) 4°C to 9°C
11. **Ozone is: (K.B)**  
 (A) O<sub>2</sub> (B) O<sub>3</sub>  
 (C) O<sub>4</sub> (D) O<sub>5</sub>
12. **In which country the rate of skin cancer is higher: (K.B)**

- (A) Japan (B) China  
 (C) India (D) Australia
13. **Number of tanneries in Kasur: (K.B)**  
 (A) 200 (B) More than 200  
 (C) Less than 200 (D) None of these

**16.6 CONSERVATION OF NATURE**

**LONG QUESTIONS**

**Q.1 What is 3R principle? (A.B)**

**Ar:**

**3R PRINCIPLE**

To ensure sustainable use of resources in our environment, we should act upon the principle of the 3R' i.e.

- Reduce
- Reuse
- Recycle

**The R1: Reduce:**

- We should use the natural resources less and should not waste them.
- We should use this principle at different places, in our daily lives.
- We should not waste water, electricity, fuel etc.
- We should turn off the tap when not in use.
- We should bathe with a bucket instead of shower.
- The lights and fans should be off, when we are not in room.
- We should take public transport (like buses) or walk short distances instead of using motor fuel.
- We should not waste food and should give unused food to poor people.

**The R2: Reuse:**

We should use things again and again. We should not throw away materials such as glass containers, plastic bags, paper, cloth etc. These should be reused at domestic levels rather than being thrown. It also reduces solid waste pollution.

**The R3: Recycle:**

Materials such as paper, plastic, glass etc. can be recycled. This decreases the volume of refuse and helps in the conservation of natural resources. A recycling of one ton of paper can save 17 trees.

**Addition of R4: Reforest:**

We can add the R4 i.e. Reforest. Trees should be planted during the rains. Trees make our environment more cool, shady and green.

**Q.2 Describe the plans for the conservation of nature. (A.B)**

**Ans:**

**PLANS FOR THE CONSERVATION OF NATURE**

The following are the projects and plans of our government for the conservation of resources.

**National Conservation Strategy:**

In 1992, Pakistan developed the National Conservation Strategy. The main objectives of the strategy are conservation of natural resources and improved efficiency in the use of resources. It also covers the policies for promoting efficiency and conservation of energy resources.

**National Drinking Water and Sanitation Policy:**

The Federal Ministry of Environment has launched the National Drinking Water and

Sanitation Policy. It focuses on the provision of clean drinking water to entire population and the conservation of water resources. Water purification plants are being installed all over the country.

**Mass Awareness for Water Conservation and Management:**

In 2006, the UNDP launched the project "Mass Awareness for Water Conservation and Management". The objective of the project was to launch a comprehensive awareness campaign for the conservation and management of water resources in Pakistan.

**Role of SCOPE:**

The organization SCOPE (Society for Conservation and Protection of Environment) works with government for mass awareness and research for the conservation of natural resources in Pakistan.

**Role of World-Wide Fund for Nature:**

The WWF (old name is World Wildlife Fund but now it is called World Wide Fund for Nature) is working on many projects related to the conservation of nature.

The following are some important programmes of WWF-Pakistan in collaboration with the government of Pakistan:

- Improving sub-watershed management and environmental awareness around Ayubia National Park
- Plantation of the trees of Jatropha and Mangroves at District Thatta, Sindh
- District-wise forest cover assessment of Pakistan
- Saving Wetlands Sky High Programme (for the conservation and management high altitude wetlands)
- Indus Basin Water Security Project (to protect the water-flow needed for the maintenance of river ecosystem and for the benefit of nearby areas)
- Regional Climate Risk Reduction in Himalayas

**Q.3 Write a note on dengue fever. (K.B)**

**Ans: DENGUE FEVER**

**Causative Organism:**

Dengue fever is a viral infection transmitted through a mosquito *Aedes aegypti*.

**Major Health Problem:**

It has become a major health problem in tropical and sub-tropical countries, including Pakistan.

**Viral Attack and Immunity:**

There are four types of dengue virus. Recovery from infection by one provides lifelong immunity against that virus but provides no protection against infection by the other three viruses.

**Incidence:**

According to the World Health Organization, there are 50 million dengue infections worldwide every year. Now, there are 2.5 billion people at risk from dengue.

**Spread of Disease:**

The female *Aedes* mosquito gets the virus when it bites an infected person. When an infected mosquito bites another person, viruses enter his/her blood and attack white blood cells. Inside WBCs, viruses reproduce and destroy them.

**Life Cycle of Aedes Mosquito:**

Adult Aedes → Eggs of Aedes → Larva of Aedes → Pupa of Aedes

**Symptoms:**

In severe cases, the virus affects liver and bone marrow. As a result, there is a decrease in the production of blood platelets and patient suffers from bleeding.

Other symptoms of dengue include:

- High fever
- Severe headache
- Pain behind the eyes
- Muscle and joint pains
- Rash

**Complications:**

Sometimes, dengue fever converts into:

**Dengue Haemorrhagic Fever (DHF):**

DHF results in:

- Bleeding
- Low levels of blood platelets
- Blood plasma leakage

**Dengue Shock Syndrome (DSS):**

In DSS the blood pressure falls dangerously low.

**Vaccination:**

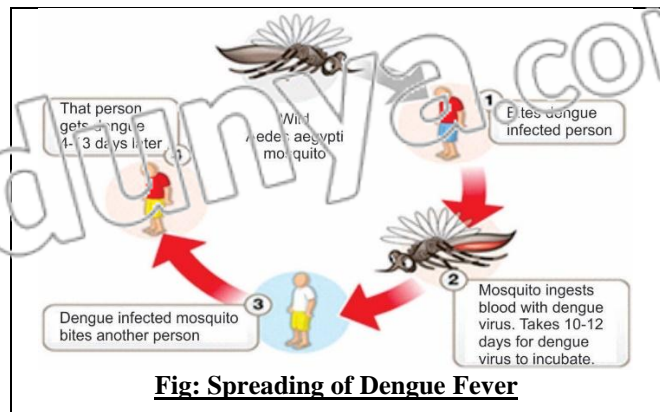
There is no vaccine for dengue fever.

**Treatment:**

There is no treatment of dengue fever.

**Control:**

At present, the only method of controlling dengue virus transmission is to check the spread of *Aedes* mosquitoes.



**Fig: Spreading of Dengue Fever**

**Breeding of Aedes aegypti:**

Aedes aegypti breeds primarily in the:

- Containers used for water storage
- Discarded plastic containers
- Used automobile tyres
- Items that collect rain water

**Control over Mosquitoes.**

The mosquitoes can be controlled through:

- Proper solid waste disposal
- Improved water storage practices

**Use of Predators:**

Small fish and crustaceans have also been used for killing the larvae of the mosquito.

**Use of Insecticides:**

Insecticide sprays have not proved efficient in killing the mosquitoes, because spray does not penetrate all habitats of adult mosquitoes.

**16.6 SHORT QUESTIONS**

**Q.1 How can we conserve nature? (U.B)**

**Ans:** CONSERVATION OF NATURE

**Meaning:**

Conservation of nature means the conservation of natural resources.

**Need of Conservation:**

Everything that we use or consume e.g. food, petrol etc. is obtained from natural resources. The renewable natural resources e.g. air reproduced easily but the 'non-renewable resources (e.g. minerals and fossil fuels) are not replenished once they get depleted. We have to conserve the non-renewable resources because their reserves are limited' and humans are heavily dependent on them for daily needs. The renewable resources too have to be judiciously used.

**Q.2 What do you mean by principle of 3-R? (A.B)**

**Ans:** Page no 229.

**Q.3 What is SCOPE? (K.B)**

**Ans:** SCOPE

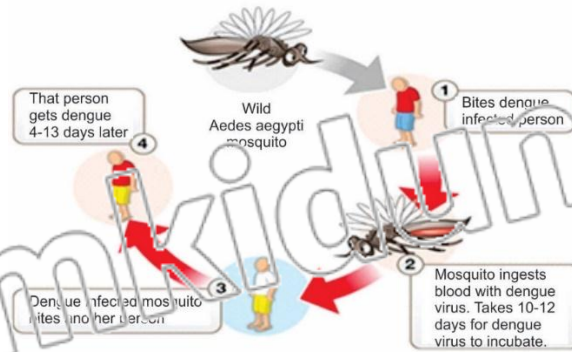
The organization SCOPE (Society for Conservation and Protection of Environment) works with government for mass awareness and research for the conservation of natural resources in Pakistan.

**Q.4 Write symptoms of dengue fever. (K.B)**

**Ans:** Page no 231.

**Q.5 Write life cycle of Aedes mosquito. (U.B)**

**Ans:** LIFE CYCLE OF AEDES MOSQUITO



**Q.6** Describe severe forms of dengue fever. (K.B)

**Ans:** Page no 231.

**Q.7** What will happen if we deplete nature resource? (U.B)

**Ans:** DEPLETION NATURAL RESOURCE

Clean water, air, fuels, agricultural land and forests appeared to be plentiful earlier, but now these are becoming scarce. If we continue depleting them like this, we will be creating untold misery for ourselves and for our future generations.

### 16.6 MULTIPLE CHOICE QUESTIONS

- Pakistan developed the national conservation strategy for conservation of natural resources in: (K.B)**

(A) 1991 (B) 1992  
(C) 1993 (D) 1994
- The UNDP launched the project mass awareness for water conservation and management in: (K.B)**

(A) 2003 (B) 2004  
(C) 2005 (D) 2006
- The organization works with government for mass awareness and research for the conservation of natural resources' is called: (K.B)**

(A) UNDP (B) UNCP  
(C) Scope (D) WWFP
- It means the establishment of new forests by planting on non forest areas called \_\_\_\_\_. (K.B)**

(A) Deforestation (B) Afforestation  
(C) Concretion (D) Assimilation
- The recycling of one tone of paper can save how many trees? (K.B)**

(A) 13 (B) 15  
(C) 17 (D) 19
- Number of Dengue infections worldwide every year: (K.B)**

(A) 20 million (B) 30 million  
(C) 40 million (D) 50 million
- How many people are at risk from dengue? (K.B)**

- (A) 1.5 billion
- (B) 2.0 billion
- (C) 2.5 billion
- (D) 3.0 billion

8. **R-2 means: (K.B)**

(JHK 2017)

- (A) Reduce
- (B) Recycle
- (C) Renewable
- (D) Reuse

**ANSWER KEY**

**MULTIPLE CHOICE QUESTIONS**

**16.1 LEVELS OF ECOLOGICAL ORGANIZATION**

1	D	2	C	3	D	4	C	5	B	6	D
7	B	8	B	9	A	10	B	11	B	12	B

**16.2 FLOW OF MATERIALS AND ENERGY IN ECOSYSTEMS**

1	C	2	D	3	B
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**16.2.4 BIOGEOCHEMICAL CYCLES**

1	B	2	A	3	B	4	D	5	C	6	B	7	D
---	---	---	---	---	---	---	---	---	---	---	---	---	---

**16.3 INTERACTIONS IN ECOSYSTEMS**

1	C	2	D	3	A	4	C	5	D	6	C
7	B	8	B	9	C						

**16.4 ECOSYSTEM BALANCE AND HUMAN IMPACT**

1	D	2	C	3	A	4	A	5	B	6	D
7	C	8	D	9	D	10	D	11	C	12	B
13	C	14	B	15	A						

**16.5 POLLUTION ITS CONSEQUENCES AND CONTROL**

1	A	2	B	3	C	4	B	5	A	6	D
7	A	8	D	9	C	10	C	11	B	12	D
13	A										

**16.6 CONSERVATION OF NATURE**

1	B	2	D	3	C	4	B	5	C	6	D
7	C	8	D								

**REVIEW QUESTIONS****MULTIPLE CHOICE QUESTIONS**

- Which of the following is the abiotic component of the ecosystem? (K.B)
  - Producers
  - Herbivores
  - Carnivores
  - Oxygen
- When we eat onions, our trophic level is; (U.B)
  - Primary consumer
  - Secondary consumer
  - Decomposer
  - Producer
- Identify the correctly matched pair: (U.B)
  - Rainfall - biotic factors in ecosystem
  - Global warming - formation of fossil fuels
  - Renewable natural resource - air
  - Corn - secondary consumer
- In the food chain tree → caterpillar → robin → hawk → coyote, which is the secondary consumer? (K.B)
  - Caterpillar
  - Robin
  - Hawk
  - Coyote
- In ecosystems, the flow of \_\_\_\_\_ is one way, while \_\_\_\_\_ is/are constantly recycled. (U.B)
  - Minerals, energy
  - Energy, minerals
  - Oxygen, energy
  - Glucose, water
- In the food chain "grass → rabbit → fox → bear → mushroom", how many types of decomposers are present? (K.B)
  - 1
  - 2
  - 3
  - 4
- Organisms in the ecosystem that are responsible for the recycling of plant and animal wastes are: (K.B)
  - Producers
  - Consumers
  - Decomposers
  - Competitors
- Which form of Nitrogen is taken by the producers of the ecosystem? (K.B)
  - Nitrogen gas
  - Ammonia
  - Nitrites
  - Nitrates



**ANSWER KEY**

1	d	2	a	3	c	4	b	5	b	6	a
7	c	8	d								

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**SHORT QUESTIONS**

**1. What are the different levels of ecological organization? (K.B)**

**Ans:** LEVELS OF ECOLOGICAL ORGANIZATION

In ecology the levels of organization range from organism to biosphere. The followings are the levels of ecological organization

- Species
- Population
- Community
- Ecosystem
- Biosphere

**2. Define ecosystem and its components. (K.B)**

**Ans:** ECOSYSTEM

**Definition:**

“The self-sufficient unit of an environment that is formed as a result of interactions between its biotic community and the abiotic components is known as an ecosystem.”

An ecosystem comprises of two basic parts:

- Abiotic components
- Biotic components

**3. How the flow of energy is different from that of materials?**

**(K.B)**

**Ans:** DIFFERENTIATION

The differences between flow of energy and flow of materials are as follows:

Flow of Energy	Flow of Materials
<ul style="list-style-type: none"> <li>• The flow of energy in different trophic levels of ecosystem is unidirectional.</li> </ul>	<ul style="list-style-type: none"> <li>• The materials flow from one trophic level to the next by means of food chains and food webs.</li> </ul>
<ul style="list-style-type: none"> <li>• The sun is the primary source of energy for all ecosystem.</li> </ul>	<ul style="list-style-type: none"> <li>• Different organisms depend on different organisms for the material in an ecosystem.</li> </ul>
<ul style="list-style-type: none"> <li>• Flow of energy follows basic law of thermodynamics.</li> </ul>	<ul style="list-style-type: none"> <li>• Flow of materials don't follow any law in an ecosystem.</li> </ul>
<ul style="list-style-type: none"> <li>• There is constant flow of energy in an ecosystem.</li> </ul>	<ul style="list-style-type: none"> <li>• Materials can be more or less in an ecosystem.</li> </ul>

**4. Define food chain and food web. (K.B)****Ans:** **FOOD CHAIN AND FOOD WEB****Food Chain:**

“A food chain is series of organisms within an ecosystem in which each organism feeds on the one before it and is fed by the one after it”.

**Examples:**

Grass → Grasshopper → Sparrow → Hawk

- The base of food chain is always formed by a plant (producer).
- It is eaten by a primary consumer, which is preyed upon by a secondary consumer.
- The secondary consumer may be eaten by a tertiary consumer.

**Food Web:**

“A network of food chains which are interconnected at various trophic levels”.

**5. What do you mean by the concept of 3Rs with reference to the conservation of natural resources? (K.B)****Ans:** **CONCEPT OF 3RS**

To ensure sustainable use of resources in our environment, we should act upon the principle of the 3R' i.e.

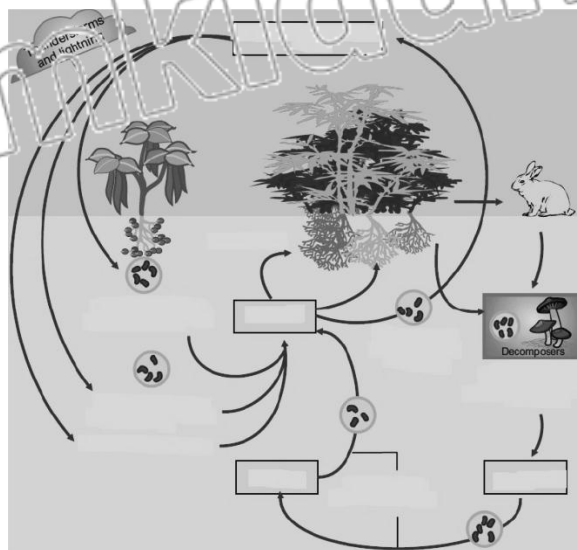
- Reduce
- Reuse
- Recycle

**UNDERSTANDING THE CONCEPT****1. Explain what do you mean by the pyramids of number and biomass? (A.B)****Ans:** See LQ.3 (Topic 16.2)**2. Write a note on Carbon cycle. (K.B)****Ans:** See LQ.2 (Topic 16.2.4)**3. What are the different stages of Nitrogen cycle? (K.B)****Ans:** See LQ.3 (Topic 16.2.4)**4. Write notes on competition, predation and symbiosis. (K.B)****Ans:** See LQ.1, 2,3,4,5 (Topic 16.3)**5. Explain how human activities have contributed to the loss of balance in nature. (A.B)****Ans:** See (Topic 16.4)**6. Write note on the causes and effects of the air and water pollutions. (A.B)****Ans:** See LQ.2, 3 (Topic 16.5)

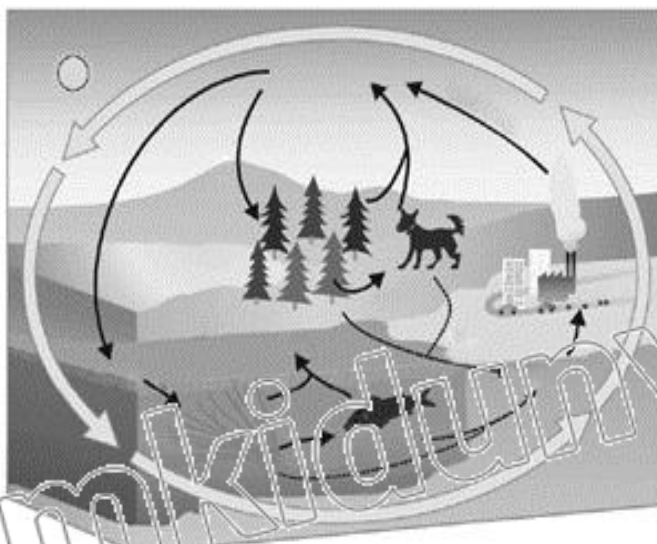
**ASSIGNMENT**

**PRACTICE DIAGRAM & LABEL**

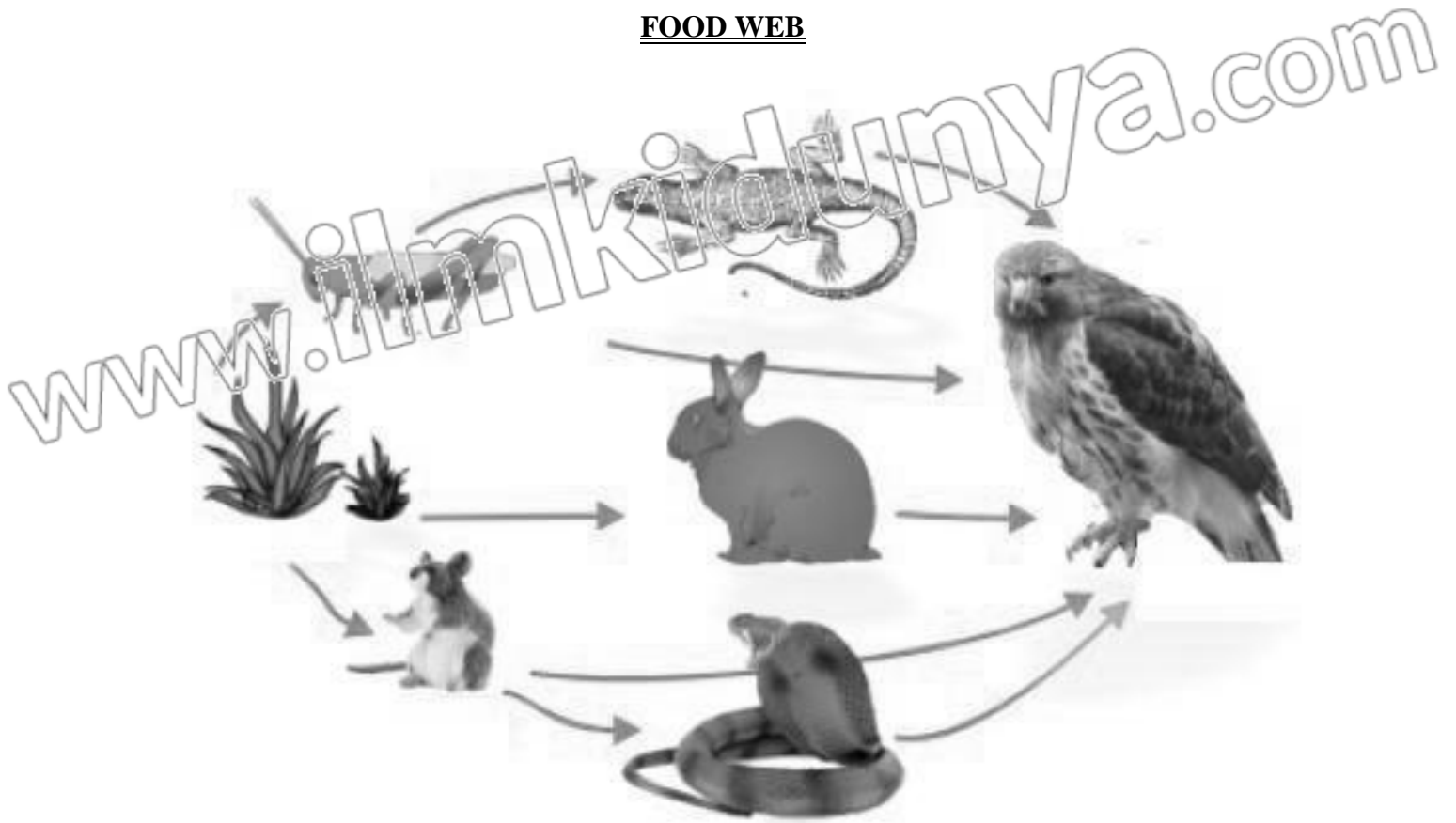
**NITROGEN CYCLE**



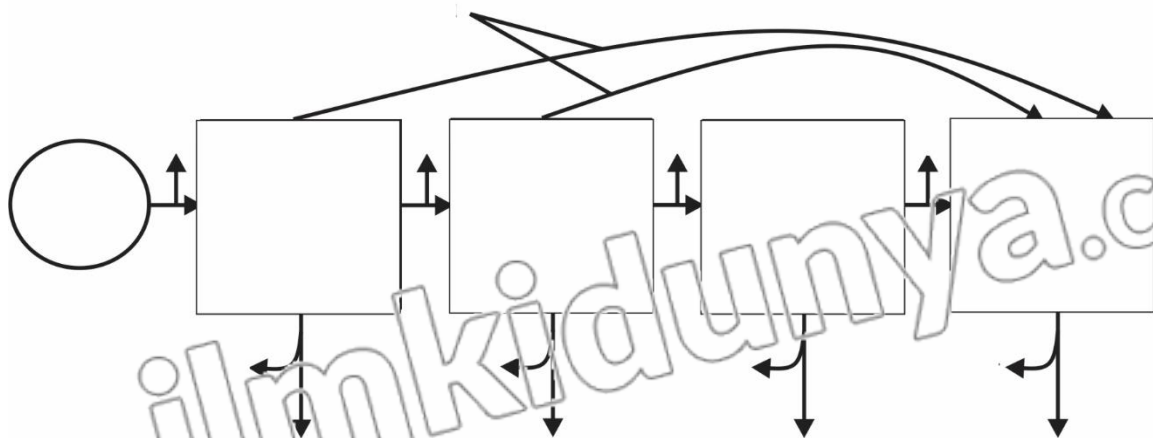
**CARBON CYCLE**



FOOD WEB



ENERGY FLOW IN AN ECOSYSTEM





CUT HERE

**SELF TEST****Time: 40 min****Marks: 25****Q.1 Four possible answers A, B, C and D to each question are given, mark the correct answer.****(6×1=6)****1. An example of artificial ecosystem:**

- (A) River (B) Ocean  
(C) Rain forest (D) Aquarium

**2. Who developed the concept of ecological pyramids?**

- (A) Charles Darwin (B) Charles Elton  
(C) Charles Brown (D) Charles Asker

**3. Which one is an ectoparasite?**

- (A) Leech (B) Liver fluke  
(C) Tape worm (D) Ascaris

**4. Acid rain contains:**

- (A) Sulphuric acid (B) Nitric acid  
(C) Sulphuric acid, Nitric acid (D) Hydrogen

**5. Thermal industries release:**

- (A) Coal (B) Flyash  
(C) Soot (D) Coal, Flyash, Soot

**6. Which of the following is the abiotic component of the ecosystem?**

- (A) Producers (B) Herbivores  
(C) Carnivores (D) Oxygen

**Q.2 Give Short Answers to following questions.****(5×2=10)**

- (i) How planned urbanization can solved many problems?  
(ii) Define Mutualism. Give example?  
(iii) How balance of carbon cycle has been upset by human activities?  
(iv) What are examples of terrestrial and aquatic ecosystem?  
(v) What are causes of land pollution?

**Q.3 Answer the following questions in detail.****(5+4=9)**

- (a) Write a note on nitrogen cycle.  
(b) Describe flow of energy in an ecosystem.

**NOTE:** Parents or guardians can conduct this test in their supervision in order to check the skill of the students.