



MATRIX
OLYMPIAD

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BIOLOGY

Class - VIII



MATRIX

Campus : Piprali Road, Sikar, Rajasthan 332001

Phone : 01572-241911, 01572-243911

Website: www.matrixedu.in

Few words for the Readers

Dear Reader,

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Our team at **MATRIX** has put in their best efforts for making this particular module interesting and relevant for you. Additional efforts have been made to ensure that the content is easy to understand and error free to the extent possible. However, there might remain some inadvertent errors in answer keys and theoretical portion and we would welcome your valuable feedback regarding the same.

If there are any suggestions for corrections, please write to us at smd@matrixacademy.co.in and we would be highly grateful.

Finally, we would like to end this message by a famous quote by Ernest Hemingway - *"There is no friend as loyal as a book."* So, please give your study material the time and attention it deserves, and it will surely help you reach newer heights in your fight with competition examinations.

With love and best wishes !

Team MATRIX

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CROP PRODUCTION AND MANAGEMENT

1

Concepts

Introduction

1. Agriculture
2. Basic Crop Practising

NCERT Solutions

Exercise – I (Competitive Exam Pattern)

Exercise – II (Board Pattern Type)

Answer Key

INTRODUCTION

- For their existence of all living organisms essentially they require food.
- Food is required for growth, development and body repair. It also protects the body from diseases and provides energy for doing all life functions.
- Among all the living organisms, only green plants are autotrophs, i.e., they make their own food. In fact, green plants perform a basic metabolic activity, called photosynthesis
- In photosynthesis by using the energy of sunlight, green plants combine carbon dioxide (CO₂) and water (H₂O) to produce carbohydrates (Food).
- In contrast to green plants, animals and human beings are heterotrophs, i.e., they depend on plants and other animals for food. Plants as food are gift of nature to human and most animals.
- In fact, different parts of plants, such as root, stem, leaf, flower and fruit, are consumed by humans in the form of cereals, vegetables, spices and fruits.

1. AGRICULTURE

- Agriculture is derived from Latin words 'Ager' and 'Cultura'. Ager means land or field and cultura means cultivation. Therefore the term agriculture means cultivation of land i.e. the science and art of producing crops and livestock for economic purposes.

2. BASIC CROP PRACTING

When plants of the same kind are grown and cultivated at one place on a large scale, it is called a crop. India is a vast country. The climatic conditions like temperature, humidity and rainfall vary from one region to another.

(a) Crop seasons :

Different crop requires different climatic conditions, temperature and photoperiod for their growth and maturity. Sunlight is required for photosynthesis - the process of manufacturing food by green plants. Photoperiods are duration of sunlight that influences plants in their growth, flowering, formation of storage organs, leaf fall, etc. In India, there are three main seasons of crop growth: Kharif, Rabi and zayad crop.

S.No.	KHARIF CROP/RAINY SEASON CROP	RABI CROP/WINTER SEASON CROP
1	Are grown during monsoon/rainy season	Are grown during winter season
2	They require warm & wet weather	They require cold & dry weather
3	They are sown in June/July & harvested in September/October	They are sown in October/November & harvested in March/April
4	e.g. - Rice, Jowar, Bajra, Cotton, Groundnut, Urad, Moong etc.	e.g. - Wheat, Barley, Gram, Mustard, Potato etc.

(b) Crop Production Management :

India is an agriculture based country. In this country, agriculture sector engages about 70% of its population and accounts for 40% of the Gross National Product (GNP). Farming practices being followed depend upon size of land holding, education and financial conditions of the farmers. Crop production management refers to controlling the various aspects of crop production, to obtain the maximum and best yield. It has the following three components :

1. Nutrient management 2. Agricultural practices and 3. Cropping pattern.

- **Basic practices of crop production :** Cultivation of crops involves several activities undertaken by a farmers over period of time.

- These activities are listed below :
 - (i) Preparation of soil (ii) Sowing (iii) Adding manure and fertilizers
 - (iv) Irrigation (v) Harvesting (vi) Storage
- (i) Preparation of soil :** The preparation of soil is the first step before growing a crop.
 - One of the most important tasks in agriculture is to turn the soil and loosen it.
 - This allows the roots to penetrate deep into the soil.
 - The loose soil allows the roots to breathe easily even when they go deep into the soil.
 - Various processes are included under preparation of soil these are as follows –



Figure : Soil Preparation

- (A) Ploughing or Tilling :** The process of loosening and turning of the soil is called tilling or ploughing.
 - This is done by using a plough. Ploughs are made of wood or iron.
 - The ploughed field may have big pieces of soil called crumbs.



Figure : Ploughing

- **Significance of ploughing :**
 - This practice loosens the soil.
 - The soil is overturned and properly aerated.
 - This allows the roots to penetrate deeper easily.

- (B) Levelling :** This is the agricultural process to make the soil in level for sowing the seeds. This is done by Leveller which is made of wood or iron. It is a flat 1.8 - 2 m long wooden plank with a log to put weight on it.



Figure : Levelling

- ⇒ **Significance of levelling :**
- This practice smoothens the soil surface.

(C) Agricultural Implements : The tools which are used in cultivation of plants are known as agricultural implements. Some of these tools are used manually whereas others are used with the help of some animals like bullocks and camels. Nowadays tractors and combine harvesters are helping the farmers in their work. A list of commonly used agricultural implements along with their uses are given below.

Khurpa	For weeding	Seed drill	For sowing
Spade	For digging and bunds formation	Harrow	For weeding
		Sickle	For harvesting
Wooden plough	For village	Combines	For harvesting and threshing
Soil plank	For breaking crumbs	Sprayers	For spraying insecticides

Figure : Table : Agricultural implements

→ **Maintenance and Care of Agricultural Implements**

- The tip of the plough should be sharpened at regular intervals for easy penetration into the soil.
- Tools should not be kept in the open during rains, otherwise they will rust.
- Tools of iron can be rubbed with a piece of brick to clean them from rust.
- Occasional servicing of tractors and combines is advisable.
- Sprayers should be washed with water thoroughly before and after each spraying.

(ii) Sowing : Sowing is the most important part of crop production. Before sowing, good quality seeds are selected.

- Good quality seeds should be clean, healthy and of good variety.
- **Selection of seeds :** Good quality seeds are heavier than damaged seeds.
- Damaged seeds become hollow and are thus lighter. So they float on water.
- Seeds should be high yielding varieties, free from insects and pests.
- **Sowing the seeds :** It is done by broadcaster and seed drill.



Figure : Selection of Seeds



Figure : Using seed drill

- **Broadcasting** is the random sowing of seeds manually.
- In **seed drill** method seeds are sown uniformly at proper distances and depths.



Figure : Seed drill

- It ensures that seeds get covered by the soil after sowing.
 - This prevents damage caused by birds.
 - Sowing by using a seed drill saves time and labour.
- **Transplantation** : The process in which seeds are sown in nurseries and seedlings are transferred to the main field e.g. Paddy.
- The uncultivated fields are known as **fallow land**.
- **Precautions during sowing:**
- Spacing should be proper.
 - Seeds should be treated with fungicides.
 - Depth should be proper.

(iii) Nutrient Management : Nutrients are supplied to the plants by air, water and soil. There are about 40 elements found in the plant ash, but only 16 of those elements are essential for plant growth and development. Hence, these 16 elements are called essential elements or essential plant nutrients. Out of 16 essential elements, two elements, carbon and oxygen are obtained from air and hydrogen from water. Remaining 13 elements are supplied by the soil. These 13 elements are minerals. A mineral is a substance which is obtained by mining.

ESSENTIAL NUTRIENTS OF PLANTS THEIR SOURCES, TYPES AND EXAMPLES.			
S.NO.	SOURCE	NUTRIENTS	TYPE
1.	Air	Carbon (C), Oxygen (O)	Macronutrients (=2)
2.	Water	Hydrogen (H)	Macronutrient (=1)
3.	Soil	Nitrogen (N), Phosphorus (P), Potassium (K), Calcium (Ca) Magnesium (Mg) , Sulphur (S). Iron (Fe), Manganese (Mn), Boron (B), Zinc Copper (Cu), Molybdenum (Mo), Chlorine (Cl)	Macronutrients (= 6) (Zn), Micronutrients (=7)

Figure : Nutrient

- **Types of Essential Nutrients** : Maze (1915) divided essential plant nutrients into two categories, macro nutrients and micronutrients.
- (A) **Macronutrients (Macroelements)** : They are those essential elements which are present in plants in easily delectable quantities, more than 1 ppm of plant body (1 mg per gm of dry weight). Out of 13 essential mineral elements, six are macronutrients, i.e., nitrogen, phosphorus, potassium, calcium, magnesium and sulphur.
- (B) **Micronutrients (Microelements)** : They are those essential elements which are present in plants in small quantities, less than 1 ppm or 1 mg/gram of dry matter. Out of 13 essential mineral elements, seven are micronutrients, i.e., iron, manganese, boron, zinc, copper, molybdenum and chlorine.
- **Mineral Replenishment** Soil is the most important reservoir of plant nutrients. Crop plants regularly withdraw minerals (in the form of nutrients) from the soil. Unless and until minerals are replenished at regular intervals, the crop plants will develop disorders in structure, growth, reproduction, functioning and susceptibility to diseases. Mineral replenishment is done through the addition of manures and fertilizers to the crop fields.
Manures and Fertilizers : The deficiency of plant nutrients and organic matter in the soil is made up by adding manures and fertilizers to the soil of crop-fields. Both manures and fertilizers are major sources of nutrients of plants, so they are used in crop production.
- **Manures** : Manures are natural fertilizers. They are bulky sources of organic matter which supply nutrients in small quantities, and organic matter in large quantities. Manures are prepared by the decomposed animal excreta and plant waste. Manures include farmyard manure (FYM), compost, green manures, vermicompost, etc.
- **Advantages of manures** : The organic manure is considered better than fertilizers. This is because,
 - It costs less.
 - It increases organic matter in soil.
 - It reduces soil erosion.
 - It enhances the water holding capacity of the soil.
 - It increases the number of friendly microbes.
 - It makes the soil porous due to which exchange of gases becomes easy.
 - It improves the texture of the soil.
- **Disadvantages of manures** :
 1. Manures are bulky and not easy to be absorbed.
 2. They have low amount of nutrients.
- **Fertilizers** :



Figure : Applying Fertilizers

Fertilizers provide plant nutrients, commercially manufactured using chemicals. Fertilizers supply Nitrogen, Phosphorus and Potassium (NPK). They are used for good vegetative growth (i.e., growth of leaves, branches and flowers), giving rise to healthy plants.

→ **Advantages of fertilizers :**

- They are nutrient specific.
- They are required in small quantities.
- They are water soluble so can be applied to absorb by the plants easily.

→ **Disadvantages of fertilizers :**

- They cause water pollution.
- Fertilizers can change the chemical composition of soil.
- They can cause eutrophication in near by water bodies.

→ **Fertilizers are divided into following four groups :**

- **Nitrogenous fertilizers :** Contain high amount of nitrogen.
- **Phosphatic fertilizers :** Contain high amount of phosphate.
- **Potassium fertilizers :** Contain high amount of potassium.
- **Complex fertilizers :** When a fertilizers contains at least two or more nutrients

TABLE COMPARISON OF MANURE AND FERTILIZER

S.NO.	MANURE	FERTILIZER
1.	A manure is a natural substance. It is obtained by the decomposition of animal wastes such as dung (gobar) of cattle and buffaloes and plant residues.	A fertilizer is a human-made substance. It is an inorganic salt or an organic compound.
2.	A manure contains small amounts of essential plant nutrients such as nitrogen, phosphorus and potassium.	Fertilizers are very rich in plant nutrients such as nitrogen, phosphorus and potassium.
3.	A manure adds a great amount of organic matter in the form of humus in the soil.	A fertilizer does not add any humus to the soil.
4.	Nutrients present in the manure are absorbed slowly by the crop plants, since manure is not soluble in water. Nutrients exist locked inside the organic compounds of humus.	Being soluble in water, a fertilizer is readily absorbed by the crop plants.
5.	A manure is not nutrient specific and it tends to remove the general deficiency from the soil.	A fertilizer is nutrient specific. It can specifically provide nutrients such as nitrogen, phosphorus and potassium to the soil according to the need.
6.	A manure is voluminous and bulky so it is inconvenient to store, transport, handle and apply to the crop.	A fertilizer is compact and concentrated so it is to easy store, transport and apply to the crop.
7.	A manure is cheap and is prepared in rural homes or fields.	A fertilizer is costly and is prepared in factories.

(iv) **Irrigation** : Process of supplying water to crop plants growing in the fields by means of canals, reservoir, wells, tube-wells etc. is known as irrigation.

→ **Purpose of Irrigation** : In agriculture irrigation fulfills the following requirements and goals of crop plants:

- Irrigation supplies two essential macronutrients-hydrogen and oxygen to the crop plants.
- It provides moisture to the soil, which helps in the germination of seeds.
- It helps in growth and elongation of the roots of crop plants.
- It helps in the absorption of nutrients by the roots of crop plants from the soil.
- It helps in increasing the number of aerial branches called tillers in the crop plants so as to get good crop yield.
- Wells and tube wells are successful in those areas where underground water is saline canal water is used for irrigation.
- Excessive irrigation causes water logging and increases surface salinity. In water logged soil plant, roots do not get proper aeration.

(A) **Irrigation Systems** :

(i) **Traditional methods of irrigation** : The water available in wells, lakes and canals is lifted up by different methods, for taking it to the fields.

- Cattle or human labour is used in these methods. So these methods are cheaper, but less efficient.
- The traditional methods are following :

(1) **Moat (pulley system)** : It is a manual irrigation method. By this method, water is directly taken out of wells with the help of a pulley and is used to irrigate fields.



Figure : Moat

(2) **Chain pump** : Pumps are commonly used for lifting water. Diesel, biogas, electricity and solar energy is used to run these pumps. Chain pump system consists of two large wheels tied at both ends with a chain where the wheel is rotated using the chain and water is filled in the buckets and poured off into the field.

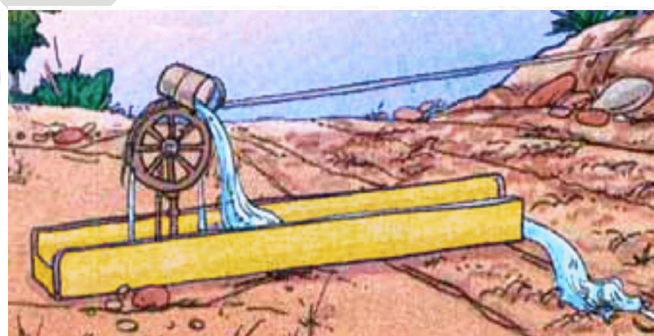


Figure : Chain Pump

(3) **Dhekli & Rahat (lever system) :** Dhekli refers to traditional irrigation practice in which water is drawn from a nearby well using pulleys and then it is spread on to the fields. This practice results in wastage of water and the distribution of water is highly uneven.

Rahat is the system which uses animals as the labour. It is an old type of method of irrigation in which wheels were used to take water out of the well. These wheels were turned by oxen and cows by tying the ropes to their body.

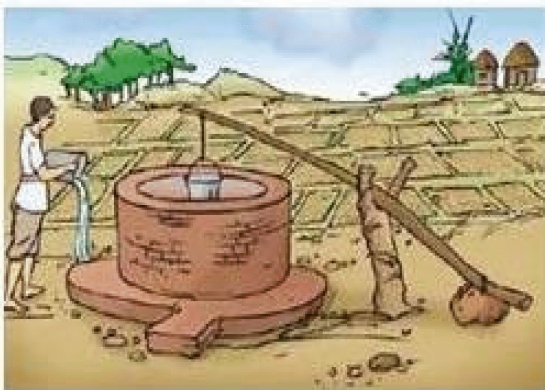


Figure : Dhekli,Rahat

II. **Modern methods of irrigation :** Modern method of irrigation help us to use water economically.

• The modern methods are as follows :

[1] **Sprinkler irrigation system :** It is water efficient system and is being introduced in the canal irrigated areas of Maharashtra, Kanataka, Andhra Pradesh, Orissa and Tamil Nadu for fruit crops

- A device having perforated ring or small stand with a revolving nozzle to which a base is attached, is used for watering crop plants.
- This system spreads water uniformly over crop plants and fields, required quantity of water is supplied.
- Sprinkler irrigation system is being introduced in canal irrigated areas of Haryana, Rajasthan and Madhya Pradesh.

[2] **Drip- irrigation system :** Drip irrigation system is being encouraged in Maharashtra, Karnataka, Andhra Pradesh, Orissa and Tamil Nadu for fruit crops. Fertigation is an innovation of applying fertilizer through drip irrigation to maximise farm productivity with available water. Modern system being encouraged in Haryana, Rajasthan and Madhya Pradesh.



Figure : Sprinkler System



Figure : Drip System

(v) **Harvesting :** The cutting of crop after its maturation is called harvesting.

- It is either done manually by sickle or by a machine called harvester.
- In the harvested crop, the grain seeds need to be separated from the chaff. This process is called threshing. This is carried out with the help of a machine called 'combine' which is a combined harvester and thresher.
- Farmers with small holdings of land do the separation of grain and chaff by **winnowing**.
- The period of harvest is celebrated with great joy and happiness in all parts of India. People celebrate it with great enthusiasm. Special festivals associated with the harvest season are Pongal, Baisakhi, Holi, Diwali, Nabanya and Bihu.



Figure : Threshing machine

Manually combine harvester can be used for both harvesting and threshing winnowing, which involved the separation of the grain from chaff (seed covering and tiny pieces of leaves or stem), can be done manually, or using a winnowing machine.

(c) Crop protection management

- (i) Weed Control :** Weeds are unwanted plants in the cultivated fields. In other words, plants other than crops are the weeds. Weeds tend to compete with the crops for food (water and nutrients), space and light. The process of removing the weeds from crop field is called weeding.



Figure : Certain common weeds

(A) Mechanical methods: Mechanical Weeding can be done by the following methods :

- Weeds may be pulled and cut with hand. Ploughing helps in removing large number of the weeds because it uproots majority of them.
- The weeds which appear during the growth of crop plants are removed manually by using a trowel (khurpa).

(iii) Storage of Grain : Most crops are harvested only once a year. Thus, they are available in plenty amount during a selective time. For getting seasonal foods regularly throughout the year, they are stored in safe storage. Cereals or food grains are stored at following three levels:

- At producer (farmer) level (called rural storage);

- At trader's level (this is done by keeping food grains in gunny bags).
- At FCI (Food Corporation of India) level (This is done by storing grains in silos. During storage, grains and seeds are subjected to spoilage and wastage by various means. This loss has been estimated to be 9.3 per cent annually. During storage damage of grains can take place by following two main types of factors:



Figure : Storage of Grain

- Factors Responsible for Loss of Grains during storage :
 - (A) **Biotic (living) factors** : insects, rodents, birds, mites etc.
 - (B) **Abiotic (nonliving) factors** : Temperature, Moisture, Humidity, Material of container in which grains are stored



Focus Point

- **Crop Rotation** : If we grow a crop continuously in the same field for many years, it results into various problems such as (i) depletion (deficiency) of same types of nutrients and (ii) build up of diseases and insect-pests. This demands for the requirement of the practice of crop rotation. Crop rotation can be defined as the practice of growing of different crops in a piece of land in a preplanned succession. Depending upon the duration crop rotation may be of following three types.

(C) Animal Husbandry

The branch of agriculture that deals with the feeding, caring and breeding of domestic animals is called animal husbandry. Husbanding means to use a resource carefully and without waste. Thus, animal farming or animal husbandry requires planning for domestic animal's shelter, breeding, health, disease control and proper economic utilisation. Our domestic animals or livestock includes those animals which are raised for farm purposes, e.g., cattle (cow, bull or ox), buffalo, yak, horse, ass, goat, sheep, camel, etc.

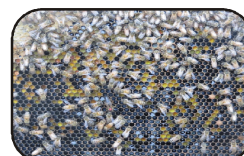


Figure : Cattle production, Poultry, Fish farming & Bee keeping

Add to Your Knowledge

- India is a large country with an enormous area under cultivation. India is blessed with continuous growing seasons which means that crops can be grown throughout the year. This is due to the subtropical climate, plenty of sunshine and lack of frost in most part of the country.
- Green revolution (high production of food grains), blue revolution (enhanced fish production), white revolution (increased milk production) and yellow revolution (increased oil production).



Golden Revolution



Yellow Revolution



Green Revolution



White Revolution



Blue Revolution

Figure : Green Revolution , Blue revolution , White revolution, Yellow revolution & Colour revolution

- In modern system of sanitation, water is used for removal of human excreta and other wastes. Sewage consists of two components: (i) The solid part, called the sludge and (ii) the liquid part, called effluent or sewage water. The dried sludge may be used as soil conditioner in lawns and flower gardens. Sewage water is quite rich in many nutrients of plants so can be used for fertilizing and irrigating the soil.
- The degradation of organic waste through the consumption by the earthworms is called vermicomposting. An earthworm is physically an aerator, crusher and mixer, chemically a degrader and biologically a stimulator of decomposition. In India, following species of earthworms are used in vermicomposting: *Dichogaster bofani*, *Drawida willsi*, *Perionyx excavatus* (Indian species) and *Eisenia foetida*, *Eudrilus eugeniae* (Exotic species).
- Selection by human beings is also called artificial selection. Artificial selection operating over long time spans can give rise to varieties strikingly different from starting generation. For example broccoli, cabbage, cauliflower and other varieties have been obtained through artificial selection from wild cabbage.
- Bananas are the number one fruit crop in the world. They are the 4th largest overall crop, after wheat, rice, and corn. They grow in more than 100 countries on farms. India grows more bananas than any other country.
- More than 6,000 different kinds of apples are grown around the world. The biggest producer is China.
- According to many historians, goats were the first animal to be domesticated. Goats are typically the cleanest of animals. Pigs, a common farm animal, are thought to be the 4th most intelligent animal, after chimps, dolphins, and elephants.
- Subsistence farmers are farmers who produce the food they need to survive on a daily basis. They are farmers who raise enough food for themselves and their families. The food is not intended to be sold in a market.

NS. 1

Select the correct word from the following list and fill in the blanks.

float, water, crop, nutrients, preparation

- (a) The same kind of plants grown and cultivated on a large scale at a place is called ____.
- (b) The first step before growing crops is _____ of the soil.
- (c) Damaged seeds would _____ on top of water.
- (d) For growing a crop, sufficient sunlight and _____ and _____ from the soil are essential.

Ans. (a) crop (b) preparation (c) float
(d) water, nutrients

NS. 2

Match items in Column-A with those in Column-B.

Column-A

- (i) Kharif crops
(ii) Rabi crops
(iii) Chemical fertilisers
(iv) Organic manure

Column-B

- (a) Food for cattle
(b) Urea and super phosphate
(c) Animal excreta, cow dung, urine and plant wastes
(d) Wheat, gram, pea
(e) Paddy and maize

Ans.

Column-A

- (i) Kharif crops
(ii) Rabi crops
(iii) Chemical fertilisers
(iv) Organic manure

Column-B

- (e) Paddy and maize
(d) Wheat, gram, pea
(b) Urea and super phosphate
(c) Animal excreta, cow dung, urine and plant wastes

NS. 3

Give two examples of each

- (a) Kharif crop (b) Rabi crop

Ans. (a) Paddy and maize (b) Wheat and gram

NS. 4

Write a paragraph in your own words on each of the following:

- (a) Preparation of soil (b) Sowing
(c) Weeding (d) Threshing

Ans. (a) **Preparation of soil** : Preparation of the soil is the first step before growing crops. It involves loosening and turning it. The process of loosening and turning the soil is called tilling or ploughing.

This has the following advantages:

- (i) Loose soil has a lot of air trapped in it, which is used by the roots to breathe easily.
(ii) Loose soil helps the growth of earthworms and microbes in the soil. They provide nutrients to the soil and aid in further loosening of the soil.
(iii) Turning and loosening of soil brings nutrient-rich soil to the top. Plants can then absorb these nutrients more efficiently.

It is carried out by using a wooden or iron plough which is pulled either by animals or by tractor.

(b) **Sowing** : Planting seeds in the soil is called sowing. While sowing seeds, following points should be kept in mind:

- (i) Seeds should be of good quality, healthy and free from diseases.
(ii) They must be planted at the proper depth in the soil.
(iii) Seeds require water for germination. The soil should, therefore, have water in it.

(iv) Seeds should be sown at proper distances. Seeds can be sown manually or with the help of seed drill.

(c) **Weeding** : The unwanted plants in the crops are called weeds. These weeds absorb the nutrients from the soil. So it is necessary to remove them. Weeds are either removed manually, chemically or by mechanical tools. The process of removal of weeds is called weeding. Some chemicals like 2,4-D are used to kill the weeds.

(d) **Threshing** : Process of separation of grains from the crop is called threshing. It can be done manually by striking the harvested crop against a hard surface or by making oxen or buffaloes trample over the cut crop or it can be done by a machine called thresher.

NS. 5

Explain how fertilisers are different from manures.

Ans. Differences between manures and fertilisers are as following :

S.No.	Manures	Fertilisers
(i)	These are natural organic substances	These are inorganic salts made by humans.
(ii)	They are rich in humus but not in inorganic nutrients.	They are rich in organic nutrients but do not contain humus.
(iii)	These are prepared in fields.	These are prepared in factories
(iv)	Manure is not nutrient specific. It only removes the general deficiency of soil.	Fertilisers are nutrient specific and provide specific nutrients to the soil.

NS. 6

What is irrigation? Describe two methods of irrigation which conserve water.

Ans. The process of watering the crops is called irrigation.

Two methods of irrigation are:

(i) Sprinkler system : This system is used on the uneven land where less water is available. The pendicular pipes, having rotating nozzles on top, are joined to the main pipeline at regular intervals.

Water is allowed to flow through main pipe under pressure, which escapes from the rotating nozzles.

In this way water gets sprinkled on the crop.

(ii) Drip irrigation: This system is used to save water as it allows the water to flow drop by drop at the roots of the plants. It is the best technique for watering fruit plants, gardens and trees. Water is not wasted at all.

NS. 7

If wheat is sown in the kharif season, what would happen? Discuss.

Ans. Wheat crop does not require much water to grow, so wheat would not grow in kharif season. The seeds would get destroyed in excess water due to rainy season.

NS. 8

Explain how soil gets affected by the continuous plantation of crops in a field.

Ans. If we sow crops continuously in the same field then the lack of specific nutrients takes place in the soil. The field becomes unfertile. It does not give any time to soil to replenish the nutrients. Thus, the soil is unable to sustain any further healthy and good crop.

NS. 9

What are weeds? How can we control them?

Ans. Weeds are unwanted plants. They grow with main crop and compete for nutrients and water. So weeds are very harmful. Process of controlling the weed is called weeding. Weeding is done manually by using khurpi and by using mechanical machines. Weeds are also controlled by using some chemical substances like 2, 4-D. These chemicals are called weedicides and are used to kill and destroy the weeds.

EXERCISE – I

ONLY ONE CORRECT TYPE

- Harrow is an implement used to remove
(A) Weeds (B) Crop plants
(C) Stones (D) Rocks
- Levelling is done to
(A) Prevent soil erosion
(B) Ensure uniform irrigation
(C) Ensure uniform mixing of manure and fertilisers
(D) All of these
- Which of the given statements is not correct?
(A) Crop rotation increases nutrients content of the soil
(B) Crop rotation helps in controlling pests and weeds
(C) Crop rotation helps to reduce soil pollution
(D) Crop rotation helps mixing of fertilisers uniformly
- Scattering of seeds in field by hands is known as
(A) Spacing (B) Broadcasting
(C) Sowing (D) All of these
- Which of the given practices damage the soil fertility?
(A) Intercropping (B) Crop rotation
(C) Field fallow (D) Monocropping
- Cutting of mature crops with sickle is called
(A) Threshing (B) Harvesting
(C) Winnowing (D) None of these
- Which of the following should come in the box 'X' in the given sequence?
Ploughing → Levelling → Sowing seeds → [x] → Irrigation
(A) Broadcasting (B) Transplanting
(C) Manuring (D) Drilling
- What will improve the quantity of food production?
(A) Pesticides
(B) Synthetic hormones
(C) Education and guidance for consumers
(D) Optimum use of land for agriculture
- Food production can be increased to meet the demand of an increasing population by
(i) practising efficient land management and development
(ii) continuous research to ensure sustainable development
(iii) using more pesticides to control pests.
(A) (i) and (ii)
(B) (i) and (iii)
(C) (ii) and (iii)
(D) (i), (ii) and (iii)
- Which among the following is not the characteristic of a manure?
(A) Manure is not readily soluble in water, thus it is absorbed by plants slowly
(B) Manure is not nutrient specific. It only removes the general deficiency of soil
(C) These are rich in humus but not in inorganic nutrients
(D) These are inorganic salts made by humans
- Sprinkler system of irrigation is very advantageous because it
(A) Helps the fields to get water logged
(B) Controls the water supply
(C) Increases the evaporation of water
(D) Decrease the fertility of soil
- The advantage of ploughing is that it
(A) Allows the penetration of roots of plants
(B) Helps in proper aeration and eradicates weeds
(C) Promotes the growth of useful soil bacteria
(D) All of these.
- A farmer sows beans in his fields after harvesting a crop of wheat. The agricultural practice he is following is
(A) Crop rotation (B) Multiple cropping
(C) Field fallow (D) Mixed cropping
- The method which enables us to select better and healthy seedlings for cultivation in rice is
(A) Transplantation (B) Broadcasting
(C) Drilling (D) All of these
- Which of the following statements is not true for chemical fertilisers?
(A) They are nutrient specific
(B) They are readily soluble in water
(C) They provide organic matter (humus) to the soil
(D) Overuse of chemical fertilisers pollutes the soil
- Fertilisers are the chemicals rich in
(A) N (B) P
(C) K (D) All of these

17. The crop that requires more irrigation is
(A) Wheat (B) Rice
(C) Maize (D) Jowar
18. Ploughing helps in
(A) Loosening of soil
(B) Distribution of nutrients
(C) Removal of microorganisms
(D) None of these
19. Removing chaff from the grains is called
(A) Weeding (B) Threshing
(C) Harvesting (D) winnowing
20. Which of the following is a rabi crop?
(A) Groundnut (B) Maize
(C) Wheat (D) Sugarcane
21. Hoe is a simple tool used for
(A) Weeding (B) Ploughing
(C) Seed sowing (D) Both (A) and (B)
22. Seed drill is used for :
(A) Harvesting (B) Cleaning the seed
(C) Sowing (D) Weeding
23. The agricultural instrument used for removal of weed is.
(A) Sickle (B) Khurpi
(C) Seed drill (D) Plough
24. Compost is a :
(A) Manure (B) Fertilizer
(C) Pesticide (D) Weedicides
25. Which one of the following method is not the traditional method of irrigation.
(A) Drip system (B) Moat system
(C) Chain pump system (D) Dhekli

PARAGRAPH

PARAGRAPH # 1

The undesirable plants that grow along with the crops are called weeds. These weeds, feed on the nutrients provided to the crops and thus reduce the supply of nutrients to the crops, thereby, inhibiting their growth. The growth of these weeds needs to be prevented in order to enhance the growth of the plants. The process of removal of weeds is called weeding.

26. The oldest method of controlling weeds is :
(A) Tillage (B) Digging
(C) Sickling (D) Hand weeding
27. Select odd one out.
(A) 2, 4D (B) Cow dung
(C) Vegetable waste (D) Urine
28. The process of removal of weeds is called :
(A) Harvesting (B) Threshing
(C) Weeding (D) Winnowing

PARAGRAPH # 2

Rajan felt worried about the condition of water scarcity in his village during the cropping season. He went to ministry of Agriculture and Farmers Welfare of his area to get the solution of this problem. There he came to know about effective method of irrigation and drought resistant varieties of crop. He requested the head of department of the ministry to arrange some workshop on this topic to educate the farmers in these methods.

29. Select odd one out :
(A) Moat system (B) Rahat and Dhekli
(C) Chain system (D) Drip System
30. Which crops require more water.
(A) Sugarcane (B) Rice
(C) Both (A) & (B) (D) Peas
31. 'Kulh' the local method of canal irrigation is popular in.
(A) Kerala (B) Himachal Pradesh
(C) Andhra Pradesh (D) Karnataka

MATCH THE COLUMN TYPE

- | | | |
|-----|---|---------------------|
| 32. | Column-I | Column-II |
| | (P) Weeding | (i) Sickless |
| | (Q) Digging and bunds formation | (ii) Seed drill |
| | (R) Tillage | (iii) Wooden plough |
| | (S) Sowing | (iv) Spade |
| | (T) Harvesting | (v) Khurpa |
| | (A) P → v, Q → iv, R → iii, S → ii, T → i | |
| | (B) P → i, Q → ii, R → iii, S → iv, T → v | |
| | (C) P → ii, Q → iv, R → v, S → iii, T → i | |
| | (D) P → v, Q → i, R → ii, S → iv, T → i | |

EXERCISE – II

VERY SHORT ANSWER TYPE

1. Which agriculture task has to be completed before sowing ?
2. What do you mean by the term agricultural practices?
3. Name the implement used for sowing seeds.
4. Name two agricultural tasks performed by a combine.
5. Give two examples of rabi and Kharif crops.
6. What do you understand by weed ? Name of weedicide.
7. Which agricultural practice comes first : harvesting or weeding. Why is it so ?
8. Name two foods obtained from animals.
9. What is broadcasting ?
10. Name two harvest festivals of India ?

SHORT ANSWER TYPE

1. Write advantages of levelling.
2. What do you mean by transplantation ? Which crops are grown by this method ?
3. How does mixed cropping help in replenishing the fertility of soil ?
4. What are the differences between rabi and kharif crops ?
5. Give two functions of soil.

LONG ANSWER TYPE

1. List in sequence the various agricultural which a farmer has to adopt for growing wheat crop.
2. State four differences between manures and fertilisers.
3. Why is storage of food materials needed ? Name the types of storage.
4. Draw a table of all instrument used in agricultural practices ?
5. How would you protect crops from pests and diseases ?

FILL IN THE BLANKS

1. _____ contain _____ matter in large quantities.
2. The undersirable plants are called _____.
3. Father of green _____ is _____.
4. Big pieces of soils are called as _____,
5. Zayad crops are grown during mainly in _____.

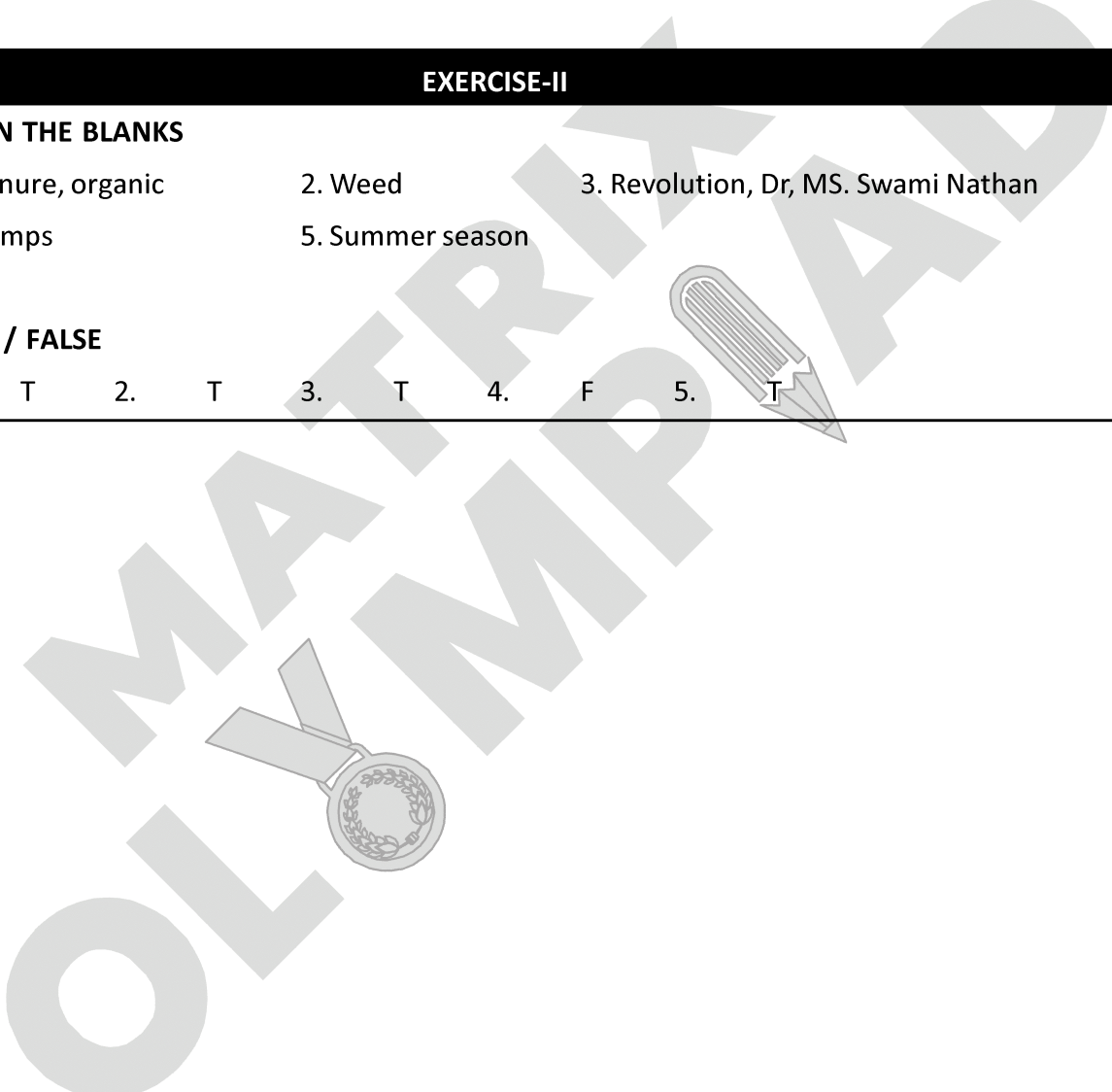
TRUE / FALSE TYPE

1. Fertilisers are nutrient specific.
2. The plants grown in field for food and fibres are called crop plants.
3. In India, special festivals are held commemorating the harvest.
4. Mustard, sunflower and groundnuts are all pulses.
5. The soil should be loosened before seeds are sown.

Answer Key

EXERCISE-I														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	D	D	B	D	B	C	D	A	D	B	D	A	A	C
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
D	B	A	D	C	D	C	B	A	A	D	A	C	D	C
31	32	33	34	35	36									
B	A	A	A	A	B									

EXERCISE-II														
FILL IN THE BLANKS														
1. Manure, organic	2. Weed	3. Revolution, Dr, MS. Swami Nathan												
4. Crumps	5. Summer season													
TRUE / FALSE														
1. T	2. T	3. T	4. F	5. T										



SELF PROGRESS ASSESSMENT FRAMEWORK
(CHAPTER : CROP PRODUCTION AND MANAGEMENT)

CONTENT	STATUS	DATE OF COMPLETION	SELF SIGNATURE
Theory			
In-Text Examples			
NCERT Exercises			
Exercise I			
Exercise II			
Short Note-1			
Revision - 1			
Revision - 2			
Revision - 3			
Remark			

NOTES :

1. In the status, put “completed” only when you have thoroughly worked through this particular section.
2. Always remember to put down the date of completion correctly. It will help you in future at the time of revision.



Space for Notes :

A large rectangular area filled with horizontal dotted lines, intended for writing notes.



MICROORGANISMS : FRIEND & FOE

2

Concepts

Introduction

1. Microbes and Their Study

1.1 Major Groups of Microorganisms

1.2 Friendly Microorganism

1.3 Medicinal Use of Micro-Organisms

1.4 Harmful Effects of Micro-Organisms

1.5 Mode of Spread of Diseases

1.6 Food Preservation

NCERT Solutions

Exercise – I (Competitive Exam Pattern)

Exercise – II (Board Pattern Type)

Answer Key

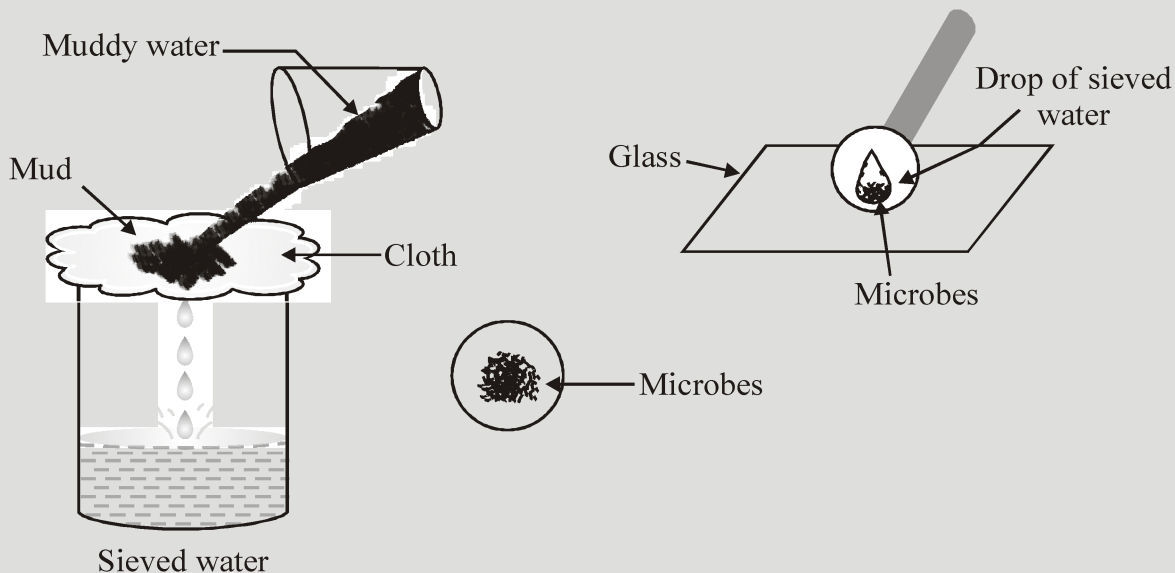
INTRODUCTION

- A large number of living organisms can be seen around us, including both plants and animals. We can see them with naked eyes. But there is a still larger number of organisms around us and even inside our body that we cannot see with naked eyes without a visual aid. These organisms are called microorganisms. In other words, the living organisms which cannot be seen with the naked eyes and can only be observed through a microscope are called microorganisms or microbes. The branch of science that deals with the study of microorganisms is known as microbiology.

LAB TIME

Let's Do & Learn

- Take some water in a tumbler from a dirty pond with stagnant water. Bring it home and sieve it through a fine piece of cloth. Observe carefully what is left on the cloth. You will see mud and some tiny living things wobbling in the mud. The water sieved through the cloth will look fairly clean. Take a big drop of this water and spread it on a clean glass piece. Observe it through a microscope. You will see still tinier organisms darting about in it.



- Take a chapaati and leave it in the open for a few days. When you observe it, you will see a whitish-grey material on it. Observe the material through a microscope. It will look like stalks with black round heads. The water, air and soil around us are full of tiny living things too small to be seen with the naked eye. That is why they are called micro-organisms or simply microbes. In spite of their so small sizes, microbes are very potent living things. Let us read about them in detail.

1. MICROBES AND THEIR STUDY

(a) History

The study of microorganisms is called Microbiology (micro = small, bios = life, logos = study).

The microorganisms include bacteria, fungi, viruses, algae and protozoans. These microbes were seen for the first time in 1677 with the help of a simple type of microscope developed by **Anton Van Leeuwenhoek**.

S.NO	NAME OF THE SCIENTIST	YEAR	CONTRIBUTION
1.	Robert Hooke	1665	He observed cork cells.
2.	Louis Pasteur	1857	He proved that fermentation is a biochemical process.
3.	Robert Koch	1872	Discovered bacterium Bacillus anthracis for anthrax diseases
4.	Alexander Flemming	1929	He proved that antibiotic penicillin is obtained from a fungus named Penicillium notatum.
5.	Edward Jenner	1798	Discovered vaccine for small pox

(b) Common Features of Microbes

- Most of them can reproduce independently. But others can grow only after attaching themselves to other specific organisms that act as their hosts.
- They are very tough and can survive in extreme conditions of moisture and heat. They have the property of forming a hard shell around themselves to survive till favourable conditions reappear.
- Some microbes like bacteria are helpful to us but most of them causes diseases like cold, fever, malaria, influenza and skin troubles.
- The microorganisms vary in size. The smaller ones are only a few microns (1 micron = 10^{-6} m) and are microscopic. Their sizes range from 0.1 to 0.5 microns.
- There are some microbes like multicellular algae and multicellular fungi like mushrooms which are visible with the naked eye, as their sizes range from a few centimeters to meters.
- The microbes reproduce asexually and sexually.

(c) Habitat of Micro-organisms

- The place where the organisms are found is called habitat. Habitat is the address of living organisms. Plants and animals have various habitats.
- Microorganisms are found everywhere i.e. in air, soil, water, hot springs, snow food, sewage, wastes, etc,
- Microorganisms are able to bear the extremes of temperature and other conditions. They are found everywhere from hot springs to snow of polar region. Some microorganism dependent on other organisms, are called parasites, e.g. Plasmodium (a parasite found in the blood of man and it causes malaria)
- Some microorganisms remain associated with other organisms and both of them are mutually benefitted are called **symbionts**. Some microorganisms grow on dead decay matter are called **saprophytes**.

1.1 MAJOR GROUPS OF MICROORGANISMS

(a) Virus :

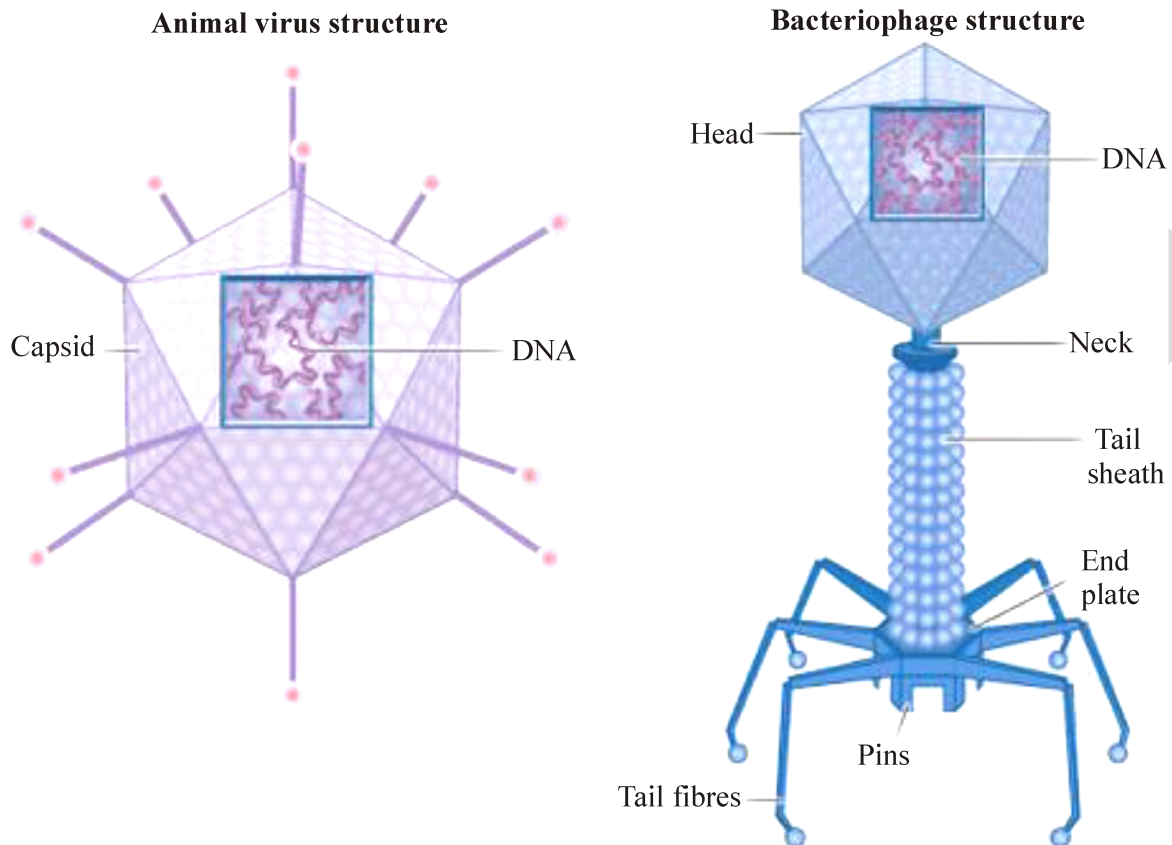


Figure : Virus structure

Viruses show both living and non-living characters.

A virus is a small particle, composed of two types of substances, protein and nucleic acid.

- Viruses show both living and non-living characters.
- (i) Non-living characters of viruses are as follows :**
 - Cell wall, organelles, cytoplasm, etc, are absent.
 - They cannot multiply on their own when present outside the host.
 - They do not respire.
 - They can be crystallized and stored for very long time period like other non-living things.
 - They require a living host cell to perform nearly every biological function necessary for their survival.
- (ii) The living characters of viruses are as follows :**
 - Like cells, they can mutate and change characteristics e.g., infective strength.
 - They contain either DNA or RNA as genetic material.
 - They respond to heat, chemical and radiations.
 - They are transmitted from the diseased host to the healthy ones.
 - They reproduce inside the host cell and produce copies of themselves.

- They show irritability, a character of only living organisms.
 - Since reproduction is a very important characteristic of life, scientists regard viruses as a link between living and non-living. They have been placed on the dividing line between the living and the non-living.
 - Because they can reproduce like living beings but only inside a living cell, not on their own. Their study has become so important and detailed that it is treated as a new branch, known as Virology.
- (iii) **Viral diseases** : Viruses reproduce only inside the cells of the host organism which may be a plant, an animal or even a bacterium. They cause several common ailments as well as serious diseases inside the host.

The viruses are **highly specific**. They attack only one kind of host and certain tissues.

(b) Algae

- Algae are simple plants having no roots, stem and leaves. Their plants body is called thallus.
- Algae are eukaryotic, autotrophic non vascular plants/ thallophytes.
- They are microscopic unicellular to large multicellular plants.
- Word algae is derived from a Latin word (alga) means sea weeds, branch of botany which deals with the study of algae is called phycology or algology (phycos-sea weeds, logos study or discuss).
- Algae occur in variety of habitats like fresh water, hot water streams, sea, on moist land (on damp soil).
- Some algae live in symbiotic association with fungi called Lichens. Algae are also porous as pond scum or pond silk.
- The algae are unicellular e.g. Chlamydomonas and multicellular Spirogyra.

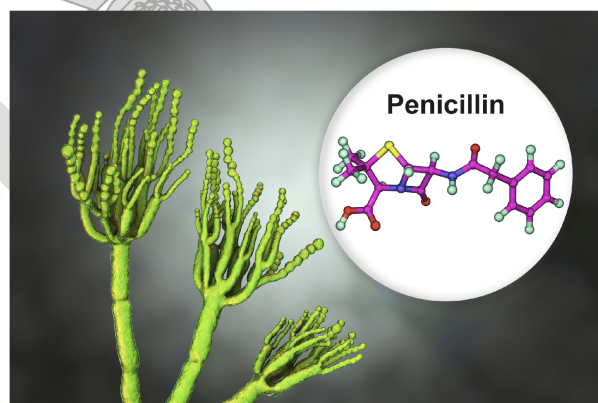
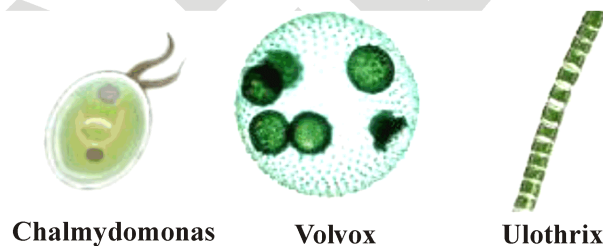


Figure : Moulds & Penicillium

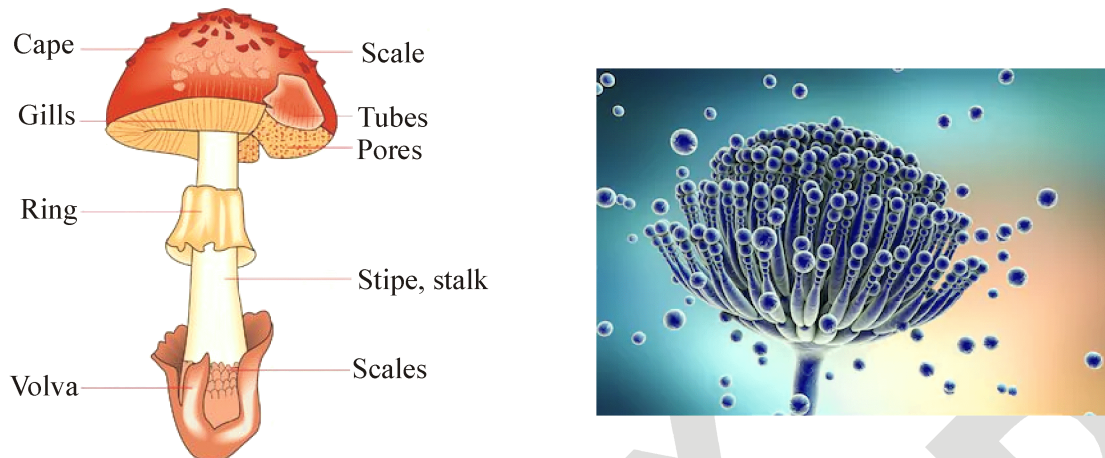


Figure : Mushroom & Aspergillus

(c) Protozoa :

These are single celled organisms called protozoa meaning literally ‘first animals’. About 20,000 organisms, all single-celled or colonies of cells are found in this group. They have animal characteristics but are not considered to be a real or true animals. Protozoa mostly range in size from 2 to 200 microns. A protozoan consists of a single piece of cytoplasm with nucleus. A living membrane surrounds the cytoplasm.

Branch of science dealing with the study of protozoan is called Protozoology. Anton Van Leeuwenhoek is the father of Protozoology.

Protozoa are usually found in ditches, ponds and on the surface of leaves of aquatic plants. Protozoa are one-celled organisms that may have plant-like or animal-like features. Normally, protozoa are classified as animals.

(i) Some examples of Protozoa are Amoeba, Euglena, Paramecium :

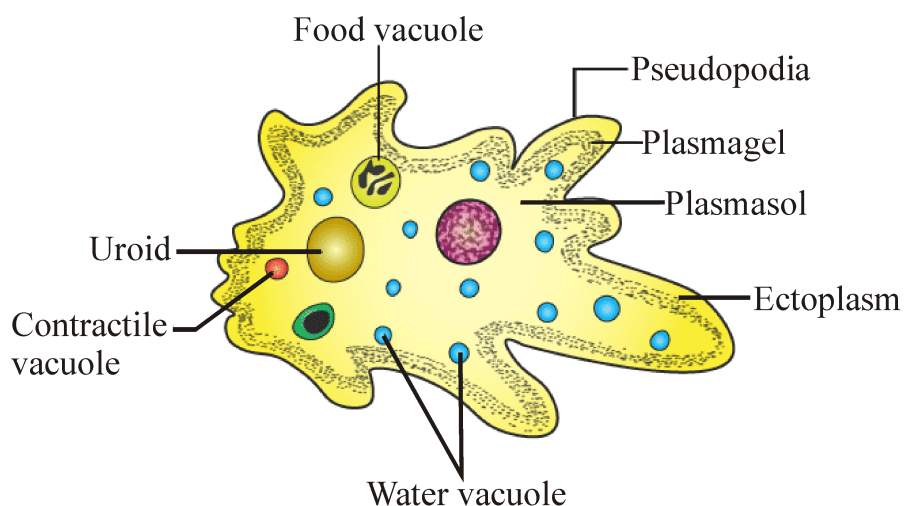


Figure : Amoeba

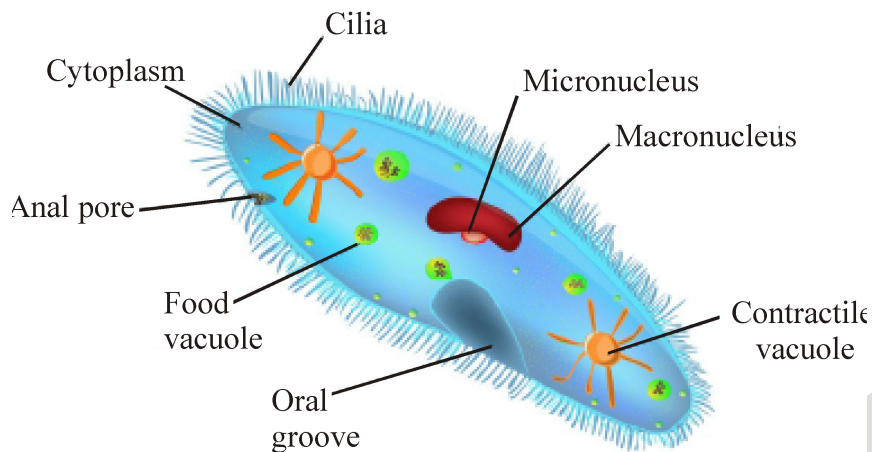


Figure : Paramecium

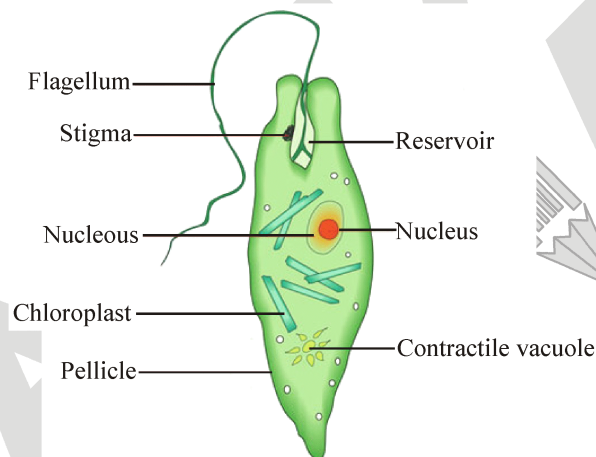


Figure : Euglena

1.2 FRIENDLY MICROORGANISM

(a) Importance of Bacteria :

Bacteria play a very important role in medicine, agriculture and several industries,

(i) In medicine :

(A) Antibiotics : Many well known antibiotics such as streptomycin, aureomycin, chloromycin are obtained from bacteria.

(B) Vaccines : Bacteria are used in the preparation of serum and vaccines.

(ii) In agriculture :

(A) Cleaning of environment: Bacteria act on dead bodies of animals and plants and convert various complex organic compounds into simple inorganic substances. These simple substance can easily mix with soil and increase the soil fertility. Thus, bacteria helps in recycling of matter and cleaning the environment.

(B) Nitrogen cycle : Although nitrogen occurs to the extent of about 78% of air by volume, it is not utilized by plants in its free state. However, nitrogen occurs in the dry substances of the plant to the extent of 1-3 percent only. Nevertheless, it is indispensable to the life of the plant, as it is an essential constituent of proteins, chlorophyll and protoplasm. Moreover it is essential for growth, particularly of the leaves.

One of the fundamental biological requirements for life to persist is that the nitrogen cycle should continue to function. During this process, the atmospheric nitrogen is fixed into organic combinations, such as amino acids, proteins, nucleic acids, etc., in living organisms via inorganic forms as NH_4 (ammonia). As living organisms die and decay, inorganic nitrogen is liberated. The soil makes the main source of nitrogen for the plant. In the plant the nitrogen exists as inorganic and organic compounds. The chief forms of inorganic compounds are the nitrates and nitrites of potassium and calcium, and also, ammonia and its compounds; while the organic compounds are chiefly the proteins. Normally the ammonium compounds found in the soil are made available for the use of the green plants after conversion into nitrate by the action of certain nitrifying bacteria living in the soil. This process is known as nitrification. The nitrate, thus produced is readily absorbed by the green plants. Both biotic as well as abiotic factors are involved in Nitrogen cycle but here only role of microorganisms is mentioned. The steps involved in Nitrogen cycle are :

- **Biological nitrogen fixation:** Carried out by both free-living and symbiotic bacteria. The free-living nitrogen fixing bacteria are: Azotobacter and Clostridium.

(b) Importance of Fungi :



Figure : Root Nodules

Fungi play an important role in medicine, agriculture, industry and as food.

(i) In medicine :

(A) Antibiotics : Many well known antibiotics are obtained from fungi. Penicillin is obtained from the fungus *Penicillium notatum*.

(ii) In agriculture :

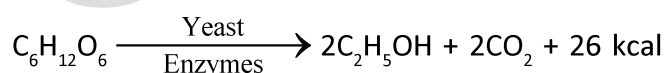
(A) Soil fertility : Fungi decompose the dead bodies of plants, animals and their waste products.

(B) The breakdown products of decomposition then escape into the air and the soil.

(C) The soil then becomes enriched and fertile.

(iii) In industry :

(A) Brewery and bakery : The wine industry (brewery) and bread industry (bakery) are the two most important industries which make use of the fungus Yeast. Both industries are based on fermentation activity of Yeast as shown below.



Of the two products of yeast fermentation alcohol is the industrial products in brewery.

(B) In bakery, CO_2 causes the dough to rise and makes the bread, light and spongy.

(C) Fermentation: The process of conversion of sugar into alcohol by anaerobic respiration is known as fermentation. Louis Pasteur discovered fermentation,

(D) As food : Yeast is also used in the preparation of idli and dosa from a mixture of powdered rice and dal.

(c) Importance of Algae :

Algae play an important role in medicine, agriculture, industry and as food.

(i) In medicine :

(A) Antibiotics : The green algae *Chlorella* yield an important antibiotic called *Chlorellin*.

(ii) In agriculture :

(A) As manure : Many of the sea weeds are directly added to agriculture fields as manure because they are rich in nitrogen and potassium.

(B) Nitrogen fixation : Some blue-green algae like *Nostoc* and *Anabaena* are important in the fixation of atmospheric nitrogen in soils.

- Agar and Algin are obtained from red and brown algae respectively.
- These are used in the preparation of medicines, food and cosmetics.

(iv) As food and fodder :

(A) Food : The red alga *Porphyra* is used directly as food in China and Japan. Dried *Chondrus* is used in puddings and jellies in Ireland.

(B) The green algae *Chlorella* is very rich in protein and vitamins and is a potential source of food for human consumption.

(C) Green algae are also used as food by fishes which are in turn consumed as food by human beings.

(d) Importance of Protozoa :

- Protozoa form an important link in aquatic food chains. They feed on algae and are food for other protists and small animals, which in turn become food for others.
- Protozoa decompose organic matter and thereby help in converting organic wastes into simpler useful soil nutrients.
- Protozoa also exist in symbiotic association with other organisms. This association is usually beneficial to both the organisms (e.g. *Zoochlorella* in *Hydra*).
- Some forms of protozoa help in the final degradation of waste and sewage.
- Protozoa are used as research material for various biological activities.

1.3 MEDICINAL USE OF MICRO-ORGANISMS

(a) Antibiotics :

Antibiotics are chemicals that kill or stop the growth of certain kinds of microbes.

- They help our body to fight against diseases. The development of antibiotics began with the discovery of Penicillin by Sir Alexander Fleming in 1928.
- Fleming noticed that an agar plate inoculated with bacterium *Staphylococcus aureus* had become contaminated with a mould.
- He further noticed the presence of a clear zone in the agar plate in which breakdown of the bacterial cells had occurred. Detailed studies to the isolation of an inhibitory substance from the mould. As the mould was identified as *Penicillium*, Fleming called the antibiotic penicillin. Soon other antibiotics were isolated.
- Some well known antibiotics are streptomycin, gramicidin and tetracycline.
- The antibiotics have been obtained from either bacteria or fungi.

- These are the drugs specific for curing bacterial diseases. They either cease the formation of cell wall or interfere in their metabolic activities like production of proteins.
- This kills or stops the growth of bacteria.
- Antibiotics are not effective for viruses or it is difficult to make antiviral drugs because viruses are acellular entities which only have nucleic acid and protein but lack cytoplasm, cell wall and cell organelles. They do not have their own metabolic system but they use the host's metabolic machinery to grow & multiply so drugs are not effective for them.

(b) Vaccination :

A vaccine is a biological preparation that provides active acquired immunity to a particular disease. Edward Jenner was the first person who developed the technique of vaccination (1798). Every organism has a variety of defence mechanisms against the disease causing organisms like bacteria, fungi, viruses, etc.

- History of Vaccines and Vaccination : Edward Jenner, a doctor, during a dreadful small-pox epidemic in England, found that small-pox seldom affected rural people who worked around cattle.
- Most of the farmers had suffered from cowpox and recovered. This led him to think that an attack of cowpox had made these people immune to small-pox.
- He tested his vaccination theory on James Phipps, a healthy boy of about 8 years old. Dr. Jenner made two cuts on James and inoculated matter from cowpox pustule into it. James' arm developed a pustule which healed. Then, after some days Dr. Jenner inoculated James with material from a small-pox pustule. No sign of small-pox appeared. Dr. Jenner's vaccination experiment was successful. He used the term vaccine for immunity producing preparation and vaccination for the process of inoculation of the preparation into the body.
- What is Immune system ?

Your body is like a castle. Your immune system defends against germs. This system has a lot of different parts which work together to keep out any harmful germs, and attack and destroy any which manage to get inside your body. On the outside, our skin is a barrier for our whole body. Inside, our strong, white blood cells travel in our blood, looking for harmful microbes. These cells attack invading microbes in different ways. Some white blood cells produce antibodies that cancel out the microbe's chemicals while others surround the microbes and Every day your body is exposed to millions of germs, and you do not get sick from them because of your immune system, Every time you do get sick because of a germ your immune system works to get rid of it and then it remembers how to fight the infection if the same germ comes again. Usually the older you get, you become immune to more germs.

1.4 HARMFUL EFFECTS OF MICRO-ORGANISMS

(a) Common damages :

- Food poisoning : Food poisoning, stomach upsets are often caused by consuming contaminated food. Food poisoning mainly caused by clostridium botulinum which secretes botulin on fresh food. These bacteria decompose foodstuffs and make them unfit for human consumption.
- Microbes cause considerable damage to stored food grains in godowns.
- They cause considerable damage to historical buildings such as temples, museums and other monuments.
- The denitrifying bacteria reduces the fertility of the soil by converting nitrates into free nitrogen.
- Some microbes cause water pollution and aid in spreading communicable diseases.
- Extreme pollution by some algae can cause death of fishes and hence disturb the food chain.

- Some microbes deteriorate the quality of textile, timber, books, paper, shoes, furniture etc.
- They spoil the taste and flavour of fruit juice, milk products, meat, tea etc.
- Some microbes cause skin diseases and other allergies in man.

(a) Diseases in humans :

Pathogen	Name of human disease
Bacteria	Tuberculosis, Tetanus, Cholera, Typhoid, Diphtheria, Pneumonia, Leprosy
Fungi	Athlete's foot, Ringworm or Eczema
Viruses	Polio, Chicken pox, Measles, Hepatitis, Common cold, AIDS
Protozoa	Amoebic dysentery, Sleeping sickness, Leishmaniasis (Kala azar), Malaria

(b) Disease in Plant :

NAME OF PLANT DISEASES	MICRO-ORGANISM	MODE OF TRANSMISSION
Citrus canker	Bacteria	Air
Rust of wheat	Fungi	Air, seeds
Yellow vein mosaic of bhindi (Okra)	Virus	Insect
Red rot of Sugarcane	Fungi	Air
Blast of Rice	Fungi	Air

1.5 MODE OF SPREAD OF DISEASES

Infectious diseases are called communicable diseases because they can spread from affected persons to a healthy person.

- The means of communication or spread are different for different microbes.
- The disease causing micro-organisms are called pathogens (e.g. Bacteria, Virus, Protozoa, Fungi etc.).
- **Means of spread :**

(a) Direct transmission :

The pathogens are transmitted from an infected person to a healthy person directly without an intermediate agent. It occurs in the following ways :

- Contact with infected person :** Diseases like chicken pox, small pox, ring worm are spread by actual contact between infected person and a healthy person. Such diseases are called contagious diseases. The sexual contact is one of the closest physical contacts two people can have with each other. Diseases like syphilis, gonorrhoea (both caused by bacteria) and AIDS (caused by virus) are transmitted by sexual contact from one partner (infected) to the other (healthy).
- Contact with Soil:** The infectious agent of tetanus can enter the human body from soil through injuries.
- Animal bites:** The rabies virus is injected in the human body by the bite of rabied dog or monkey.
- Droplet infection :** Pathogens spread by way of sneezing, coughing, spitting and talking as in common cold, influenza, diphtheria, tuberculosis, pneumonia etc.

(b) Indirect transmission :

The pathogens of some diseases are carried through some intermediate agents. It occurs in the following ways:

- (i) **Vectors** : They are living organisms which spread their pathogens from an infected person to a healthy person. Usually, a part of life cycle of the pathogen is passed in the body of the vector.
- Some animals like housefly transfer the pathogen without taking them in their bodies. They are called carriers.
 - Housefly is carrier of cholera, dysentery, typhoid, diarrhoea, etc.
 - Female mosquitoes of many species are vectors of several diseases. They require blood meal in order to obtain nutrients for laying eggs. Female Anopheles spreads malaria while Culex spreads filaria.
- (ii) **Through contaminated food & water**: Cholera, hepatitis B, diarrhoea, ascariasis, etc. are some diseases which are transmitted through contaminated food and water.
- (iii) **Air borne diseases** : Infectious agents can get transferred from infected person to healthy person through air, dust and droplets (emitted on sneezing, coughing or spitting), e.g., common cold, pneumonia, tuberculosis.
- (iv) **Fomite borne** : Articles coming in contact with patients are a source of infection, e.g., door handles, taps, garments, currency, utensils, crockery.

1.6 FOOD PRESERVATION

- The main causes of spoiling of food products are microorganisms like bacteria and fungi. Wherever they get proper conditions of food, moisture and temperature they start growing. We can preserve food materials by controlling temperature and moisture.
 - **Following are the methods of food preservation –**
- (a) **Low temperature storage** :
- Food products can be preserved for a long time by ceasing the activities of microorganisms when kept at low temperature.
- On small scale we can preserve food material in a freeze. Now cold storage depot are available where one can store his agriculture products like fruits, vegetables, milk, fish, meat, eggs, prepared food and fruit juice for long time.
 - Microorganisms present in food products can't be destroyed by low temperature but their metabolic activities can be arrested so that they can't act on food products. At -10°C to -18°C temperature, fruits, eggs and meat can be stored for long time.
- (b) **Heat and cold treatment (Pasteurisation)** :
- The method developed by scientist Louis Pasteur, is used to store milk and liquid food products.
- Bacteria are destroyed by heating the substance at 62°C for 30 minutes or at 71.7°C for 15 seconds followed by cooling.
- (c) **Dehydration** :
- Bacteria and fungi can't be active in absence of moisture. Fruits, vegetables, meat, fish etc. are preserved by drying them in sun, air or heat. Yellowing of fruits can be avoided by dipping in 0.5 percent solution of potassium metabisulphite and then drying.
- (d) **Chemical Method (Use of preservatives)** :
- Many chemical substances help in preservation of food materials by arresting the growth of microorganisms in them. Acetic acid, Benzoic acid, Sorbic acid, sodium benzoate and sodium metabisulphite are used as preservatives.
- (e) **Preservation by common salt** :
- Concentrated solutions of common salt can kill micro organisms, due to dehydration. Meat and fish are covered with dry salt to check the growth of bacteria, e.g. Lemon preserved in common salt.

(f) Preservation by sugar :

Concentrated solutions of sugar can kill micro organisms, due to dehydration. Sugar reduces the moisture content which inhibits the growth of bacteria. Jams, Jellies, squashes and sweets known as Agra ka Petha, Murabba etc. are preserved by sugar.

(g) Preservation by oil and vinegar :

Use of oil and vinegar prevents spoilage of pickle because bacteria can not live in this environment.

(h) By radiation :

Preservation of food material by radiation is a new but cheaper method. In this method air tight packed food substances, are passed through a radiation beam. Microorganisms present in food substances get destroyed due to radiations and new microorganisms can't enter due to packing.



NS. 1

Fill in the blanks.

- (a) Microorganisms can be seen with the help of a _____.
 (b) Blue green algae fix _____ directly from air to enhance fertility of soil.
 (c) Alcohol is produced with the help of _____.
 (d) Cholera is caused by _____.

- Ans.** (a) Microscope
 (b) Atmospheric nitrogen
 (c) Yeast
 (d) Bacteria

NS. 2

Tick the correct answer.

- (a) Yeast is used in the production of
 (i) Sugar (ii) Alcohol
 (iii) Hydrochloric acid (iv) Oxygen
 (b) The following is an antibiotic.
 (i) Sodium bicarbonate
 (ii) Streptomycin
 (iii) Alcohol
 (iv) Yeast
 (c) Carrier of malaria-causing protozoan is
 (i) Female Anopheles mosquito
 (ii) Cockroach
 (iii) Housefly
 (iv) Butterfly
 (d) The most common carrier of communicable diseases is
 (i) Ant (ii) Housefly
 (iii) Dragonfly (iv) Spider
 (e) The bread or idli dough rises because of
 (i) Heat
 (ii) Grinding
 (iii) Growth of yeast cells
 (iv) Kneading
 (f) The process of conversion of sugar into alcohol is called
 (i) Nitrogen fixation (ii) Moulding
 (iii) Fermentation (iv) Infection.

- Ans.** (a) (ii), (b) (ii), (c) (i), (d) (ii), (e) (iii), (f) (iii).

NS. 3

Match the organisms in Column-A with their action in Column-B.

Column-A	Column-B
(i) Bacteria	(a) Nitrogen fixation
(ii) Rhizobium	(b) Setting of curd
(iii) Lactobacillus	(c) Baking of bread
(iv) Yeast	(d) Causes malaria
(v) A protozoan	(e) Causes cholera
(vi) A virus	(f) Causes AIDS
	(g) Producing antibodies

- Ans.** (i) - (e), (ii) - (a), (iii) - (b), (iv) - (c), (v) - (d), (vi) - (f).

NS. 4

Can microorganisms be seen with the naked eye? If not, how can they be seen?

- Ans.** Microorganisms are very small in size. They are so small that they cannot be seen with naked eyes. A microscope has to be used to see these organisms. Therefore, they are called microorganisms.

NS. 5

What are the major groups of microorganisms?

- Ans.** Microorganisms can mainly be divided into five groups:
 (i) Bacteria (ii) Fungi (iii) Protozoa
 (iv) Algae (v) Viruses

NS. 6

Name the microorganisms which can fix atmospheric nitrogen in the soil.

- Ans.** Bacteria like Rhizobium, Azotobacter and blue green algae like Anabaena and Nostoc can fix atmospheric nitrogen in the soil in form of nitrogenous compounds.

NS. 7

Write 10 lines on the usefulness of microorganisms in our lives.

- Ans.** Microorganisms are very useful to us. They help us in following ways:

- (i) Microorganisms help us in food sector. They are used for curdling of milk, preparation of bread, cake, etc.
- (ii) Microorganisms are used to produce alcohol at large scale.
- (iii) They are also used to produce wine.
- (iv) Yeast is used in bakeries.
- (v) They are also used as preservatives for food items.
- (vi) They are used to make different medicines, especially the antibiotics.
- (vii) Microorganisms are used to prepare vaccines for various diseases.
- (viii) They are useful for agriculture sector, as they enhance the fertility of soil by fixing atmospheric nitrogen.
- (ix) They work as natural cleaners, as they decompose the dead bodies of plants and animals.
- (x) Microorganisms prepare manures by decomposing dead bodies of plants and animals.

NS. 8

Write a short paragraph on the harms caused by microorganisms.

Ans. Microorganisms can prove very harmful to us as they cause a number of diseases in humans, plants and animals. Diseases in humans like common cold, tuberculosis, measles, chicken pox, polio, cholera, typhoid, hepatitis B, malaria, etc. are caused by microorganisms. Some serious diseases like anthrax is also caused in animals by the microbes. Microbes also cause diseases of plants like blights in potatoes and red rot in sugarcane, etc. They also reduce the yield. Microbes grow on food products and render them unfit for consumption. Consumption of such food causes food poisoning. Microbes also spoil clothings and leather products.

NS. 9

What are antibiotics? What precautions must be taken while taking antibiotics?

Ans. Medicines taken to kill or stop the growth of harmful or disease causing microbes in human body are called antibiotics. Antibiotics are very useful as only antibiotics can save us from many microbial infections and diseases. Antibiotics are made from fungi and bacteria. Alexander Fleming discovered the first antibiotic called penicillin in 1929. Now-a-days a number of antibiotics are used to cure a variety of human and animal diseases. Streptomycin, tetracycline, erythromycin, etc. are some commonly used antibiotics. Antibiotics should only be taken when advised by a qualified physician. They should only be taken when needed, otherwise, they become less effective for future use.

EXERCISE – I

ONLY ONE CORRECT TYPE

1. Penicillin is obtained from a/an
(A) Alga (B) Protozoan
(C) Virus (D) Fungus.
2. Bacterium responsible for the curdling of milk is
(A) Lactobacillus (B) E. coli
(C) Rhizobium (D) Plasmodium.
3. Aedes and Anopheles are
(A) Bacteria (B) Protozoans
(C) Algae (D) None of these.
4. Amoeba is a/an
(A) Virus (B) Alga
(C) Protozoan (D) Bacterium.
5. Mushrooms are
(A) Algae (B) Bacteria
(C) Fungi (D) None of these.
6. Which of the following is the smallest microorganism?
(A) Alga (B) Bacterium
(C) Protozoan (D) Virus
7. Bacteria are _____ organisms.
(A) Single-celled (B) Multicellular
(C) Non-cellular (D) None of these
8. Algae are autotrophs because they
(A) Carry out anaerobic respiration
(B) Can manufacture their own food
(C) Feed on dead organisms
(D) Feed on other living organisms.
9. Microorganisms which cause diseases are called
(A) Antigens (B) Antibodies
(C) Pathogens (D) Vectors.
10. Which of the following act as a host for the virus which causes dengue fever?
(A) Mosquitoes (B) Houseflies
(C) Rats (D) Humans
11. Tuberculosis spreads by
(A) Mosquitoes (B) Houseflies
(C) Contaminated water
(D) Droplets of sneeze and cough.
12. Which of the following bacteria can live symbiotically?
(A) Rhizobium (B) Chrosonomas
(C) Azotobacter (D) Clostridium
13. Fungi can be distinguished by
(A) Absence of chlorophyll
(B) Presence of chitin in cell wall
(C) Presence of plastids
(D) Both (A) and (B)
14. Which one of the following produces antibiotics?
(A) Mucor (B) Rhizopus
(C) Penicillium (D) Agaricus
15. Pasteurisation is a method invented by
(A) Edward Jenner (B) Alexander Fleming
(C) Louis Pasteur (D) Robert Koch
16. Algae differ from fungi in being
(A) Heterotrophic (B) Autotrophic
(C) Parasitic (D) Sporophytic
17. Common cold is a
(A) Bacterial disease (B) Viral disease
(C) Protozoan disease (D) Algal disease
18. The vector of malaria in humans is –
(A) Culex
(B) Aedes
(C) Anopheles
(D) all of these
19. Which of the following involves the use of microorganisms?
(A) Production of chemical fertilisers
(B) Production of fireworks
(C) Production of soft drinks
(D) Production of antibiotics
20. What is caused by the harmful effects of certain microorganisms?
(A) Fermentation of glucose
(B) Food poisoning in humans
(C) Heart disease in humans
(D) Production of antibiotics
21. Malaria is caused by a
(A) Virus (B) Fungus
(C) Protozoan (D) Bacterium
22. The branch of biology which deals with the study of microorganisms is called
(A) Botany
(B) Zoology
(C) Microbiology
(D) Genetics

23. These organisms have an ability to help in recycling of nutrients. Which organisms are these?
 (A) Bacteria (B) Diatoms
 (C) Virus (D) Algae
24. Select the incorrect statement.
 (A) Anthrax is a bacterial disease that affects humans and cattle.
 (B) Rust of wheat is a fungal disease that spread by air.
 (C) Citrus canker is a viral disease that affects citrus fruits.
 (D) Yellow vein mosaic is a viral disease that affects bhindi.
25. Bacteria present in root nodules of pea.
 (A) E-coli (B) Plasmodium
 (C) Rhizobium (D) Penicillin

PARAGRAPH

PARAGRAPH # 1

Ria thought of making curd. For this, she took lukewarm milk, mixed some curd into it and stir well. She kept the mixture in fridge. Next day she observed that curd was not set. Can you tell why the curd did not set. Curd did not set because she kept the mixture in fridge. Lower temperature of fridge retarded the growth of Lactobacillus in the mixture.

26. Which of the following is responsible for curd formation.
 (A) Lactobacillus (B) E-coli
 (C) Aspergillus (D) Streptococcus
27. Lactic acid bacteria grow in :
 (A) Curd (B) Milk
 (C) Juice (D) Water
28. The conversion of milk to curd also lead to.
 (A) Increasing vitamin B₆
 (B) Increasing vitamin C
 (C) Increasing vitamin B₁₂
 (D) Increasing vitamin D

PARAGRAPH # 2

A protozoan called plasmodium is responsible for malaria. It lives in the liver and blood of the person who has been infected by this disease. A female Anopheles mosquito when

sucks blood from the infected person, Plasmodium along with blood, is taken into its stomach. The plasmodium, here, multiplies itself and reaches the salivary gland of the mosquito, Now, when this mosquito bites a healthy person, it infects plasmodium along with saliva to him. the healthy person then gets an attack of malaria.

29. Malaria is caused by :
 (A) Bacteria (B) Protozoa
 (C) Fungi (D) Virus
30. Which kind of mosquito causes malaria disease.
 (A) Female (B) Male
 (C) Both (A) & (B) (D) None of these
31. Which malaria parasite is most dangerous.
 (A) Plasmodium vivax
 (B) Plasmodium ovale
 (C) Plasmodium malariae
 (D) Plasmodium falciparum

MATCH THE COLUMN TYPE

32. **Column-I** **Column-II**
 (P) Bacteria (i) Baking of bread
 (Q) Yeast (ii) Malaria
 (R) Virus (iii) Setting of curd
 (S) Protozoa (iv) Cholera
 (T) Lactobacillus (v) Aids
 (A) P → iv, Q → i, R → v, S → ii, T → iii
 (B) P → ii, Q → iii, R → i, S → iv, T → v
 (C) P → v, Q → ii, R → iii, S → iv, T → i
 (D) P → i, Q → iii, R → iv, S → ii, T → v
33. **Column-I** **Column-II**
 (P) Antibiotic (i) Virus
 (Q) Virus (ii) Malaria
 (R) Bacteriophage (iii) Smallest micro-organism
 (S) Fermentation (iv) Penicillin
 (T) Anopheles (v) Alcohol
 (A) P → iv, Q → iii, R → i, S → v, T → ii
 (B) P → ii, Q → iii, R → i, S → iv, T → v
 (C) P → v, Q → ii, R → iii, S → iv, T → i
 (D) P → i, Q → iii, R → iv, S → ii, T → v

EXERCISE – II

VERY SHORT ANSWER TYPE

1. Name two diseases caused by protozoans.
2. Name any two fungi.
3. Which groups of microbes consist of only unicellular organisms?
4. Which bacteria is responsible for the curdling of milk?
5. Name a bacterium which is used to produce alcohol.
6. What do you mean by fermentation ?
7. Name any two free-living bacteria.
8. Who discovered the first antibiotic?
9. Name any two symbiotic bacteria.
10. Define denitrification.

SHORT ANSWER TYPE

1. Describe the role of blue green algae in soil fertility.
2. Write the harmful effects of bacteria.
3. Write the harmful effects of fungi and algae.
4. Suggest some methods to prevent the growth of moulds.
5. What are viruses? Draw a labelled diagram of a virus.

LONG ANSWER TYPE

1. Name the type of microorganisms which cause the following diseases :
 - (i) Sleeping sickness
 - (ii) Plague
 - (iii) Common cold
 - (iv) Malaria
 - (v) Anthrax
2. What are fungi? How are they useful or harmful to us? Give figures also.
3. What do you mean by food poisoning? Explain.
4. What are food preservatives? Write about some common preservatives.
5. Explain the nitrogen cycle with a diagram.

FILL IN THE BLANKS

1. _____ is used in the preparation of beverages by fermentation of barley.
2. _____ is a skin disease in human caused by fungus.
3. _____ and _____ are two diseases.
4. In legumes, the root nodules contain the bacterium _____.
5. _____ made the first vaccine.

TRUE & FALSE

1. All fungi are unicellular.
2. A virus can reproduce on its own.
3. Yeast is a fungus.
4. Salt forces microbes to gain water.
5. Virus is living outside the body.

Answer Key

EXERCISE-I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
D	A	D	C	C	D	A	B	C	A	D	A	D	C	C
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	B	C	D	B	C	C	A	C	C	A	B	D	A	B
31	32	33	34	35	36									
C	A	A	A	B	D									

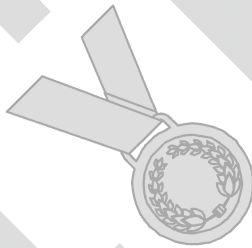
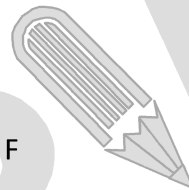
EXERCISE-II

FILL IN THE BLANKS

1. Yeast 2. Ringworm 3. Cholera and typhoid 4. Rhizobium
 5. Edward Jenner

TRUE / FALSE

1. F 2. T 3. T 4. F 5. F



SELF PROGRESS ASSESSMENT FRAMEWORK

(CHAPTER : MICROORGANISMS : FRIEND & FOE)

CONTENT	STATUS	DATE OF COMPLETION	SELF SIGNATURE
Theory			
In-Text Examples			
NCERT Exercises			
Exercise I			
Exercise II			
Short Note-1			
Revision - 1			
Revision - 2			
Revision - 3			
Remark			

NOTES :

1. In the status, put “completed” only when you have thoroughly worked through this particular section.
2. Always remember to put down the date of completion correctly. It will help you in future at the time of revision.



Space for Notes :

A large area for writing notes, consisting of 25 horizontal dotted lines.

