UNIT - IV

HETEROTROPHIC NUTRITION

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Introduction:

In our previous unit, we learnt how plants manufacture organic food (Carbohydrates) from simple inorganic substances such as Carbondioxide and water, the different steps involved in this process of manufacture of food by plants, etc. We have understood that only green plants and certain chemosynthetic bacteria have the ability to manufacture their own food. Think of the different organisms, including human beings, that are present in our environment; cats, dogs, cows, mosquitoes, bed-bugs, bacteria which are not chemosynthetic, fungi (which are non-green plants) that grow on exposed bread and fruits, etc. OH! so many organisms. All these organisms require food, viz., carbohydrates, fats, proteins for their growth and development. Do you have any idea as to how these organisms obtain their food? You may not. It does not matter. By the end of this unit you will be in a position to have a clear understanding of such a phenomena. More specifically, in this unit you would seek answers to the following questions.

- How do animals and certain non-green plants meet their food requirement?

- How can they be classified into different groups according to their mode of feeding, type of food they take,etc.?
- How certain plants feed on other animals to obtain their food?

All animals, being deprived of the ability to manufacture their own food, have to depend on other living organisms for their food. Consider the example of human beings. Think of the different foodstuffs you take daily. You may be taking foodstuffs like rice, potato, milk, egg, meat,chapati,etc., which contain carbohydrates, proteins and fats. Consider the example, 'white of an egg'. You know that it consists almost entirely of protein. Yet,this protein just as it is, can neither replace the proteins in your body nor supply you with energy which would enable you to carry on different activities. There are two main reasons as to why it cannot. One, the egg protein is different from any protein in your body. Two, there is no way by which the egg white can get into your body cells, because it does not dissolve in water and hence it cannot be carried by your blood. Hence, as a first step, it would have to be digested, that is, it would have to be changed into simpler substances that would dissolve in water before the protoplasm of the cells could make use of it. Likewise, carbohydrates and fats are to be broken down into simpler

substances like simple sugar (glucose) and fatty acids, before the cells could make use of it. Here arise the questions like:

- Where does this breaking down of different food substances into simpler substances take place in the body?
- How different foodstuffs are broken down into simpler and diffusible form?
- How does this digested food is absorbed by the cells of the body?

We will be finding answers to these Questions in the course of this Unit, viz., Heterotrophic Nutrition. You will be learning this Unit in the same way as you have learnt the topic 'Protoplasm and its Composition', that is, through small frames. I hope you enjoy this Unit too.

Unit - IV: (Heterotrophic Nutrition)

Approach : Inductive PLM

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1. Let us recall what we have studied in our previous sub-unit. We studied that green plants and certain bacteria, namely, chemosynthetic and photosynthetic bacteria have the ability to manufacture their own food. In other words, these organisms nourish themselves.

This type of nutrition which is self-nourishing in nature is called _____ nutrition.

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autotrophic

2. You are right. This type of nutrition which is self-nourishing in nature is called as autotrophic nutrition. The organisms which nourish themselves by manufacturing their own food are called as self-nourishers, or in other words, they are called as _____ _____.

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autotrophs

3. You are correct. Organisms which meet the requirement of food (that is requirement of carbohydrates, fats and proteins) by manufacturing it are called as autotrophs.

Think of the food requirement of animals. They also require carbohydrates, fats; proteins, minerals etc., for various life activities. It means, the food requirement of plants and animals are _____.

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same

4. You are perfectly correct. Plants and animals do not differ as far as their food requirements are concerned. You already know that green plants and certain bacteria, namely, chemosynthetic and photosynthetic bacteria meet their food requirement by manufacturing their own food. But what about plants which are non-green? We shall take the example of fungi with which you are all familiar. They do not possess chlorophyll in them.

Since fungi do not have chlorophyll in them, they c___t manufacture their own food.

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cannot

5. Like fungi, there are many other plants, for example, the plant called Cuscuta, bacteria etc., which do not possess chlorophyll.

Since, these plants do not possess chlorophyll in them, they also ca___ manufacture their own food.

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cannot

6. Now we shall consider the other Kingdom of living organisms, namely, the animal kingdom. All of you know that animals do not possess chlorophyll.

It is because of this lack of chlorophyll in their cells, animals _____ manufacture their own food like that of green plants.

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cannot

7. Now we know that animals and non-green plants do not have the capacity to manufacture their own food, which is due to lack of chlorophyll in their cells.

Since they do not have the capacity to manufacture their own food, we can say that they are not a___hs.

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autotrophs

8. You are right. They are not autotrophs. Then the question is, how do they meet their food requirement? Let us take one example, namely, that of cat. You know that it feeds on rats and milk.

In other words, we can say that cats are de___nts on other animals for their food.

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dependents

9. We shall consider another example, namely, that of Cow. This animal, as you know feeds on grass, small plants etc.

So, we can say that animals like cow, buffalo etc., are _____ on plants for their food.

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dependants

10. So far, we have considered animals feeding on living organisms. Now we shall take one example namely that of hawk which feeds on the flesh of living or dead animals.

It is same as saying that hawks _____ on the flesh of living or dead animals for its food.

depend

11. Now we shall consider the plant kingdom and understand how non-green plants meet their food requirement. Take the example of bacteria (other than photosynthetic and chemosynthetic) which feed on the foodstuffs in our mouth, and similarly that of fungi which are non-green plants feeding on dead and decaying organisms.

In other words, we can say that non-green plants _____ on other organisms, whether living, dead or decaying, for their food.

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depend

12. From the earlier frames about animals and non-green plants, what can we conclude about their meeting of food requirement?

We can conclude that organisms (animals and non-green plants) which do not have the capacity to manufacture their own food _____ on other organisms for their food.

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depend

13. You are correct. All animals and non-green plants (other than chemosynthetic and photosynthetic bacteria) depend on other organisms (some on living, and some on dead and decaying) for their food, since they cannot manufacture their own food.

Hence, we can say that they are not _____phs, or we call them as non-autotrophs

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autotrophs

14. I hope, by this time you are clear about autotrophs and non-autotrophs. Think as to how they differ from each other.

Autotrophs are In_____t for their food, whereas, non-autotrophs, namely, animals and non-green plants are _____ for their food.

Independant, dependant

15. Good. autotrophs are independent for their food, whereas, non-autotrophs are dependent for their food. We know that some of the non-autotrophs depend on living organisms for food, some on dead organisms, and some on dead and decaying organisms.

That means non-autotrophs depend on _____ sources of food.

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different

16. You are right. Non-autotrophs depend on different sources of food. Hence, they are also called as Heterotrophs. (Hetero means different and trophs means food).

So, the organisms which depend on other sources of food whether living, dead or decaying are called as _____.

Hetero-trophs

17. And, this type of nutrition, wherein, living organisms depend on other organisms whether living, dead or decaying is called as Heterotrophic nutrition.

So, _____ type of nutrition is a type of nutrition, wherein, living organisms obtain their food from different sources whether living, or dead and decaying.

hetero-
trophic

Assignment - 1

To make sure that you have understood the concept, you may answer the following questions.

1. What is Heterotrophic nutrition?

2. How do Heterotrophic and Autotrophic nutrition differ from each other?

3. Give three examples of Heterotrophs.

Activity :

Prepare a list of Heterotrophic organisms seen in your environment. Write one or two sentences about the type of food they take.

For a minute, you glance at the list of heterotrophs you have prepared. Among the organisms in the list, you may find that some are plants and some are animals. Among the animals, some may feed on the flesh of other animals, some on plants, some on dead and decaying organisms, and some may infect the healthy living organisms and absorb food etc. Now you think of a way by which these can be classified. Write your classification in a separate sheet of paper and proceed with the frames.

18. Let us take the examples of Cats, dogs, human beings, cows etc. You know that, they are all heterotrophs.

In other words, we can say that they _____ on other organisms for their food.

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depend

19. You are right. Now you think as to how these animals like Cats, dogs etc., nourish themselves. Let us take the specific example of Cats. You know that cats first kill rats and eat the flesh, or ingest it. The food that is thus taken in is digested in the stomach. The digested food is utilized for various life activities.

Like cats, dogs also first i_____ts food, then dig___ts it in stomach and thus meet their food requirements.

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ingests, digests

20. We shall consider our own case that is of human beings. We take many foodstuffs.

But, all these foodstuffs are first _____, and then _____ in the stomach, and thus it is utilized for various activities.

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ingested, digested.

21. Like cats and dogs, there are so many different kinds of animals surrounding us. Think of the different ways by which they nourish themselves. Can we conclude anything with regard to the way they nourish?

We can conclude that almost all animals first_____the food, and then _____it in their body and thus they meet the food requirement.

ingests, digests

22. You are right. Since almost all animals nourish themselves in this way, that is ingesting the solid food, digesting it and absorbing it, we can say that this is animal mode of feeding.

So, the type of feeding, wherein, the solid food is first ingested, digested in the body, and then absorbed can be called as _____ mode of feeding, since it is seen mostly in animals.

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animal

23. So far, we have tried to understand something about animal mode of feeding. Now let us try to understand about certain plants, which nourish themselves like animals. Recall what you have studied about insectivorous plants in your sixth standard. You know that these are green-plants and possess chlorophyll.

Since, these insectivorous plants possess chlorophyll, they are able to manufacture C_____tes needed for their life activities.

Carbohydrates

24. But, you have also studied that these plants capture insects, digests them and absorb nutrients from the body of the insects. This they do to meet their nitrogenous food requirements such as proteins etc.

So, we can say that these insectivorous plants feed on other insects (solid food) just like _____.

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animals

25. It can also be said in a different way, that is, these plants (insectivorous plants) have the ability to ingest, digest and absorb _____ food just like animals.

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solid

26. Now, you compare the kind of nutrition in insectivorous plants with that of any other green plant.

You may say that green plants have the capacity only to manufacture its food, whereas, insectivorous plants, besides possessing the ability to manufacture their food, have the capacity to ingest, digest and absorb _____ food like animals.

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solid

27. You are right by saying that insectivorous plants have the ability to ingest, digest and absorb solid food (insects) like animals. This animal mode of feeding is called as Holozoic type of feeding.

So, almost all animals and insectivorous plants are examples for _____ type of feeding.

Holozoic

28. Now you might be thinking as to what about bacteria and fungi. You know very well that fungi (fungi is pleural, whereas fungus is singular) do not have chlorophyll in them and hence, depend on other organisms for food. About bacteria, you know that bacteria other than photosynthetic and chemosynthetic,

depend on other organisms whether living or dead for their food.

In other words, we can say that these fungi and bacteria are h____phic in nature.

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hetero-trophic

29. First we shall consider those bacteria which live on dead and decaying organisms. All of you might have experienced the smell of dead rat at one time or another. What may be the reason for this?

You may say that, it is because of the d___ing of the dead rat.

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decaying

30. You are correct. You take your own example. What will happen if an open wound on your body is left untreated? You know that it will cause septic, or we can say that there will be formation of pus and after a few days starts swelling.

In other words, we can say that the dead tissues of the wound start _____ing.

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decaying

31. You can think of many more examples of decaying. But, the question is how and why this decaying is caused? It is because of the bacteria which live on them. These bacteria secrete certain enzymes, which break down the carbohydrates, fats and proteins of the dead tissues and thus, absorb the broken down food.

In simpler words, these bacteria feed on _____ and _____ organisms and thus obtain their nourishment.

dead, decaying	32.	Let us take the example of fungi. All of you might have seen the appearance of some whitish substance when fruits and vegetables, or moist bread slices are exposed to air for a long time. You know that the whitish substance is the fungal growth. Think, from where does this fungus gets its nourishment to grow? You may say that it obtains its food from the exposed _____ or _____or _____.
fruits, vegetables bread.	33.	You know that fruits and vegetables which have been plucked from the plants and kept for long time becomes dead and after sometime decay. This ____ and ____ing fruits and vegetables form the food of certain fungi and bacteria.
dead, decaying	34.	Now, you know that dead and decaying organisms which everyone thinks as waste, form the food of many organisms. These dead and decaying organisms are denoted by Greek word,namely, Sapros. So, the Greek word _____ means dead and decaying organisms or rotten organisms.
Sapros	35.	And, the organisms which feed on these dead and decaying organisms are called as Saprophytes. 'Sapro' means dead,'phyta' means plants. Since a majority of the

organisms which feed on dead and decaying organisms are plants, they are called as phyta.

So, S_____tes are organisms which live on dead and decaying organisms and they include both plants and animals.

Saprophytes 36. I hope you are clear about saprophytes and their mode of feeding. Now, think of the bacteria that live in our mouth and [illegible] intestine. They feed on the food that we take and thus meet their food requirement. The bacteria which live in our mouth, feed on the food particles that are there sticking to the teeth and make them decay. If we do not brush our teeth daily, the teeth gets spoiled. We serve as hosts for these bacteria.

In other words, human beings serve as _____ for certain type of bacteria.

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hosts 37. Let us take another example, namely, that of round worms. You know that they live in the intestine of human beings and absorb food from the intestine by attaching themselves to the intestinal walls.

So, we can say that human beings serve as _____ for round worms also.

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hosts 38. We shall consider another example namely Cuscuta plant.

This plant winds itself round the stem of other plants (see the diagram 1) and absorb food from the stem of those plants.

So, the plants on which Cuscuta grows are _____ for Cuscuta plant.

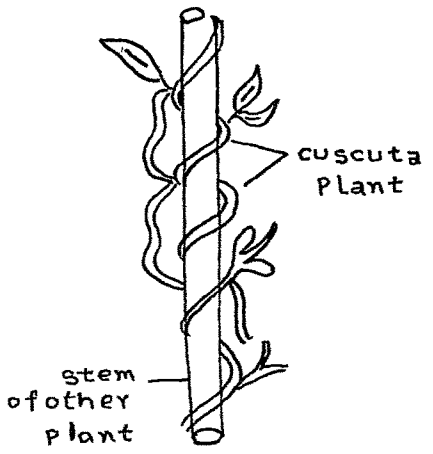

Diagram - I

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hosts

39. We have seen three examples of plants and animals obtaining food from other living organisms. These organisms which obtain food directly from other living organisms are called parasites and the organisms from which they obtain food are called as hosts.

So, in the earlier three examples, bacteria, round worms and Cuscuta plant are the _____.

Parasites

40. You are all familiar with bed-bugs and mosquitoes. They suck the blood of human beings and thus meet their food requirement.

In this example, bed-bugs and mosquitoes are the _____, whereas human beings are the _____.

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parasites, hosts.

41. Let us summarise what we have studied. So far, in this Unit, we studied about

1) plants and animals feeding on solid food material; 2) plants and animals feeding on dead and decaying organisms; and 3) Organisms obtaining food directly from other living organisms.

In other words, we have studied about three types of modes of nutrition, namely, 1)_____, 2) _____ and 3) _____.

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holozoic, saprophytic, parasitic

42. We can also say it in a different way, that is, according to the nature of feeding, organisms (heterotrophs) can be classified into:
1)_____,2)_____, 3_____.

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holozoic saprophytes parasites

43. You are right. They can be classified into Holozoic organisms, saprophytic organisms and parasitic organisms depending upon the mode of obtaining nourishment. But all these three types come under _____phs, since in all the three types, there is dependency for food on other organisms, whether living or dead.

Heterotrophs

44. So far, you have studied about three modes of obtaining food among heterotrophs. Let us consider parasitism. Think of the association between a parasite and its host. Let us take a specific example, namely, the association between round worms and human beings. Think as to which organism is benefited in this association:

human beings/round worm

If your answer is human beings, go to frame 45.
If your answer is round worm, go to frame 46.

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45. Think carefully. In the association between round worm and human beings, round worms are the parasites and human beings are the hosts, since human beings supply food material to the round worms.

Hence, _____ _____ are benefited and not _____ _____

Go to frame No. 46

Round worms, Human beings

46. You are correct. Round worms are benefited since they obtain food from human beings. Think of the example of bacteria living in the mouth and intestine of human beings.

In the above example _____ are benefited since they obtain food from their hosts, namely, _____ _____.

Bacteria, Human beings

47. In both the examples which we have studied so far, it is the _____ that is benefited than the _____.

Parasite host

48. You are correct. It is usually the parasites that are benefited than the hosts.

It is a harmful association. But can there be an association between two organisms wherein both are benefited? You will understand when you proceed with the following frames.

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49. We shall consider a case of two friends 'A' and 'B' living together. Mr. 'A' is having a job and earning, but is not having a house to live. Whereas, Mr. 'B' is having his own house, but is without a job. Here Mr. 'A' looks after Mr.'B' for his food and other things from his earnings, and at the same time he gets shelter from Mr. 'B'.

In the above association that is between Mr. 'A' and Mr. 'B', _____ the friends are being benefited - One/both

If you answer is 'One of' go to frame 50
If your answer is 'both' go to frame 51

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50. Think once again. Mr. 'A' takes care of Mr. 'B' for his food and other things. So 'B' is benefited. Now you think of Mr.'A'. Since Mr. 'A' gets shelter, he is also benefited. In other words _____ are benefited. (go to frame 51)

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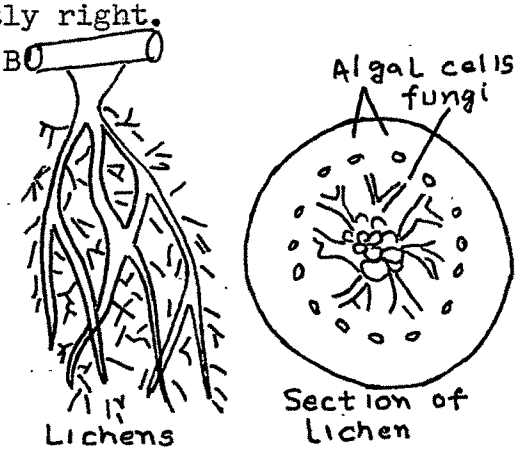
51. You are perfectly right. Both Mr.'A' and Mr.'B' are benefitted. Let us take the example of a plant, namely, lichens. It is made up of both algal cells and fungal cells.(see diagram). The algal cells possess chlorophyll



and hence can manufacture carbohydrates. This food is supplied to fungal cells which do not possess chlorophyll. The fungal cells inturn provide algal cells with water and mineral salts.

In this association both algal cells as well as fungal cells are _____

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benefitted

52. We shall consider another example which you have already studied, namely, nitrogen fixing bacteria. You know that these bacteria supply the roots of leguminose plants with nitrates, and inturn gets prepared food from the plants.

This is another example of the association between organisms, wherein, both the organisms are _____.

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benefitted

53. This type of an association wherein two different organisms living together and both being benefited is called as symbiosis.

So,_____, just like parasiticism, association between two organisms, is a type wherein, both are mutually benefited.

Symbiosis

54. The difference between symbiosis and parasitism is, in symbiosis _____ the organisms are benefited whereas in parasitism only _____ organism is benefited.

---

both,
one

Answer the following questions before you proceed further:

1. What is parasitism? Give two examples for this type of an association.
2. What is symbiosis? Give two examples for this type of an association.
3. What is the difference between parasitism and symbiosis.

Activity:

1. From the list of heterotrophs which you have prepared already, write the names of the organisms which are parasites and also the possible hosts for these parasites.
2. Here is given a statement. "All animals are parasites on plants". Write a paragraph about your agree or disagreement with the statement. Later, you can discuss with your teacher.

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55. Well friends, so far, you have studied about different types of heterotrophs and also different types of associations. You know that all animals are heterotrophs. Among these animals, some animals only feed on flesh of other animals e.g. Cats, tigers, wolf, etc.

These animals which feed on flesh of other animals are commonly called as C_____animals.

Carni-vorous	56.	Like wise, some animals feed only on plants e.g.- Cow, buffaloes, deer etc. These animals are called as _____ animals.
Herbi-vorous	57.	Well, now you know two types of animals, namely, Carnivorous animals which feed only on flesh and blood of other animals, and, herbivorous animals which feed on leaves and plants. In addition to these two categories, there is another category of animals which feed on both plants as well as animals. These animals are called as Omnivorous animals. Human beings, as you know, feed on both plant products as well as animal. Hence they are _____ animals.
Omnivorous	58.	You are right. Human beings are omnivorous in nature. Now let us take the example of one Carnivorous animals, namely, Cat. You know that cats feed on the flesh of ra__.
Rats	59.	True, Cats feed on the flesh of rats. Think for a moment the food of rats. Rats' food may comprised of rice, wheat, radish, carrot, etc. In other words, rats feed on Pl____ and Pl____ products.

Plant, Plant

60. You are correct. Rats feed on plant and plant products. Now, from this example can we say that cats even though are carnivorous animals, depend on plants for their food?

Yes/No

If Yes go to the frame No. 62
If No go to frame No. 61

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61. You might have written 'No' by thinking about Cats feeding on Milk. You know that milk is obtained from cow, or buffalow and these animals feed on only plants.

It means, cats indirectly depend on _____ for their food.

Go to Frame No. 62

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62. You are right. Like this, you may think of animals depending directly (like herbivorous) or indirectly like cats on plant for their food. Now, can we generalise that "<u>All flesh is grass</u>".

Write your answer in a separate sheet of paper for your agreement or disagreement with the statement, namely, "<u>All Flesh is Grass</u>" and discuss with your teacher.

Your teacher will discuss with you about your agreement or disagreement, and he will develop the Concept of <u>food chain</u> and <u>ecosystem</u>. (Teacher to discuss about the topics "All Flesh is Grass" and to develop the Concept of feed chain and ecosystem.)

Unit - IV : (Heterotrophic Nutrition)

Approach : (Deductive PLM)

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1. Let us recall what we have studied in our previous Unit, viz., Autotrophic nutrition. We studied that green plants and certain bacteria, namely, chemosynthetic and photosynthetic bacteria have the ability to manufacture their own food. In other words, these organisms have the ability to nourish themselves.

This type of nutrition which is self-nourishing in nature is called as _____ nutrition.

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autotrophic

2. You are right. This type of nutrition which is self-nourishing in nature is called as autotrophic nutrition. The organisms which nourish themselves by manufacturing their own food are called as self-nourishers or in other words, they are called as a___phs.

Autotrophs

3. You are correct. Organisms which meet the requirement of food, that is, requirement of carbohydrates, fats and proteins by manufacutring them are called as autotrophs.

Think of the food requirement of animals. They also require carbohydrates, fats, proteins, minerals etc., for various life activities. We can say that the food requirement of both plants and animals are same.

So, plants and animals do not di___ as far as their food requirement is concerned.

---

differ

4. We shall take one example. The plant that grows in your sports ground requires carbohydrates, fats, etc., for its growth and development. In the same way, you also require the same carbohydrates, fats, etc., for your growth and development.

In other words, the food requirement of yourself and that of the plant growing in your sports ground is s___e.

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same

5. You are perfectly correct. Plants and animals do not differ from each other as far as the basic food requirement is concerned. But, the question is 'how do these organisms (whether plants or animals) meet their food requirement? We already know that green plants and certain photosynthetic and chemo-synthetic bacteria meet this food requirement by manufacturing their own food. What about animals and non- green plants?

Since, animals and non-green plants do do not possess chlorophyll, they cannot manufacture their own food. In other words, they _____ have the ability to manufacture their own food.

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do not

6. We can also say that animals and non-green plants are not au___phs.

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auto-trophs

7. Then the question is, how do they meet their food requirement? All animals and non-green plants depend on other organisms for meeting their food requirement. Some depend on living organisms, and some on dead and decaying. These organisms which depend on other organisms are called as Heterotrophs.

H_____s are the organisms which depend on other organisms for their food.

Hetero-trophs

8. You are right. Heterotrophs are the organisms which obtain food from different sources (it may be either living, or dead and decaying), and this type of nutrition is called as Heterotrophic nutrition.

We can also say that the mode of nourishment of Heterotrophs is called as _____ nutrition.

Heterotro-phic

9. By this time you might be wondering as to how can an organism feed on dead and decaying organisms. We shall study an example to understand this type of heterotrophic nutrition better. You are all familiar with the bird 'Hawk'. It feeds on the flesh of living or dead animals.

It is the same as saying that hawks _____ on the flesh of living or dead animals for its food.

depend

10. Now let us take the examples of animals which feed on other living organisms e.g., cats, dogs, etc., feeding on the flesh of living organisms; cows and buffaloes feeding on grass and small plants,etc.

It means, there are many animals which depend upon other l g organisms for their food.

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living

12. Let us consider non-green plants to understand how they meet their food requirement. Take the example of bacteria (other than photosynthetic and chemosynthetic) which feed on food stuffs in our mouth; fungi, which are non-green plants feeding on dead and decaying organisms.

In other words, we can say that non-green plants _____ upon other organisms whether living, dead or decaying for their food.

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depend

12. Now, I hope that you are clear about how animals and non-green plants meet their food requirement by feeding on living, or dead and decaying organisms. Now you think as to how these heterotrophs differ from autotrophs.

Autotrophs are in _____ for their food, whereas, animals and non-green plants are _____ for their food.

---

independent
dependent

13. Now you are clear about heterotrophs, heterotrophic nutrition, and how it differs from autotrophic nutrition, etc.

Assignment 1

To make sure that you have understood the concept, you may answer the following questions:

1. What is Heterotrophic nutrition?
2. How do heterotrophic and autotrophic nutrition differ from each other?
3. Give three examples of heterotrophs.

Activity

Prepare a list of heterotrophic organisms seen in your environment. Write one or two sentences about the type of food they take.

For a minute you glance at the list of heterotrophs you have prepared. Among the organisms in the list, you may find that some are plants, and some are animals. Among the animals some may feed on flesh of other animals, some on plants, some on dead and decaying organisms, and some may infect the healthy living organisms and absorb food. Now, you think of the way by which these can be classified. Write your classification in a separate sheet of paper and then proceed with the grames.

15. In your list of heterotrophs, probably you might have given the examples of cats, dogs, human beings, cows,etc. You might have listed them under heterotrophs mainly because they _____ on other organisms for food.

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depend

16. Think for a moment, how these animals like cat, dog etc., nourish themselves. They ingest solid food (that is flesh, bread etc.), digest it in their stomach, and this digested food is made use of for performing various life activities. Like cats, dogs, etc., majority of the animals ingest solid food, digest it in their stomach, and the digested food is absorbed and utilized for various life activities.

From the above we can say that ingesting solid food, digesting and absorbing it, is characteristic of majority of _____.

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animals

17. Since this mode of feeding, namely, ingesting the solid food, digesting it and absorbing it is characteristic of majority of animals, it is called as animal mode of feeding, or it is also called as holozoic mode of feeding.

In simpler words, we can say that animal mode of feeding is called as _____ mode of feeding.

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holozoic

18. We shall study some examples to understand this holozoic mode of feeding or animal mode of feeding. You know that elephants and buffaloes feed on plants (which is solid food) digest them in their stomach and thus get energy for various activities.

So, the mode of feeding in elephants and buffaloes is _____.

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holozoic

19. Let us consider the case of human beings. We eat rice, wheat, vegetables etc., which are solid in nature, digests them in our stomach, and this digested food is utilised for various life activities.

In other words, it can be said that the mode of feeding in human beings is also _____ in nature.

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holozoic

20. Let us consider the plants which are holozoic in their mode of feeding. Recall what you have studied about insectivorous plants in your sixth standard. These plants feed on insects (solid food), digests the insects, and absorb the nutrients from the body of insects.

So, insectivorous plants are also examples for _____ mode of feeding.

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holozoic

22. But, you might be wondering as to why these plants have to depend on insects, even -though they have the capacity of manufacture their own food. Yes. You are correct in your doubt. These insectiverous plants, being green in colour (possessing chlorophyll) have the capacity to manufacture their own carbo-hydrates. But, they have to depend on insects for their nitrogenous food requirement such as proteins.

Since they feed on insects (solid food) just like any other animal, we can say that they are _____ in their mode of feeding.

---

holozoic

23. You are correct. So far, we have seen animals and plants which are holozoic in their mode of feeding. Let us take the examples of bacteria (other than photosynthetic and chemosynthetic) and fungi which are non-green and which depend on dead and decaying organisms for their food. Since, these organisms depend on dead and decaying organi-sms, they are called as saprophytes.

So, _____tes are organisms which feed on dead and decaying organisms.

---

saprophytes

24. Let us split the word saprophyte to understand it better. Sapros means dead and decaying or rotten food, and phytes means plants.

Like bacteria and fungi, there are many more living organisms which depend on dead and decaying organisms for food, and these organisms are called as _____.

---

saprophytes

25. And their mode of nutrition is called as saprophytic nutrition.

The mode of obtaining nourishment from dead and decaying organisms is called as _____ nutrition.

---

saprophytic

26. We shall take the examples of bacteria and fungi to understand this mode of nutrition. In your house, you might have experienced the smell of a dead rat. The nasty smell is due to the decaying of the rat, caused by the bacteria which live on them. These bacteria which live on dead organisms secrete certain enzymes which break down the carbohydrates, fats and proteins of the dead tissues and absorb nutrients and thus make the tissues decay.

Now we have seen one example of saprophyte, namely, bacteria feeding on d_____ and decaying organisms.

---

dead, decaying

27. Coming to fungi, all of you might have seen the appearance of some whitish substance when fruits, vegetables or moist bread is exposed to air. You know that this whitish substance is the fungal growth. From

where does this fungus gets its nourishment to grow?

You may say that it gets food from the exposed fruits or vegetables which are decaying. In other words, fungus is another example for a s_____, since they obtain their food from dead and decaying organisms.

---

saprophytes

28. So far we have studied about organisms feeding on dead and decaying organisms. Think of bacteria that live in our mouth and our intestine. They meet their food requirement from the food we take. We serve as hosts for these bacteria.

In other words, human beings are the _____ for certain type of bacteria.

---

hosts

29. In the earlier example, namely, bacteria living in the mouth and intestine of human beings, bacteria are called as parasitis, since they obtain food directly from living organisms.

In the example of bacteria and human beings, human beings serve as _____ for the bacteria which are the _____.

---

hosts, parasites

30. We shall consider another example to understand the concept of parasites and hosts. You are all familiar with round worms which live in the intestine of human beings, and absorb food from the intestine by

attaching themselves to the intestinal walls.

In the above case,_____ are the parasites and _____ are the **host**

---

round worms human beings

31. We shall consider another example,namely, cuscuta plant. This plant winds itself round the stems of other plants(see the diagram 1) and absorb food from the stems of those plants.

So, the plants on which cuscuta grows are the _____ for cuscuta plant.

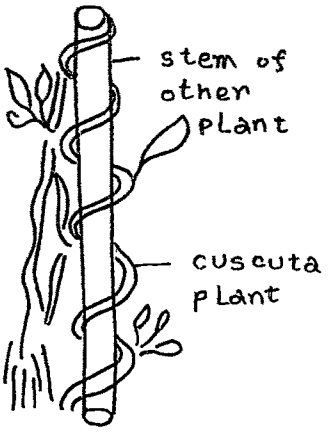

Diagram 1

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hosts

32. To cite other common examples, you all are familiar with bed bugs and mosquitoes. They suck the blood of human beings and thus meet their food requirement.

Here, bed bugs and mosquitoes are the _____ and human beings are the _____.

---

parasites

33. Let us summarise what we have studied in last few frames. We have studied about plants and animals feeding on solid food materials; plants and animals feeding on

dead and decaying organisms; and organisms obtaining food directly from other living organisms.

In other words, we have studied about three types or modes of nutrition,namely; 1_____,2_____ 3_____.

---

holozoic saprophytic, parasitic

34. You are right. They can be classified into holozoic organisms, saprophytic organisms and parasitic organisms, depending upon the nature of obtaining nourishment. But all these three types come under _____ type of nutrition, since in all the three types, there is dependency for food on other organisms whether living or dead or decaying.

---

hetero-trophic

35. Uptil now you have studied about three modes or types of obtaining food among heterotrophs. Let us consider parasitism. Think of the association between a parasite and its host. Let us take a specific example, namely, of round worms and human beings. In this association, it is the round worms that are benefited.

In other words, we can say that round worms, being parasites are _____ than the hosts,namely, human beings.

---

benefited

36. You are correct. In the association between parasites and hosts, usually

parasites are benefited. We shall see whether this is true in other cases of parasites and hosts. Consider the example of bacteria living in the mouth and intestine of man.

Here also, bacteria which are the _____ are benefited, and not human beings, who are the _____.

---

parasites, hosts

37 You are right. Bacteria which are the parasites on human beings are benefited in the association between bacteria and human beings. It is a harmful association, since one is a gainer and the other is a looser. But, there is another type of association that exists between two living organisms, wherein, both the organisms are benefited. This type of association is called as symbiosis.

So, _____ is a type of association that exists between two living organisms, wherein, both the organisms are benefited.

---

symbiosis

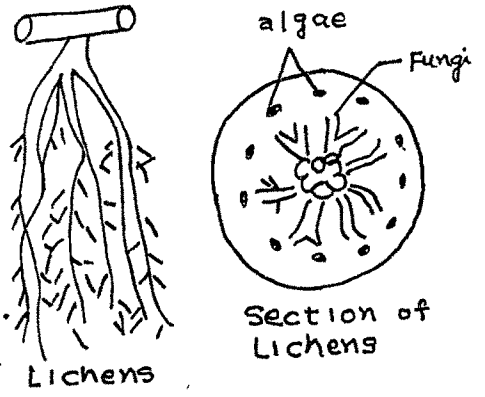
38. To understand this better, we shall consider the case of two friends, Mr. 'A' and Mr. 'B' living together. Mr. 'A' is having a job and earning, but is not having his own house to live. Whereas Mr. 'B' is having his own house, but is without a job. Here Mr. 'A' looks after Mr. 'B' for his food and other things from his earnings and at the same time he gets shelter from Mr. 'B'.

In the above association between Mr. 'A' and Mr. 'B', b____ are benefited.

---

both

39. You are perfectly correct. We shall take another example, namely, 'lichens' to understand better. Lichens are plants and are made up of both algal cells and fungal cells. (see the diagram). The algal cells possess chlorophyll and hence can manufacture carbohydrates. This food is supplied to fungal cells which do not possess chlorophyll. The fungal cells in turn provide algal cells with water and mineral salts.



In this association both algal cells as well as fungal cells are _____.

---

benefited

40. Let us consider another example, namely, nitrogen fixing bacteria', about which you have already studied in your earlier classes. You know that these nitrogen fixing bacteria live in the roots of leguminose plants and supply these plants with nitrates. In turn, these bacteria get prepared food from the leguminose plants.

In the above example also, both the organisms, namely, leguminose plants and bacteria are mutually _____.

---

bene-
fited

41. From the different examples considered above, you must have understood what is symbiosis.

Symbiosis is a type of association that exists between two living organisms, wherein both the organisms are _____.

---

bene-
fited

42. Now recall what you have studied about parasitism. Parasitism is a type of association that exists between certain organisms, wherein, only parasites are benefited, whereas hosts are not benefited, on the other hand, they are the loosers.

In other words, we can say that in parasites only one organism, out of the two is b_____.

---

bene-
fited

43. The difference between symbiosis and parasitism is, in symbiosis b____ the organisms are benefited, whereas in the parasitism only _____ organism is benefited.

---

both
one

Now let us try to summarise what we have studied. We have studied, in the earlier frames, about two types of associations that exist among certain living organisms, namely parasitism and symbiosis. Parasitism is a association that exists between two organisms, wherein, only one organism is benefitted. Symbiosis is another type of association that exists between two organisms, wherein, both the organisms are benefited.

To make sure that you have understood the concepts, you may answer the following questions in a separate sheet of paper and then proceed with the frames.

Assignment - 2

1. What is parasitism? Give two examples for this type of an association.
2. What is symbiosis? Give two examples for this type of an association.
3. What is the difference between parasitism and symbiosis?

Activity :

1. From the list of heterotrophs which you have prepared already, write the names of the organisms which are parasites and also the possible hosts for these parasites.
2. Here is given a statement namely "All animals are parasites on plants". Write a paragraph about your agreement or disagreement with the statement in a separate sheet of paper. And later, you can discuss with your teacher.

44. Well friends, so far, you have studied about different types of heterotrophis and also different types of associations. You know that all animals are heterotrophs.

Among these animals, some animals feed only on the flesh of other animals, e.g. cats, tiger, wolf, etc.

These animals which feed on the flesh of other animals are commonly called as c _____ s animals

---

carnivorous

45. Likewise, some animals feed only on plants e.g. cows, buffaloes, deer, etc.

These animals are called as _____ animals.

---

herbivorous

46. Well, now you know two types of animals, namely, carnivorous animals and herbivorous animals. In addition to these categories, there is another category of animals which feed on both plants as well as animals. These animals are called as Omnivorous animals.

Human beings, as you know, feed on both plant products as well as animal products. Hence they are _____ animals.

Omnivorous

47. You are right. Now you recall the statement "All flesh is grass" and the points you have written in favour of or against the statement. If you think deeply you will come to know that the statement "All flesh is grass" is true. Let us take one simple example, viz., of cats and examine this statement.

Cats are carnivorous in nature and feed on r___.

---

rats

48. True. Cats feed on the flesh of rats. Think for a moment the food of rats. It may be rice, wheat, radish, carrot etc.

In other words, rats feed on plant and p____t products.

---

plant

49. You are right. Rats feed on plant and plant products. Now, from this example can we say that cats even though carnivorous, depend on plant and plant products for their food?

Yes/No

If your answer is 'yes' go to frame 51
If your answer is 'no' go to frame 50

---

50 You might have written 'no' thinking about cats feeding on milk. You know that milk is obtained from cow and buffalo and these animals feed only on plants.

It means, cats indirectly depend on _____ for their food.

go to frame No. 51

---

51 You are correct. Like this, you may think of animals depending directly (like herbivorous or indirectly (like cats) on plants for their food. Now, can we generalise that "All flesh is grass".

Write your answer in a separate sheet of paper for your agreement or disagreement with the statement, namely,"All flesh is grass" and discuss with your teacher.

Your teacher will discuss with you about your agreement or disagreement, and he will develop the concept of Food Chain and Ecosystem.

(Teacher to discuss about the topic "All Flesh is Grass" and to develop the concept of food chain and ecosystem).

Food Chain and Ecosystem

Think of the statement "All Flesh is Grass", and the reasons which you have given for your agreement or disagreement with the statement. Some of you might have agreed with the statement. Let us take 2 or 3 examples and examine the truth of the statement.

Example - I :

You may be familiar with the birds, namely, vultures. You know that they eat snakes (refer diagram 14). Snakes eat frogs as their food. Think of the food of frogs. Frogs feed on insects. Right. What about the food of insects? You may say that they depend on plants e.g.- butterflies, grasshopper, etc., feed on honey and stamens of the plants. You can see that ultimately all depend upon plants for their food. We shall consider another example.

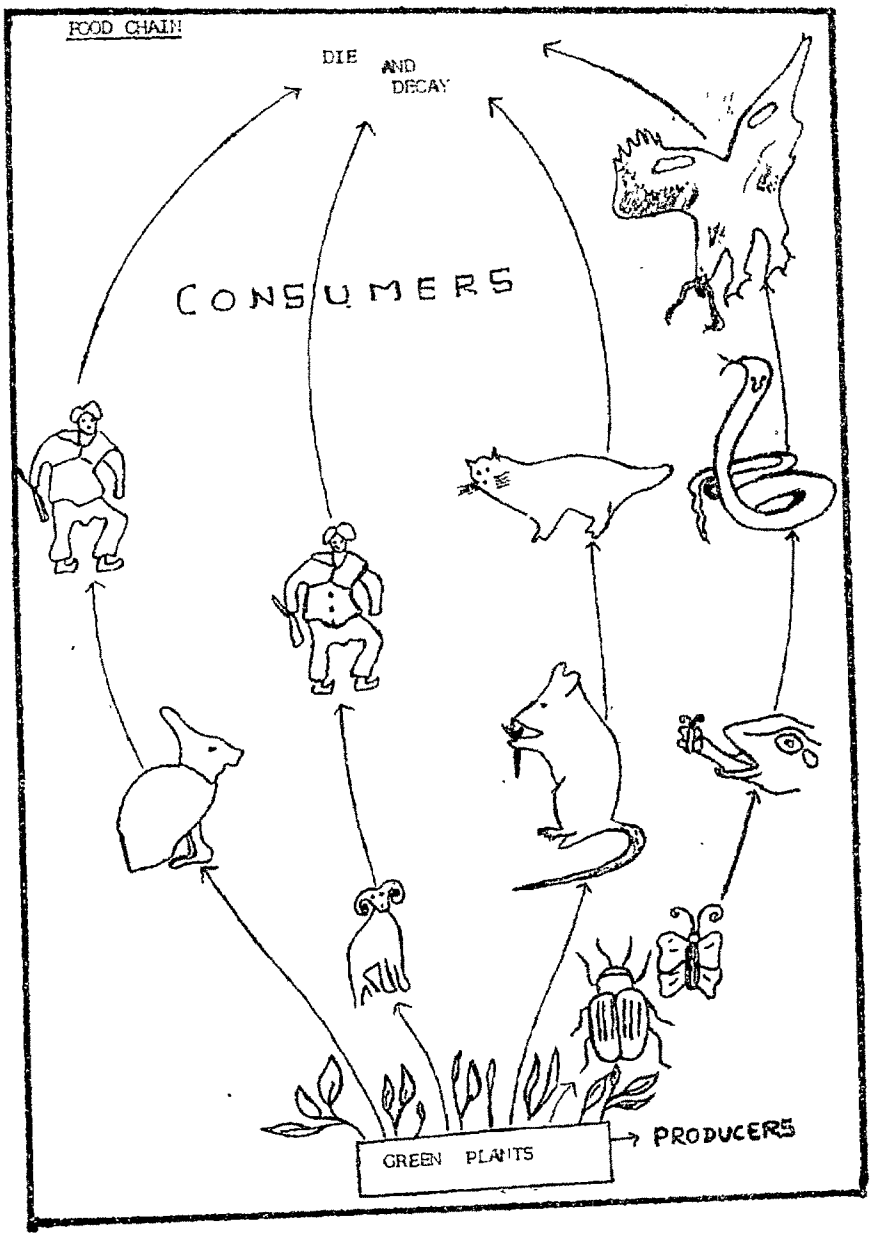
Example -II :

You all know that cats feed upon rats (refer diagram -14). The food of rats consists of rice, wheat grains, cabbage,etc., which are all plant products. In other words, rats depend upon plants for their food. In this example also you can make out that cats, a purely carnivorous animal, depending upon plants indirectly for food. You may consider another example, namely, that of human beings.

Example-III :

All of you know that human beings are Omnivorous, which means, they take both vegetarian as well as non-vegetarian foods. We need not consider the case of vegetarians, because, they directly depend upon ——————→plants for their food. What about non-vegetarians? Refer diagram 14. They may eat fish, mutton, chicken beef, etc., which are nothing but flesh of animals. Think of the food of these animals. They feed on plant and plant products. In this respect, indirectly, even non-vegetarians depend upon plants for their food.

By now, from the three examples which we have considered, you might have come to know that 'all flesh is nothing but grass.' You can think of many more examples. For a moment, think deeply about the examples. Can we generalise anything from the


FOOD CHAIN
DIE AND DECAY
CONSUMERS
GREEN PLANTS
PRODUCERS

examples. You may say that all animals directly (herbivorous) or indirectly (carnivorous) depend on plants for their food. Plants are the manufacturers of food. They manufacture food and supply it to all other living organisms. It is because of this reason, they are called as producers. And, all animals are the consumers of food, since they consume or utilize the food manufactured by plants. Plants form the base, and on which all other animals depend for their food. All these organisms (both plants and animals) are linked with each other just like a chain. It is because of this linking of animals and plants by their food relation in the environment, such a Chain is called as Food Chain. Food chain is a chain consisting of animals and plants linked by their food relation.

Thnik of your own environment. In your environment, you will find both living and non-living things. Living things are plants and animals. Non-living things are soil, air, etc. It is almost a community, and you live in such a community, of living and non-living things. This type of community which includes plants, animals and non-living things is called as Ecosystem.

Things to do:

1. Think of the different living organisms that are there in your environment, and represent them in the form of food chains depending upon their food relationships.

2. Collect pictures of animals and plants living in such ecosystems as pond, sea, forest, etc., and arrange them according to their food relations. It would be a nice material for exhibiting them in your class.

Points for Discussion:

1. Discuss the different types of ecosystems you can think of.

2. Can you argue as to how an acquarium is an ecosystem by itself.

The Process of Digestion in Animals

Introduction:

Friends, in our previous classes we have tried to understand how animals and non-green plants meet their food requirement, in other words, the heterotrophic mode of nutrition. You may recall that under this heterotrophism, we studied something about holozoic, saprophytic and parasitic organisms. You know that most of the animals (with the exception of some lower organisms) and insectivorous plants feed on solid food. For a moment, you recall what you have studied in Unit-II, namely, 'protoplasm and its composition' about absorption of food by cells. We studied that the complex food substances, e.g., carbohydrates, fats, proteins, etc., which we take in the form of food materials like chapati, rice, egg, etc., are to be brokendown into simpler substances if they are to be absorbed by the cells. In other words, the food that is taken in by an organism has to be digested before it is absorbed. At this stage, you may wonder as to how a unicellular organisms like amoeba or paramaecium can ingest, digest and absorb solid food without having a digestive system. You will come to know this in the following classes. About higher organisms, as in the case of frogs, fish, cats, human beings, etc., you know that they have specialised organs for performing these functions. Let us consider the

example of human beings. You know that human beings ingest the food with the help of hands and mouth, and digest it in their stomach and intestine. Later, this digested food is absorbed and utilized for various life activities. Fine. But, do you have any idea as to where and how the food (carbohydrates, fats, proteins etc.) in digested, and in which form it is absorbed? Perhaps, you may not. It should not worry you, because you would be learning it shortly.

Precisely, you would be learning things such as:

1. The different types of the process of digestion seen in lower and higher animals;
2. The different types of digestive system seen in lower and higher animals; and
3. The exact nature of the process of digestion and absorption seen in higher organisms, with a special reference to human beings.

You would be learning the first two aspects in the same way as you have learnt "Cell and its Organelles", that is, through transparencies* and teacher's explanation* You may recall that you answered a few questions after a few projections and teacher's explanation about "Cell and its Organelles" were over. In the same way, you may have to answer a few questions in the work booklet supplied to you. This would help you to remember certain things. You can discuss with your teacher and clarify your doubts, if any.

I hope this will be another enjoyable experience in your pursuit of knowing about living organisms.

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*Transparencies have been presented at the end of "Teacher's Explanation" (Please refer after page No. 265).

1. Let us start this Section by taking examples of Single Celled or Uni-celled animals.

This is the diagram of an amoeba with which you are all familiar. As you know, it is one of the simplest of all organisms, and its entire body is composed of only one cell. It feeds on solid food which comprises of micro-organisms such as bacteria. You know that all organisms have to first ingest the food, digest it and then absorb it. All higher organisms ingest food with the help of hands or mouth, digest it in their stomach and intestine and absorb. From the diagram,you can make out that amoeba does not have hands or mouth or alimentary canal to ingest and digest the food. Think for a moment as to how this organism, having no mouth and digestive system, ingests, digests and absorbs the solid food.

2. Let us consider the first process, namely, the process of ingestion. In higher animals, they have well developed organs such as hands, jaws etc., for ingesting the food.

Since amoeba does not have all these specialised organs, it ingests its food in a different way which is quite interesting to know. Look at the diagrams. They are the diagrams shown at various stages of ingestion in amoeba.

When an amoeba comes in contact with food, the protoplasm flows around the food in the form of finger like projections (refer diagrams 2a and 2b).

These finger like projections grow further and meet on either side of the food, and thus engulfs it along with a drop of water (refer diagram 2c).

3. Now, let us see as to what happens to this engulfed food.

The food that is thus engulfed, is released to the cytoplasm in the form of a small bubble or vacuole (refer the diagram 3a). Since this vacuole contains food, it is called as a food vacuole. Now, you may be clear about the process of ingestion in amoeba. We shall next pass on to the process of digestion in amoeba.

4. You know that the second process after ingestion is digestion. In higher animals, they have stomach, intestine etc., for this purpose. But in amoeba, such organs are absent, since it is composed of only one cell. Then the question is, how does it digests the food present in the food vacuole?

The cytoplasm surrounding the food vacuole starts secreting enzymes on it (refer diagram 4a). These enzymes act on the prey, kill it and break it into simpler substances such as carbohydrates, fats, proteins, etc.

In other words, we can say that the engulfed food is digested in the cytoplasm by the enzymes. The food thus digested, diffuses into the surrounding cytoplasm (refer diagram 4b). But the question is, will all the food be digested?

5. We shall see in the next as to what happens to this indigested food.

Amoeba does not have definite anal opening as we find in higher animals to throw of the indigested food. The indigested food is thrown out from the point anywhere on the body. First, the indigested food is pushed towards a point, and finally is thrown out through that opening (refer diagram (5a and 5c).

6. Now, let us consider another example, namely, paramaecium and study the processes of ingestion, digestion, absorption and excretion.

Like amoeba, paramaecium is also a unicellular organism and feeds on microorganisms such as bacteria. Paramaecium differs from amoeba in that, it has got a groove like structure on one side (refer diagram 6a).

This groove leads into a tubular structure known as cytopharynx. The main organ which help during digestion are the hair

like structures present all over the body of the organism. You may be curious to know as to how these hair like structures help the animal in ingesting the food.

7. During the process of ingestion, the hair like structures known as 'Cilia' present all over the body of the organism start beating in water.

Due to this lashing movements of Cilia, the food is pushed towards the groove along with water currents (refer diagram 7a). The food passes through the groove into the Cytopharnyx and from there, it is released to the cytoplasm in the form of a food vacuole (refer diagram 7b and 7c).

8. Now, think for a moment as to how this food may be digested in the Cytoplasm.

Recall the process of digestion in amoeba. You know that the cytoplasm secretes enzymes with the help of which the food is digested, (refer diagram 8a). In the same way, in paramaecium also the Cytoplásm surrounding the food vacuole secretes enzymes, with the help of which the food is digested. This digested food later on diffuses into the surrounding cytoplasm. (refer diagram 8b).

9. Now, let us see as to how paramaecium throws out the indigested food.

Like amoeba, paramaecium also does not have a definite anal opening. Usually, the indigested food is thrown out through a small pore or opening present on the ventral side of the animal (refer diagram 9).

10. So far, we have tried to understand the process of ingestion, digestion, absorption and excretion in the case of amoeba and paramaecium.

For a moment, we shall focus our attention only on the process of digestion seen in amoeba and paramaecium. (Refer diagrams, 10a, and 10b). You know that in both the cases, digestion takes place with the help of enzymes secreted by the Cytoplasm. Think as to whether the digestion of food takes place within the cell or outside the cell.

11. You may say that digestion takes place within or inside the cell since both are unicellular organisms. This type of a digestion which takes place with the cell is called as <u>intracellular</u> digestion.

So, intracellular digestion is a type of digestion which takes place inside the cell. A few organisms having this type of digestion are Amoeba, Paramaecium, some bacteria, etc.

12. Let us now take a few examples of organisms which are multicellular in nature, and try to understand the process of ingestion, digestion, absorption etc.

What you see in the picture is the diagram of an earthworm. As you all know and as the very name indicates, earthworms live mainly in the burrows of the soil and feed on the dead and decaying organisms present in the soil. From the figure you can make out that there is a definite mouth to take in the food, and an anus to pass out the indigested food.

13. We shall try to understand where and how digestion of food takes place in earthworms.

Earthworms ingest the dead and decaying leaves, etc., along with large amount of soil through the mouth (refer diagram 13a) The food thus taken in through the mouth, passes through pharynx into the gizard (refer diagram 13b). In the gizard, the food is thoroughly ground. This ground food passes into the intestine where the cells present in the intestinal walls secrete enzymes. These enzymes digests the food which is mixed with the soil, which the animal had taken in.

The food thus digested by the enzymes in the intestine, is picked up by the blood and is supplied to all parts of the organisms The indigested food and the soil is thrown out in the form of small pellets through the anal opening (refer diagram 13b).

14. Recall the process of digestion in amoeba and paramaecium and think for a moment as to how the process of digestion in earthworms differs from that of amoeba or paramaecium.

You know that in amoeba and paramaecium, the digestion of food takes place within the cell, whereas, digestion in earthworms takes place in the alimentary canal, that is, outside the cells. Hence, we can say that the process of digestion in earthworms is not intra-cellular. In this respect the process of digestion in earthworms differs from that of amoeba and paramaecium.

15. Let us consider our own case, that is, of human beings, who are the highly evolved organisms and try to understand these different processes, namely, ingestion, digestion, absorption, excretion.

Recall what you have studied about digestive system of human beings in your previous standards. Refer to the diagram 15a. They have mouth and teeth to ingest food, stomach and intestine to digest the ingested food, and anus to throw out the indigested food.

16. Think as to whether the digestive system of human beings differs from that of earthworms.

You can easily see that they do not differ basically. They are alike, in the sense

that both have definite mouth for intaking or ingesting the food, an alimentary canal to digest the food and absorb it, and a definite anal opening to pass out the indigested food.

17. This type of a digestive system where there is a definite mouth, alimentary canal and anus is called as complete digestive system.

18. Let us try to compare the process of digestion seen in earthworms with that of human beings.

Both earthworms and human beings do not differ from each other because in both the cases the digestion of food takes place in the alimentary canal, outside the cells. In other words, we can say that the process of digestion in earthworms and human beings is extracellular in nature. ('Extra' means outside and 'cellular' means cells).

19. Recall the process of digestion in amoeba and paramaecium, and compare it with that of earthworms and human beings. We can say that amoeba and paramaecium have intra-cellular type of digestion, whereas Earthworms and human beings have extra-cellular type of digestion.

20. Lastly, we shall consider the case of one more organism, namely, that of Hydra and see whether we have understood the concepts intra and extra-cellular digestion correctly or not.

Hydra is another organism with which you are all familiar. Like amoeba and paramaecium, hydra is also holozoic in nature and feeds on small organisms such as moeba, water-flies etc.

In the diagram, you can see thin finger like projections surrounding the mouth of the organism. These projections are called as tentacles, and help the animal in the process of ingestion. Hydra differs from amoeba and paramaecium by having a definite mouth. We shall see as to how it ingests the food.

21. During ~~the~~ ingestion, first, the food that is the prey, is captured with the help of the tentacles and is killed (refer diagram 21a). The prey thus killed is taken to the stomach or gastrovascular cavity through the mouth (refer diagram 21b). In the gastrovascular cavity, the food is digested with the help of enzymes secreted by the cells of the gastrovascular cavity (refer diagram 21c).

22. Here what you see in the diagram 22a is the longitudinal section of hydra. You can find a number of cells situated on the walls of the gastrovascular cavity. Some of these cells are amoeboid in nature having no definite shape and size. These cells ingest the food which has been already broken down in the gastrovascular cavity in amoeboid fashion. (Refer diagrams 22b and 22c). Only one cells is shown in the process of ingesting the the digested food in amoeboid fashion. The food that is thus digested is absorbed and circulated to the other

cells. The indigested food is thrown out through the opening situated near the tentacles.

23. Now think as to how the digestive system of hydra is different from that of earthworms and human beings.

> You may say that the digestive system of hydra differs from that of earthworms and human beings by having only one opening which serves as both mouth and anus. This type of a digestive system is said to be incomplete digestive system, since there is no definite mouth, alimentary canal and anus.

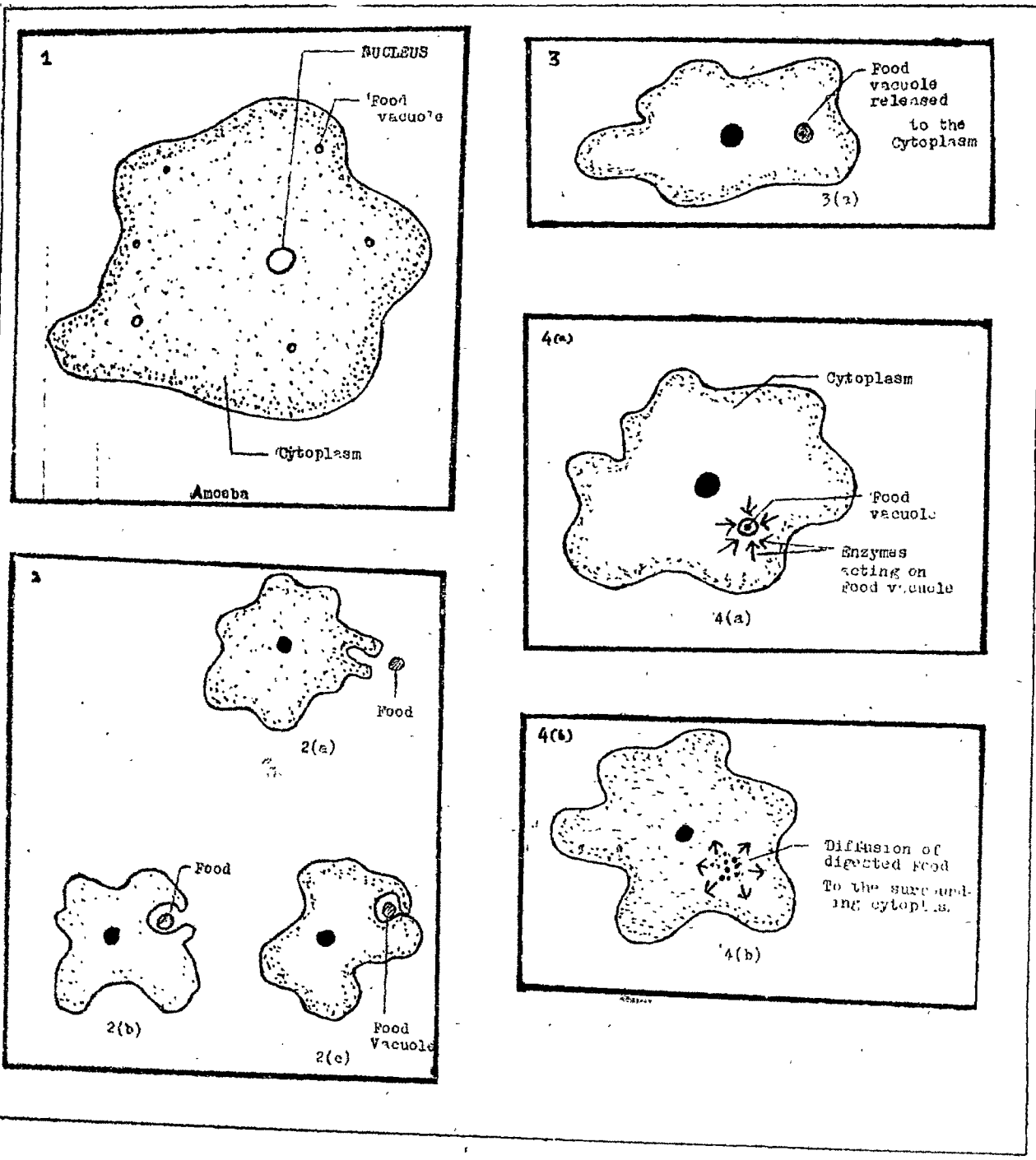
24. Let us summarise what we have studied so far. In all, we studied four things. They are:

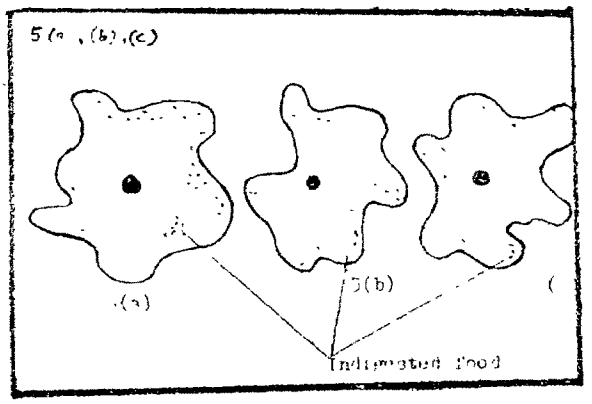
1. Intra-cellular digestion: It is a process of digestion that takes place inside the cells.

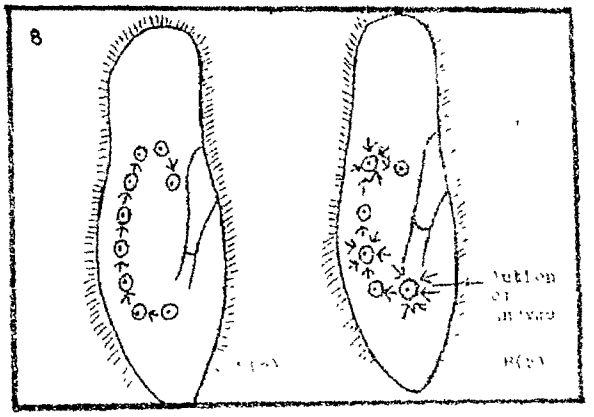
2. Extra-cellular digestion: It is a process of digestion that takes place outside the cells of the organism in the alimentary canal.

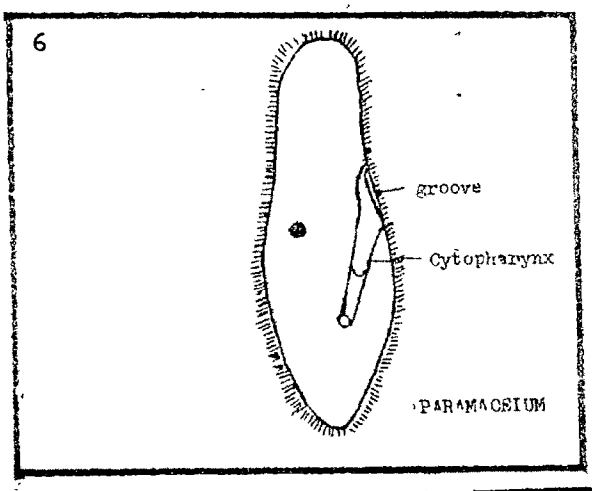
3. Complete digestive system: A digestive system where there is a definite mouth, alimentary canal and anus.

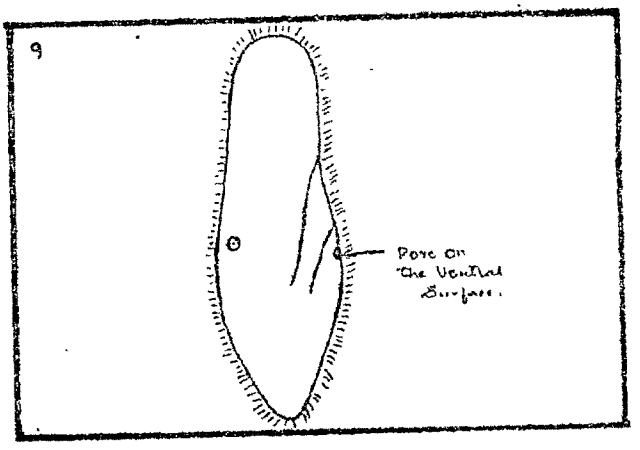
4. Incomplete digestive system: A digestive system where there is only one opening serving as both mouth and anus.

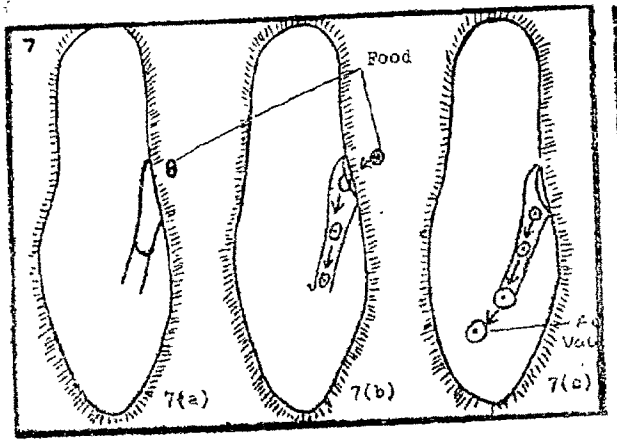

1
NUCLEUS
Food vacuole
Cytoplasm
Amoeba
2
Food
2(a)
Food
2(b)
Food Vacuole
2(c)
3
Food vacuole released to the Cytoplasm
3(a)
4(a)
Cytoplasm
Food vacuole
Enzymes acting on food vacuole
4(a)
4(b)
Diffusion of digested food
4(b)

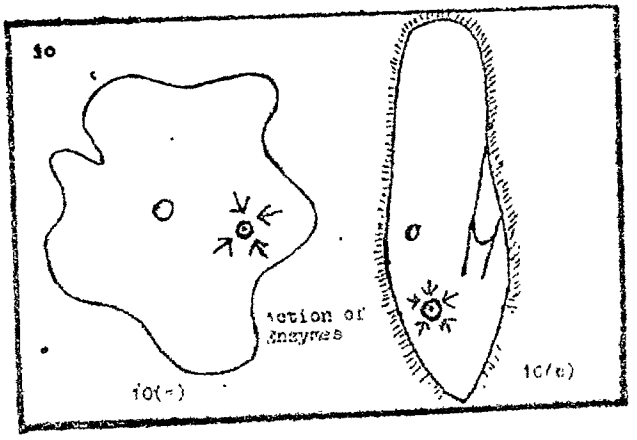

5(a),(b),(c)
5(b)
Ingested food


8


6
groove
Cytopharynx
PARAMACEIUM


9
Pore on
the Ventral
Surface

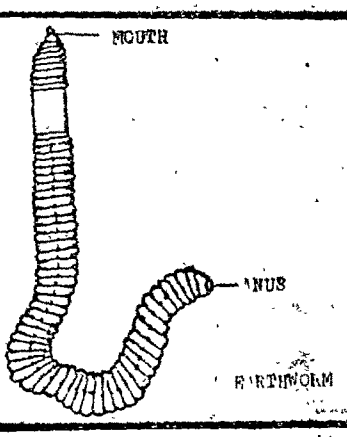

7
Food
7(a)
7(b)
7(c)


10
10(a)
10(c)

11

INTRACELLULAR DIGESTION IS A TYPE OF DIGESTION WHICH TAKES PLACE INSIDE THE CELL.

12



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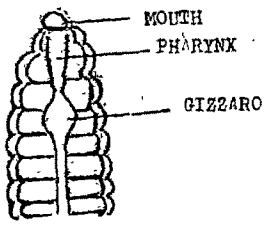
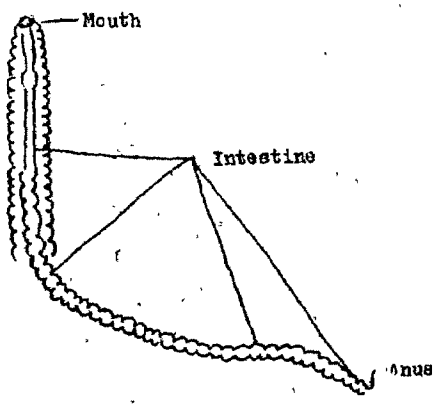


13(a)

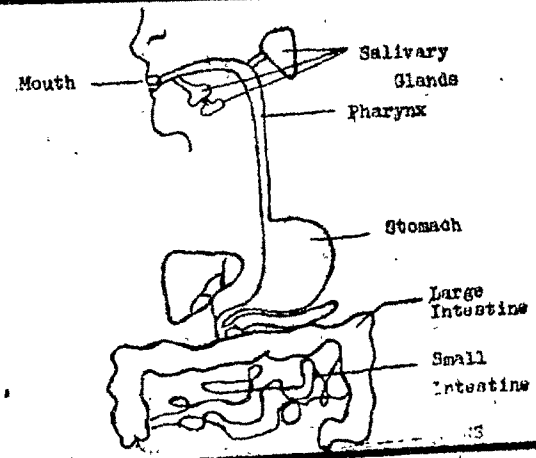


13 (b)

14

DIGESTION IN EARTHWORMS TAKES PLACE IN THE ALIMENTARY CANAL i.e., OUTSIDE THE CELLS. HENCE, DIGESTION IN EARTHWORMS IS NOT <u>INTRA</u> CELLULAR.

15



16

EARTHWORMS AND HUMANBEINGS DO NOT DIFFER FROM EACHOTHER AS FAR AS DIGESTIVE SYSTEM IS CONCERNED SINCE, BOTH HAVE DEFINITE MOUTH, DIGESTIVE TRACT AND ANUS.

17

BOTH EARTHWORMS AND HUMAN BEINGS HAVE COMPLETE DIGESTIVE SYSTEM

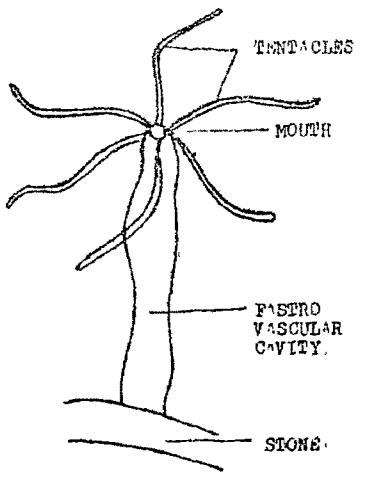
18

EXTRACELLULAR DIGESTION IS A TYPE OF DIGESTION WHEREIN DIGESTION OF FOOD TAKES PLACE IN THE ALIMENTARY CANAL, THAT IS OUTSIDE THE CELLS, E.G., EARTHWORMS, FROGS, FISHES, HUMAN BEINGS.

19

AMOEBA AND PARAMAECIUM DIFFER FROM THAT OF EARTH WORMS AND HUMAN BEINGS IN THAT, THEY HAVE INTRA CELLULAR DIGESTION.

20



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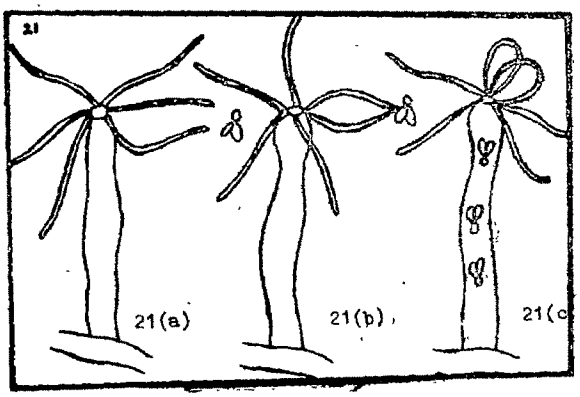

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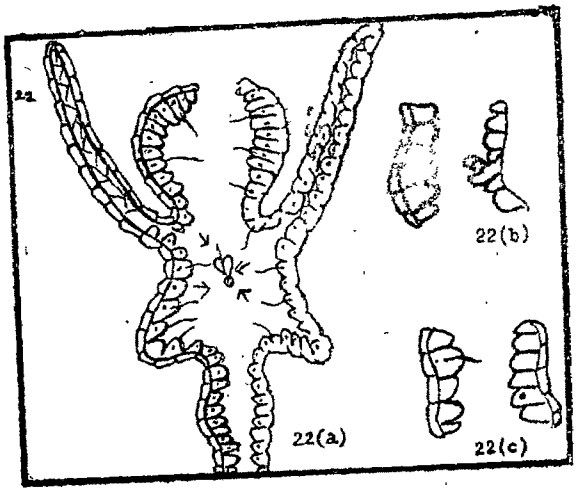


23

HYDRA HAS A
INCOMPLETE DIGISTIVE
SYSTEM

WORK - BOOKLET

DIRECTIONS:

I. (A) What is meant by Extra-cellular Digestion?

(B) What do you understand by intra-cellular digestion?

(C) What is the difference between incomplete and complete digestive tracts?

II. 'A' is an organism and is unicellular in nature. The cytoplasm of the organism secretes its enzymes to the outside and digests the food (refer to the diagram). Reason out as to whether digestion in this organism is intra-cellular or extra-cellular.

III. Recall what you have studied about the process of digestion in hydra. You know that digestion first takes place in gastrovascular cavity and the digested food is absorbed by the cells of the gastrovascular cavity. Some of the cells present in the walls of the gastrovascular cavity which are amoeboid in nature, ingests the digested food and digests them in their cells.

Is the digestive process in hydra intra-cellular or extra-cellular or both?

Give your reasons.

TOPICS FOR INDIVIDUAL STUDY

I. (a) Using a Text-book of Zoology, make a study of the process of Ingestion, Digestion and Absorption in such animals as (i) Euglena; (ii) Leech; (iii) Mosquito; (iv) Bed bugs; (v) Frogs; (vi) Fishes; and (vii) Birds.

(b) Study carefully the modifications in the mouth parts and digestive tracts of these animals.

To help you in this regard, some of the reference books that are there in your library, are given below:

1. OUTLINE OF ZOOLOGY
   by - M. Ekambaranath IYYAR

2. TEXT BOOK OF ZOOLOGY
   by - R. D. VIDHYARTHI

3) CHORDATE ZOOLOGY AND ELEMENTS OF ANIMAL PHYSIOLOGY.
   by - E. L. JORDAN,
   H. S. VISHNOI.

INTRODUCTION

Friends, in our earlier classes we have tried to understand the process of ingestion, digestion, absorption etc., by taking a few examples from animal kingdom. You know very well that food stuffs, in general, are complex chemical compounds - Carbohydrates, Fats and Proteins, and all living organisms can make use of them only when they are broken down into simpler substances. In other words, the complex food has to be digested before it can be absorbed and made use of for various activities. Think for a moment as to what would have happened if there were no organs to digest the food. The process of digestion is a complex process and involves the role of enzymes, hormones, nerves and muscles. We can simply compare this process with a drama which involves a number of characters. Before we proceed with the topic, namely, 'The Process of Digestion', let us know how this knowledge about digestion was acquired by man.

THE STORY OF THE DIGESTIVE PROCESS - A DISCOVERY BY CHANCE

Perhaps, you will be surprised to learn that people had only vague ideas about digestion till 1815. Famous biologists namely Aristotle and Hippocrates thought that the

food we take will be cooked in the stomach before it is being absorbed by the cells. Some other biologists explained that food undergoes decaying during digestion. All these misconceptions were there in those times mainly because people thought that it is a sin to cut open the body of an organism. It was in the year 1822, the first experiment was done with a view to understanding the process of digestion in man. This experiment was favoured by a fortunate accident. The site of this chance happening was a small village near lake Michigan, U.S.A. Once it so happened that a factory worker by name Alexis St. Martin was accidentally shot by a bullet in the stomach. His stomach and lungs were protruding from the wound. The food was pumping out of the victim's stomach. Immediately he was rushed to a near by hospital, where a doctor named William Beaumont attended the patient. Dr. William Beaumont nursed him back to health, but during the process of wound healing, it so happened that the margins of the wounds on the body wall and stomach got fused with each other. Hence, a permanent window was left in the stomach of St. Martin. Imagine the condition of poor Martin. He could eat and drink normally, but he had to put a bandage on the window, or opening in order to prevent the food from escaping through the opening. Not only this, he lost his job in the factory since he could not work. However, Dr. Beaumont took pity on him and kept him as his domestic servant.

One day the servant was lying sideways in his bed. The doctor happened to pass by him and to his astonishment could see the softened bit of meat in the stomach of the servant. Think, what would have you done, if you were Dr. William Beaumont? I am sure, you would have become curious and would have thought that you have an excellent opportunity to contribute to the understanding of the process of digestion in human beings. As any other scientist, he conducted many experiments concerning the digestive process and made detailed notes. And, for all these experiments, St. Martin was the experimental object. I am sure you are interested in knowning Dr. Beaumont's observations. Let us see.

Dr. Beaumont observed that when the food enters the stomach, a juice oozes out of the stomach wall. By feeding different types of foods to his 'experimental object', he came to know which of the foods were digested in the stomach. He invented many remarkable techniques for his study. He used to lower pieces of food into St. Martin's stomach by means of a silken thread and noted the time taken for its digestion. He also demonstrated that the juice collected from the stomach can bring about the digestion of food in a test tube just as it does in the human body.

Dr. William Beaumont conducted as many as 238 experiments on his servant, and in 1833, he brought out a book on "Experiments and Observations" on the Gastric Juice (Juice secreted by stomach walls) and the physiology of digestion. This created interest in other scientists. These scientists did experiments on human beings as well as on animals, and thus gradually the process of digestion and function of various intestinal juices came to be clearly understood. With this background, we shall pass on to the nature of digestion in animals.

How does Digestion takes place in a typical mammal?

The process of digestion in all the Vertebrates (vertebrates are animals having vertebral column - back bone) are much alike. Hence, the digestive process of man will be described as a typical of those of all Vertebrates.

The alimentary canal:

Before we start understanding the exact nature of digestion, let us make a quick review of what we have studied about human digestive tract in our previous standards. Refer to the Diagram 1. We know that the food we take in, is first chewed thoroughly by the teeth and while this is going on, it

is acted upon by the saliva. The chewed or masticated food is then forced from the mouth through pharynx and oesophagus to the stomach. The stomach is a bag like structure and leads to small intestine, which in turn leads to large intestine. Connected to the digestive tract are three main glands, namely, salivery glands in the mouth region, liver and pancreas in the region of abdomen. These glands secrete their juices into the digestive tract and help the process of digestion. Now, with this back-ground let us pass on to the exact process of digestion at different regions of the digestive tract. Before that, you may answer the following questions to make sure of what you already know about human digestive system.

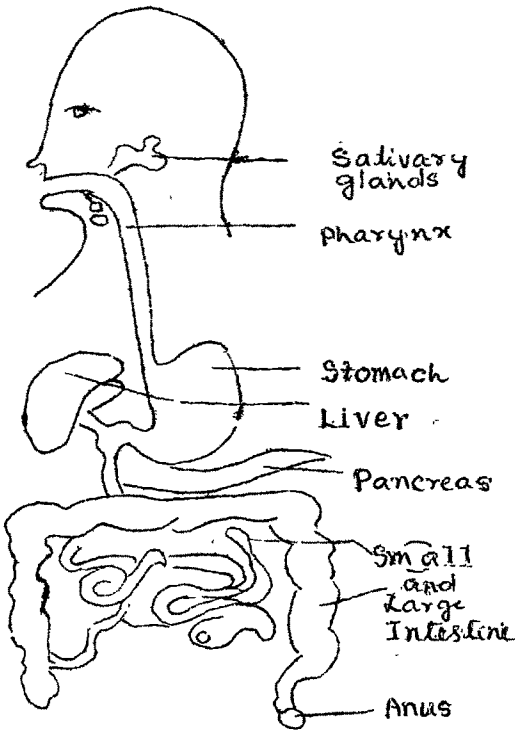


Diagram-1
Human digestive System

1. Name the different parts of human digestive tract.
2. Name the three glands that are associated or connected with the human digestive tract.

Answers :-

1. The different parts of human digestive tract are: (i) Mouth, (ii) Pharynx, (iii) Oesophagus (iv) Stomach (v) Small intestine, (vi) Large intestine and (vi) Anus.
2. The three glands that are connected with the human digestive tract are: (a) Salivary gland, (b) Liver, and (c) Pancreas.

Digestion in Mouth:

Mouth forms the first part of the digestive system, and the process of digestion begins here. Think for a moment as to what you do after placing food e.g. chapati or rice or any solid food, in the mouth. You may say that you make it soft with the help of saliva and start chewing it. And thus, you make the bigger molecules of food into smaller and smaller. You might have experienced that as you go on chewing the food, the food becomes softer and softer. What may be the reason. Surely you would say that it is because of saliva. You are correct. It is because of saliva or salivary juice, the food becomes soft. This salivary juice is secreted by certain glands known as salivary glands present in the region of mouth. Let us try

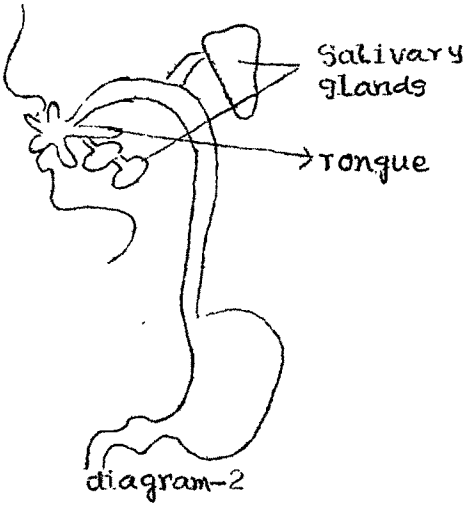


diagram-2

to understand their location and the functions performed by them. The diagram 2 gives you an idea of the location of the salivary glands. You can make out from the diagram three pairs of salivary glands situated in the region of mouth; two pairs are situated below the tongue and one pair above and slightly behind the tongue. These glands will be highly active when there is food in the mouth. Many a time, you might have experienced your mouth becoming watery when you see sweets, or even the smell of it for that matter. It is because of the nervous connection it has with the brain (you will study more about these glands in your higher classes). Now the question is what is the role played by saliva in the process of digestion in the mouth. You may perform the following simple experiments to get a better understanding of the functions of saliva.

Experiment - 1 : Take a table spoon full of pounded rice (chuvda) and put it in your mouth. Try to swallow as it is. Record your experience.

Experiment - 2 : Take some small pieces of chapati and feel it with your finger. Record your experience. Now put them in water and allow it to soak for sometime. Afterwards, feel it and record your experience.

Experiment - 3 : Take some wheat or rice grains and put it in your mouth. Record the taste of it before and after chewing it.

Discussion:

In your experiment with 'chuvda' you might have felt it very difficult to swallow the 'chuvda' as such. But you might have felt it very easy to swallow after mixing it with salvia. What may be the reason? You may say that 'chuvda' was made moist by the salvia and hence it became easy to swallow. Like this, you might have experienced with many food stuffs. Think of the function of saliva. We can say that saliva makes the food moist and thus helps in easy swallowing.

In the second experiment, namely, soaking chapati in water, you might have felt the pieces of chapati as very slimy and soft. This is because, water acts upon certain food substances and makes it slimy and soft. In our mouth also, the water content of saliva (major portion of saliva consists of water) makes the food soft and slimy, so that the food can pass through the gullet easily into the stomach. From this experiment, we can say anything about the function of saliva? We can say that saliva does the function of making the food soft and slimy.

Consider the last experiment you have performed. At the very beginning, you might not have experienced any taste. But, later when the chewed rice or wheat got mixed with saliva, you might have experienced a sweet taste. This is

because of the conversion of starch present in rice or wheat grains into sugar by the enzyme ptylin present in saliva. At this point, you may ask as to why starch is to be converted into sugar? You may recall that our body cells can absorb only simpler substances which can pass through the cell membrane. Starch molecules, being complex and bigger in size, cannot pass through the cell membrane. Hence, these starch molecules should be converted into simpler glucose molecules before it is absorbed. By this time, you might be clear of the functions of saliva.

We shall put them together:

1. Saliva produced in the mouth makes the food moist, soft and slimy, and helps for easy swallowing.
2. Secondly, it converts the starch portion of the food into sugar.

Let us now try to summarise the whole process of digestion in the mouth.

In the mouth, the food is first chewed well with the help of teeth. This chewed food mixes with the saliva secreted by the salivary glands. The salivary juice converts the starch part of the food into sugar; makes the food moist, soft and slimy and thus prepares it for easy swallowing.

Before you proceed further to understand the process of digestion in stomach, you may like to make sure that you have understood what has been presented so far in this section. To do so, you may answer the following questions.

Questions:

1. Why do you think that digestion of food begins in the mouth?
2. Why is it necessary to chew the food well before swallowing it?
3. Write in a paragraph about the need of salivary glands in the mouth.
4. Suppose you chew cooked potato along with ground nuts and butter. Think as to which one of them is digested in the mouth. Give your reasons.

Answers :

1. Mouth forms the first part of the digestive system, and it is here the starch portion of the food (complex substances) is broken down into sugar (simpler substance). Hence, we can say that the process of digestion first begins in the mouth.

2. Food has to be chewed well in the mouth before it is swallowed due to the reasons that;

    1. it will be easy to swallow,
    2. it mixes well with the saliva, which is very much needed for the conversion of starch into sugar.

3. Salivary glands secrete a juice known as a salivary juice which helps the organism in the following ways:

   1. it helps in making the food moist,
   2. it helps in making the food soft and slimy so that it can be easily swallowed,
   3. it digests the starch portion of the food into simple sugar and helps for quick absoroption by the body cells.

Digestion in the Stomach:

The food from the mouth is pushed through pharynx and oesophagus into the stomach. From the Diagram 3, you can make out that it is a bag like structure and is situated just below the diaphram. You may wonder to know that food stays in the stomach for nearly 3½ to 4 hrs. and it has the capacity of 2 to 2½ litres. You may be thinking as to what happens to food in the stomach during its stay for 3½ to 4 hours. During its stay in the stomach, it is slowly churned or stirred by the action of stomach muscles. The churned food mixes with the gastric juice secreted by glands, known as gastric

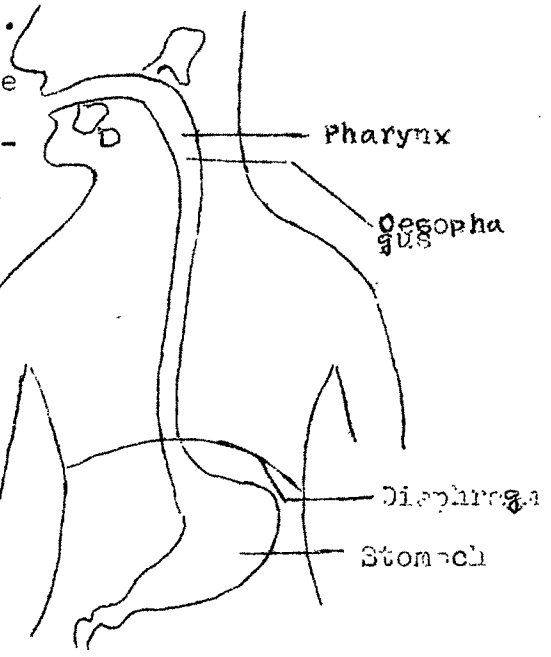
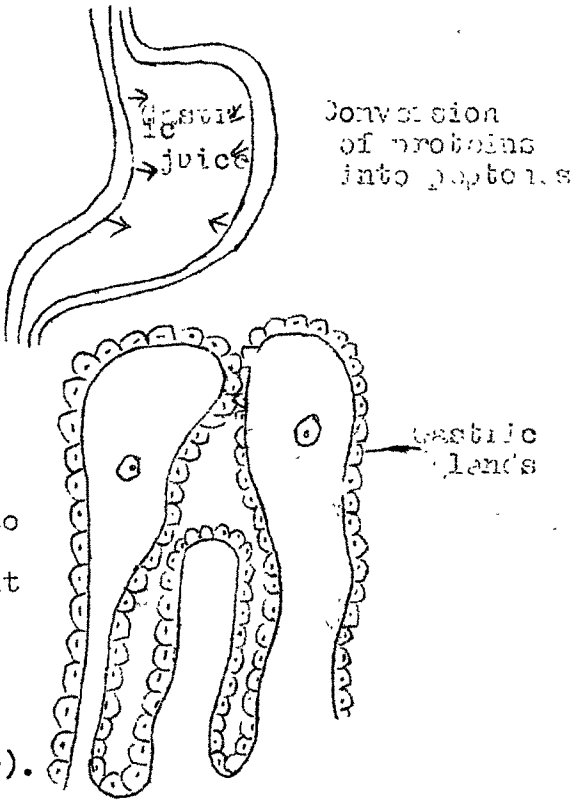


DIAGRAM - 3

glands. Diagram 4b is a small portion of stomach showing the gastric glands. Millions of such cells are there situated on the walls of the stomach. This gastric juice otherwise known as stomach juice is rich in hydrochloric acid, water and enzymes such as renin and pepsin. Hydrochloric acid makes the contents of the stomach acidic and thereby help the enzymes to act. (You will study more about acids, and how they serve as medium for certain enzymes in your chemistry class this year). The enzymes namely renin and pepsin act upon the food and convert protein content of the food into peptones. Most of the proteins are converted into peptones here. The remaining proteins pass on to the small intestine; the next part of the digestive system where it will be converted into peptones. (You will study more about acids, and how they serve as mediums for certain enzymes in your chemistry classes this year).



Diagrams 4(a) & 4(b)

juice, starch will not be digested.

3. As a student of biology, you may think of the following scientific reasons for not staying with an empty stomach.

   (i) Every organism requires energy for various purposes, hence food is necessary.

   (ii) When there is no food in the stomach, there will be nothing for the gastric juice to digest. Hence, the hydrochloric acid part of gastric juice acts upon the stomach walls and causes damage, ultimately leading to ulcers. It is because of this reason, it is always better not to stay with an empty stomach.

Digestion in the Small Intestine:

People often think and speak of stomach as if it were the most important organ of the digestive tract. Actually it is possible for a person to live comfortably having his stomach removed and taking frequently small meals. This is because the major part of digestion occurs in the small intestine. The small intestine is a much coiled tube, about 20 to 25 ft. long and about 1½ inches wide open when filled. From the Diagram-5, you can

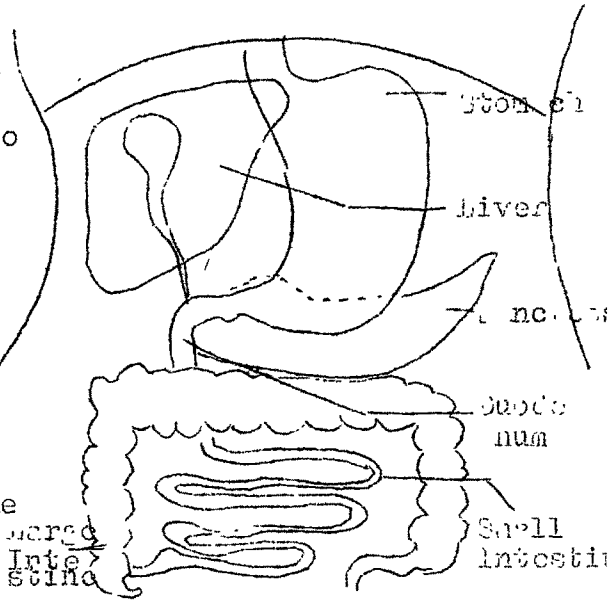


Diagram-5

make out that at the very entrance to the small intestine there is a small constricted part known as the duodenum. It is the first part of the small intestine. You also notice in the same diagram two glands connected with duodenum. They are the liver and pancreas. You may be curious to know more about these glands. Let us consider each gland and try to understand their role in the process of digestion.

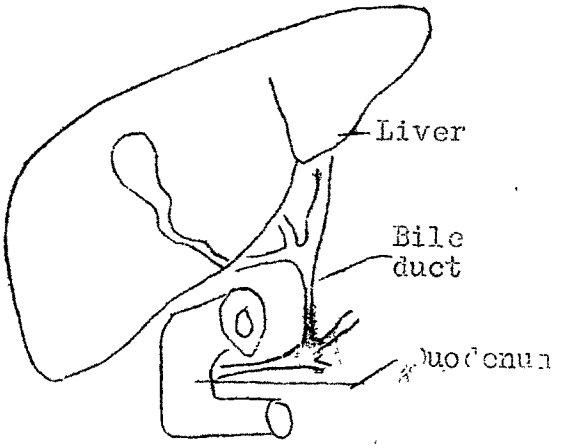


Diagram-6

Liver:- The liver is the largest gland present in the body of human beings. As you can see from the Diagram 6, it is situated on the right side of the duodenum in the abdominal region. The cells of this gland, namely, liver cells secrete a juice known as bile juice. In the figure, you can notice a duct passing out of the gland. It is the bile duct and carries the bile juice away from the liver. This juice acts on the fat content of the food and digests it.

Pancreas:- From the Diagram 7, you can make out that the gland pancreas is situated along the lower side of the stomach, and it will be usually about 3 to 4 inches long. Just like salivary glands and liver, pancreas also secretes a juice known as pancreatic juice. Observe the Diagram 7

closely. You will make out a duct coming out from pancreas and joining with the bile duct. It is the pancreatic duct and it carries pancreatic juice secreted by pancreas into duodenum. The common duct formed by the union of bile duct and pancreatic duct (refer to the diagram 8) opens into the duodenum. Thus, duodenum receives both pancreatic and bile juices. You may be interested to know their action on the food. These juices contain enzymes such as trypsin, amylase and lipase. Trypsin converts proteins and peptones into amino acids. Amylase or ptyline converts remaining starch into sugar, and lipase converts fats into fatty acids. Besides these juices, the walls of the small intestine also secretes a juice known as 'Intestinal juice', which is also rich in lipase and invertase.

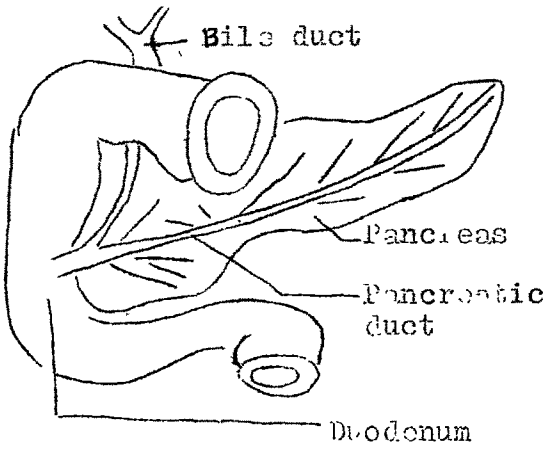


Diagram-7

The enzyme invertase converts remaining carbohydrates into simple sugars, and lipase converts fats into fatty acids. Thus the food stuffs containing carbohydrates, fats, and proteins are completely digested in the small intestine into sugars, fatty acids and amino acids. This digested food is ready to leave the small intestine and

enter into the blood stream This is picked up by the villi present in the intestinal wall and circulated to all parts of the body. (You will study more about this absorption and circulation of digested food, in your next unit viz., Circulation and Transportation).

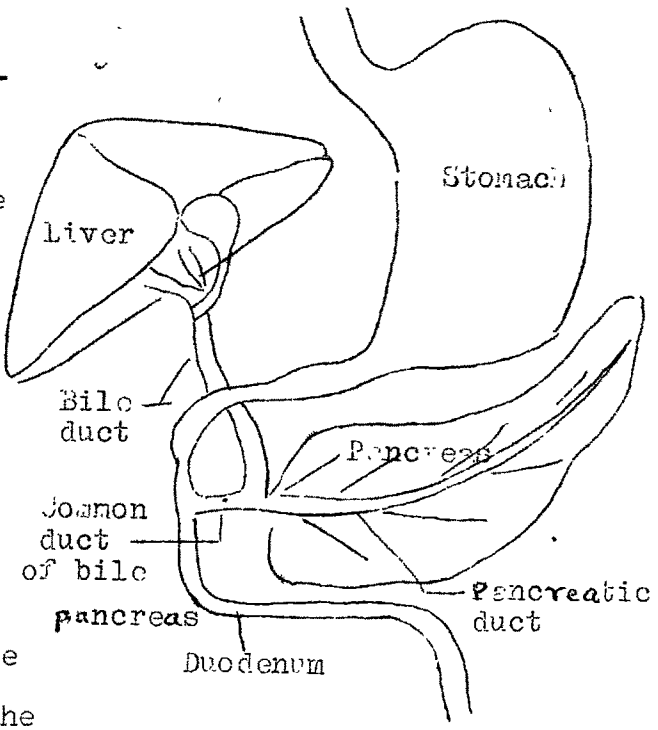


Diagram-8

The indigested food passes from small intestine into large intestine. In the large intestine, the cells lining the walls of the large intestine absorb water portion of the indigested food. The indigested food, because of the loss of water becomes solid and is thrown out of the body through the opening, namely, anus.

Now you may answer the following questions in order to make sure whether you have understood the process of digestion in small intestine.

Questions:

1. The two digestive juices that are poured into the region of duodenum are (i)_____, and (ii)_____.

2. The enzymes that are present in bile and pancreatic juices are:

   (i) _____
   (ii) _____
   (iii) _____

   (Renin, amylase, pepsin, trypsin, lipase, invertase).

3. The intestinal juice secreted by the cells present on the walls of intestine contains enzymes such as _____ and _____.

4. Here are given two columns 'A' and 'B'. Under 'A' are given the names of the enzymes. Under 'B' you find the functions or the actions of the enzymes. Match 'A' with 'B'.

'A'	'B'
i) Trypsin	a) converts starch to sugar.
ii) Lipase	b) converts proteins and peptones into amino acids.
iii) Invertase and	c) proteins into peptones.
iv) Amylase	d) fats into fatty acids.

Answers:

1. Bile juice and pancreatic juice.

2. Trypsin, amylase, lipase.

3. Lipase, Invertase.

4. i) b.
ii) d.
iii) a.

Summary:

Let us try to summarise what we have studied about the process of digestion in human beings. We studied that the process of digestion begins in the mouth and ends in the small intestine. In the mouth, food is chewed well and is mixed with saliva. The enzyme ptyline present in saliva converts starch present in food into sugar. This partly digested food passes on from mouth to stomach through oesophagus.

In the stomach, the food stays for about 2½ hours to 3 hours. We studied that during its stay, it gets acted upon by the gastric juice secreted by the stomach walls. The enzymes namely, Renin and Pepsin present in the gastric juice converts proteins present in food into peptones. Next, from the stomach, the food passes on to small intestine, where digestion of food is completed.

In the small intestine, food gets mixed with bile juice (secreted by the liver), pancreatic juice (secreted by the pancreas), and the intestinal juice (secreted by the walls of the intestine). From Table - 1, you will get a picture of what all you have studied about these juices.

Name of the juice	Enzyme present	Action on food
Bile Juice and Pancreatic juice	Trypsin	Converts proteins and peptones into amino acids.
	Amylase	Remaining starch into sugar
	Lipase	Fats into fatty acids
Intestinal juice	Lipase	Fats into fatty acids
	Invertase	Remaining carbohydrates into sugar

The food that is thus digested is absorbed by the blood vessels present in the villi and is later on circulated to all parts of the body.

The indigested food passes on to the large intestine, where much of the water is absorbed and the rest is thrown out as faeces through the anus.

Friends, I hope that you are clear about the whole process of digestion that occurs in the body of human beings.

You know very well as to why we took human beings as an example for understanding the process of digestion in vertebrates. You might have heard of disorders such as vomiting, nausea, appendicites, etc. You may be interested in knowing more about these disorders. You may refer to the book mentioned under reference.

Reference:

H.S. Diehl, Amita D. Laton, Franklin C. Vaughn, John, M., Lampe.

"Health and Safety for You". Page No. 149-152, McGraw-Hill Book Company.

Things to do:

It is a fun to perform some experiments in biology and learn. You may perform the following experiments and experience yourself.

1. Think of some foods - for example, hot soup, milk, potato and Gulab Jamun, Which makes your salivary glands secrete the most saliva?

2. Smell some foods. Does smelling the food cause more saliva to flow? Record your experience.

3. Hold your nose and look at some food. Does looking at food affect your salivary glands?

4. Do the above experiments before lunch when you are hungry. Do them again after lunch. Does being hungry make a difference?

5. Think as to what may happen to a person, if his small intestine is removed completely? Write your answer in a separate sheet of paper. You are free to give as many possibilities as possible. More credits will be given for more points.

6. Discuss with your teacher and try to understand about the factors that cause vomiting, indigestion, nausea, etc.

Summary:

Friends, let us try to summarise what we have learnt in this Unit,namely 'Heterotrophic Nutrition'. We studied that heterotrophic nutrition is found in all those organisms which cannot synthesize their organic food from simple inorganic substances like water, carbondioxide and mineral salts. These organisms depend directly or indirectly on plant and plant products for their basic food requirement. You may recall the food chain we studied. It is a chain of organisms linked by their food relations, and ultimately plants forming the base of such a chain. We discussed about the statement "All Flesh is Grass" and ultimately came to a conclusion that it is true.

Coming to the nutrition seen among heterotrophs, we studied three types. They are:

1. Holozoic - Organisms feeding on solid food in an animal fashion, that is, first ingesting the solid food, digesting it and absorbing it.

2. Saprophytic - Organisms feeding on dead and decaying organisms and absorbing nutrients from it.

3. Parasitic - Organisms feeding on other living organisms directly and thus obtaining their nutrients.

Next, we studied how animals ingest, digest and absorb solid food. We studied that during digestion, the complex molecules of carbohydrates, proteins and fats are broken down into simpler substances such as sugars, amino acids, fatty acids which are later absorbed and utilized for various life activities. We studied about two types of digestion seen among animals. 1) Extra-cellular Digestion:- a type of digestion that occurs outside the cells in the digestive cavity. 2) Intra-cellular Digestion :- a type of digestion that occurs within the cell in the cytoplasm. To understand the exact process of digestion, we took the example of human beings and studied the process in detail. From the Table - 2, you will get a picture of what you have studied about the process of digestion in human beings.

Table - 2 : Process of Digestion in Human Beings

Name of the organ of the digestive tract	Name of the juice secreted	Enzyme present in the juice	Action of the enzyme
Mouth	Saliva	Ptyline	converts starch to sugar
Stomach	Gastric juice	Renin and Pepsin	converts proteins to Peptones
Small intestine (duodenal region)	Bile juice and Pancreatic juice	Trypsin	Converts proteins & peptones to amino acids.
		Amylase	converts starch into sugar
		Lipase	converts fats into fatty acids.
Small intestine (intestinal part)	Intestinal juice	Lipase	converts fats into fatty acids.
		Invertase	remaining carbohydrates or starch into sugar.

The indigested food passes through large intestine and is thrown out through the anus as faeces.

UNIT TEST IV

PART I

Name : _____

I. Instructions:

Here are given a few incomplete statements. Under each incomplete statement, you will find 3 alternatives with which you can complete that statement. You have to choose that alternative which is most appropriate and which completes the statement. Encircle the serial number of the alternative you have selected. C

(1) There is a group of bacteria living in the environment, which neither possess Chlorophyll nor any pigment similar to Chlorophyll. They also cannot utilize chemical energy for manufacturing their food. Naturally these organisms should be: C

(a) autotrophs (b) chemotrophs (c) heterotrophs

(2) Symbiosis is a kind of association between to dis-similar living organisms, wherein

(a) both the organisms are benefited

(b) only one organism is benefited

(c) both the organisms are not benefited.

II. Match the following:

(1)

(a) Holozoic organisms.

(b) Saprophytic organisms.

(c) Parasitic organisms

1. organisms which absorb food from dead and decaying matter.
2. Organisms which absorb food from other living organisms directly.
3. organisms which feed on solid food.
4. organisms which manufacture food by using chemical energy.

11 II. (Contd.)

(2) (a) Saprophytic bacteria — 1. Bacteria which nourish themselves by utilizing solar energy C

(b) Chemosynthesis bacteria — 2. Bacteria which depend on other living organisms for their food.

(c) Parasitic bacteria. — 3. Bacteria which feed on dead and decaying organisms.

4. Bacteria which nourish themselves by utilizing chemical energy.

III. Give two examples each for the following: C

1. Holozoic mode of feeding: (i) _____(ii)_____

2. Saprophytic mode of feeding:(i) _____(ii))_____

3. Parasitic mode of feeding: (i) _____(ii)_____

IV. Explain briefly as to what you understand by the term 'heterotrophic nutrition'. K

V. Here is given an example of a kind of association that exists between two living things. There lives a kind of small fish which attaches itself to the under-surface of another big fish by its mouth. After a short period of time, the connection becomes permanent. The blood streams of both the fishes become one. From that time on, the small fish is nourished by the blood of the big fish for as long as either of them live.

Is this partnership an example of parasitism or symbiosis? Give your reasons for it. C

UNIT TEST IV

PART II

I. Instructions:

Here are given a few incomplete statements. Under each incomplete statement, you will find 3 or 4 alternatives with which you can complete that statement. You have to choose that alternative which is most appropriate and which completes the statement. Encircle the serial number of the alternative you have selected.

(1) The process of digestion that occurs within the cell is called as: K

(a) intra cellular digestion

(b) extra cellular digestion

(c) cellular digestion.

(2) In the case of hydra, digestion of food takes place both inside as well as outside the cell. Hence, the process of digestion in hydra is: C

(a) extra cellular

(b) intra cellular

(c) both extra as well as intra cellular.

(3) The overall function of digestion is: K

(a) breaking down of the complex food into simpler substances such as sugar, amino acids, fatty acids, etc.

(b) absorption fof food

(c) oxidation of food and release of energy

(d) none of the above.

(4) The enzyme ptylin in salvia converts: K

(a) sugar to starch

13 (b) proteins to peptones

(c) starch into sugar

(d) fats into fatty acids.

(5) The enzyme pepsin present in gastric juice converts: K

(a) sugar to starch

(b) proteins into peptones

(c) fats into fatty acids

(d) peptones into amino acids.

(6) The enzyme lipase present in pancreatic and bile juice converts: K

(a) milk proteins into peptones

(b) starch into sugar

(c) proteins into peptones

(7) If the whole of small intestine is removed from the body of a human being, then: A

(a) there will be no digestion and absorption of food in the body

(b) there will be digestion but absorption will not be there in the body

(c) the process of digestion and absorption will not be affected.

(8) It is always good to chew the food well before swallowing, because: C

(a) food will be easily digested and absorbed

(b) food will be easily digested

(c) food will be easily absorbed

(d) food will be more tasty.

14 II. Fill in the Blanks:

(1) The relationship between producer and consumer organisms is; Producers _____ food whereas Consumers _____ food. K

(2) It is a common experience that when we chew boiled potato we feel sweet after some time. This is because: A

_____

(a) proteins of potato are converted into peptones,
(b) starch of potato is converted into sugar,
(c) fats of potato is converted into fatty acids).

III. Match the following:

Instruction:

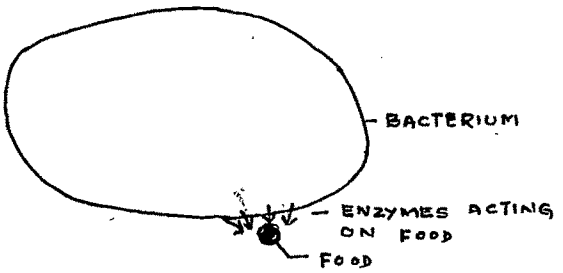
Below are given two tables "A" and "B". Under "A" are given names of the enzymes present in the digestive juices. Under "B" are given names of the digestive juices. Match the enzymes with the digestive juices in which they are present. K

"A"	"B"
(1) Ptylin	(a) gastric juice
(2) Pepsin	(b) pancreatic and bile juice
(3) Trypsin	(c) Salivary juice
(4) Invertase	(d) Intestinal juice

IV. Reason out:

Below is given the diagram of a bacterium digesting its food. Observe the diagram carefully and write as to whether the process of digestion is intra-cellular or extra cellular. Give your reasons. A

15



ANSWER:

V. Here are given names of a few organisms. Develop a food chain with the help of them. C

(a) Plants

(b) Grass hopper

(c) Snakes

(d) Vultures

(e) Frogs.