A LINEAR PROGRAMME ON
MICRO-ORGANISMS

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INSTRUCTIONS

You have been given a new type of book. This is actually a “Programmed Text” and the information through this technique has been given in small bits within two parallel lines (_______). This is called a frame. There are three units in all. Unit I consists of 68 frames, Unit II of 95 and Unit III has 197 frames in it.

To study through the programme, you will find one or two blanks given at the end of each frame. You will have to fill this blank on the basis of the knowledge of information that has been presented in the frame. The response blank in the frame has been provided in the programme in any of the following forms.

1. There can be a straight line (--------) towards the end of the frame, which shows that here the response of one word is required.

   EXAMPLE : The term 'organism' means living--------, here the answer is "being."

2. If there are two straight lines (-------- --------) towards the end of the frame, then it requires a response consisting of two words.

   EXAMPLE : "The term 'organism' means-------- --------" the answer is "living being."

3. If there is a letter/s ending in a dotted line (.................) Your answer word has to begin with the letter/s given before the dotted line.

   EXAMPLE : The term 'organism' mean ii...being'. Here the required answer is living'.

4. If there are two words or group of words, which have been separated by an oblique line, given in a bracket and there is a straight line before the bracket, then you have to strike off the incorrect answer and write the correct answer.

   EXAMPLE : Amoeba (--------) is/is not) found at dry places. Here the required answer 'is not' is to be written in the blank and 'is' is to be struck off.

5. When you have read the frame and also given the response, check your answer, which is given on the left side of the next frame. This is necessary. The word or group of words written on the left side of the next frame is the correct answer. Compare it with the answer that you have written. If it is correct, proceed to the next frame. If your answer is incorrect, donot change your wrong answer for the right one. Only keep it in mind. Donot make any correction in your answer. Before proceeding to the next frame, make sure that you have checked your answer.
6. Do not make haste. Take your own time to read the frame and to write the response.

7. After completing the programme, you will be given a “Criterion Test”. This will tell you how much you have learned through this method.

8. Do not leave any frame unread. Do not skip over any frames, otherwise you will lose the link and the possibility of committing more mistakes will increase.

9. Do not feel scared of. This is not a test. It is a new method of learning and now please start with it.
UNIT—I

This part of the programme includes:

1. Meaning and definition of Micro-organisms.
2. Types of Micro-organisms.
3. Examples of Micro-organisms.

1. The term ‘Micro-organism’ is made up of two words i.e. this term consists of two parts.

2. The two parts of this term are: (i) Micro and (ii) organism.

3. ‘Micro’ means minute or very small. Therefore, ‘Micro-organism’ means very small organisms.

4. ‘Micro’ means very small.

5. ‘Organism’ means ‘living-being’. Therefore, Micro-organism means very small living-being.

6. ‘Organism’ means living.

7. The word ‘organism’ stands for living-beings.

8. Living-beings are called organisms.

9. The term used for living beings is organisms.

10. Thus the term ‘Micro’ means very small and organism means living-being.

11. Some living organisms are very small and they cannot be seen with naked eyes. These living organisms are called Micro-organisms.
12. The organisms which are very small and cannot be seen with unaided eyes are known as Micro-organisms.

13. The living organisms which are too small to be seen with naked eyes are called Micro-organisms.

14. Very small living beings are called Micro-organisms.

15. Those living beings, which cannot be seen with unaided eyes are called Micro-organisms.

16. Micro-organisms are small living beings.

17. Small living beings are known as Micro-organisms.

18. Some micro-organisms are made up of only one cell, i.e., body of some micro-organisms consists of only one cell.

19. These micro-organisms which are made up of only one cell are called 'unicellular Micro-organisms'.

20. Unicellular micro-organisms are made up of one cell only.

21. The organisms which have only one cell in their body are called unicellular organisms.

22. The body of unicellular organisms consists of only one cell.

23. The organisms which are made up of one cell only are called unicellular micro-organisms.

24. The body of unicellular micro-organisms is made up of one cell.

25. The living beings which are made up of only one cell are called unicellular organisms.

26. 'Uni' means one, thus unicellular organisms are those which are made up of only one cell.
27. 'Uni' means

28. 'Cellular' means 'made up of cells', when we say all living beings are cellulars, we mean that all living beings are made up of

29. All living beings are made up of hence they are all cellular.

30. 'Cellular' means made up of

31. Living organisms are made up of cells hence they are said to be

32. Unicellular micro-organisms are made up of cell.

33. 'uni' means and cellular means made up of

34. Amoeba is made up of one cell only, so it is called a micro-organism.

35. Amoeba is unicellular organisms because it is made up of only cell.

36. Body of Amoeba is made up of only one cell.

37. An example of unicellular organism is

38. Paramecium is another example of unicellular animal. This organism is also made up of cell only.
49. Like amoeba, paramecium is also an ————cellular animal.

40. Amoeba and pa ————are made up of single cell each.

41. Two examples of unicellular organisms are ———— and ————.

42. There are some other micro-organisms which are made up of more than one cell i.e. many cells, they are called 'multicellular' micro-organism.

43. 'Multi' means many and cellular means made up of ————.

44. 'Multi' means ————.

45. Hence multicellular micro-organisms are made up of ————cells.

46. The body of multicellular micro-organisms consists of ————cells.

47. The micro-organisms which are made up of many cells are called ———— micro-organisms.

48. Nostoc is made up of more than one cell; hence it is a ———— micro-organism.

49. Nostoc is multicellular but is very small hence it is a ————organism.

50. Nostoc is a ————cellular micro-organism.

51. An example of multicellular micro-organisms is ————.

52. Amoeba is unicellular, whereas ———— is multicellular.

53. The organisms, which are made up of one cell are called unicellular and those which are made up of many cells are called ————.
multicellular 54. Thus we can say that micro-organisms are of two types, (i) ———— and (ii) multicellular micro-organisms.

unicellular 55. The two types of micro-organisms are ———— and ————

unicellular 56. The organisms which have one one cell in their body are called ———— and multicellular those which have many cells are called ————

unicellular 57. Paramecium and ———— are unicellular animals, whereas ———— is a multicellular animal

amoeba, nostoc

Recapitulation

58. What are micro-organisms ?

59. The term ‘micro’ means ————

60. The word ‘organism’ stands for ————

61. Micro-organisms are of ———— types.

62. The two types of micro-organisms are, (i) ———— and (ii) ————

63. Unicellular micro-organisms are made up of ———— cell only.

64. Two examples of unicellular micro-organisms are ———— and ————

65. Multicellular micro-organisms are made up of ———— cell.

66. ‘Uni’ means ————

67. Give an example of Multicellular organisms ————

68. Term ‘multi’ means ————

ANSWERS:

58. The organisms which are very small and cannot be seen with the naked eyes.

59. very small

60. living being

61. two

62. unicellular, multicellular

63. one

64. amoeba, paramecium

65. many

66. one

67. Nostoc

68. many
UNIT—II

In this part of the programme, we shall study Amoeba, a representative of unicellular microorganisms. The study here, will include:

1. Morphology
2. Habitat
3. Structure of amoeba

MORPHOLOGY:

1. Amoeba is an—_____ (uni/multi) cellular micro-organism.
2. Under the microscope, amoeba appears as an irregular or shapeless living matter.
3. Amoeba is constantly changing its shape, hence we can say that it is shapeless—_____—living matter.
4. It does not have any constant body shape, so it is said to be—_____—in shape.
5. Amoeba is—_____—in shape.

HABITAT:

6. Amoeba is found at the bottom of Ponds, in the slow moving streams, muddy ditches i.e, where there is lot of water. It—_____—(is/is not) found at dry places.
7. Amoeba does not live at places where there is no water—_____—
8. Amoeba is found at places where there is—______
STRUCTURE:

9. The continuous change in form and shape of the body is due to pseudopodia (Singular-Pseudopodium).

10. Pseudopodium are figure like, blunt processes, which help amoeba to change its...

11. The body of amoeba is shapeless due to the presence of finger like process called...

12. Amoeba appears shapeless because of...

13. Amoeba can change its shape with the help of finger like process known as...

14. These finger like processes called...

15. The finger like pseudopodia can be given out or withdrawn on its own will.

16. "Pseudo" means false, hence pseudopodia means false...

17. "Pseudo" means...

18. "Podia" means feet, thus Pseudopodia means false...

19. The word "podia" means...
Pseudopodia are false feet of amoeba.

False feet of amoeba are called pseudo-

The finger like projections found on the body of amoeba which help it move are called pseudopodia.

B. BODY WALL:

The body of amoeba on the outside is covered by a cell membrane i.e. outermost covering of body of amoeba is called cell membrane.

Outermost covering i.e body wall of amoeba is called membrane.

The body wall i.e. is very thin, tough, elastic and semi-permeable layer of protoplasm.

The cell membrane is very thin, tough elastic and semi-permeable.

The cell membrane is permeable in nature i.e. it allows only certain substances to pass through it.

The cell membrane is semi-permeable in nature.

This semipermeable cell permits the passage of water, oxygen, carbon-dioxide etc. but does not allow the cell protoplasm to go out.

The cell membrane allows the passage of ox………, wat……… and Co2 etc.
32. Through the cell membrane cell-protoplasm cannot pass, whereas water can pass.

33. The cell membrane does not allow cell CO\textsubscript{2} to pass through it.

34. The cell protoplasm cannot pass through the cell membrane.

C. PROTOPLASM:

35. The living matter, called protoplasm lies inside the body wall known as

36. The cell membrane encloses protoplasm inside it.

37. Enclosed within the cell membrane lies living matter called protoplasm.

38. This living matter can be distinguished into two parts.

39. Protoplasm can be distinguished into parts.

40. The two parts of protoplasm are, the outer ectoplasm and inner endoplasm.

41. The protoplasm consists of outer ectoplasm and inner endoplasm.

42. The outer part of the protoplasm is called ectoplasm, and inner part is endoplasm.

43. The inner part of protoplasm is called endoplasm.

44. The two parts of protoplasm are, (i) which lies towards the outside and (ii) that lies towards the inside.
ectoplasm 45. Ectoplasm is that part of the protoplasm which lies on the outer region and
endoplasm lies inner to it.

endoplasm 46. Outer to endoplasm lies —— part of the protoplasm.

ectoplasm 47. The outer region of protoplasm is called———-

ectoplasm 48. This ectoplasm, which lies towards the ——-(inside/outside) is thick, clear
transparent and firm.

outside 49. Thick, colourless, transparent part of the protoplasm is called———

ectoplasm 50. Ectoplasm is thick, colourless and———

transparent 51. Ectoplasm is colourless, transparent and———-

Thick 52. As———, is thick, it does not flow.

ectoplasm 53. Ectoplasm———(does/does not) flow.

does not 54. Endoplasm which lies towards the —— is thin, fluid like and granular.

inside 55. Endoplasm is fluid like, granular and———

thin 56. Thin, fluid like, granular part of the protoplasm is called———

endoplasm 57. As endoplasm in thin and ——— like it can flow.

fluid 58. Endoplasm can flow because it is———like.

fluid 59. The part of protoplasm that can flow is called———-

endoplasm 60. The part of protoplasm that does not flow is———

ectoplasm 61. Endoplasm is moving constantly, this movement of———plasm is ‘cyclosis’.

endoplasm 62. Cyclosis is cycle like movement of———
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endoplasm 63. Movement of endoplasm is called---

cyclosis 64. As the endoplasm moves, the inclusions present in it also------along with it.

move 65. Inclusions present in the------move along with it.

department 66. However, the two parts of protoplasm i.e.---and------can interchange into each other.

ectoplasm 67. This means that, the difference between ectoplasm and------is not permanent.

endoplasm 68. Ectoplasm can change into------and vice-versa, as they are interchangeable.

endoplasm 69. Ectoplasm and Endoplasm are inter------

INCLUSIONS OF ENDOPLASM

NUCLEUS

changeable 70. In the centre of protoplasm lies a small, disc shaped nucleus i.e. the nucleus lies in the centre of------

protoplasm 71. The small, disc shaped body found in the centre of protoplasm is called nu........

nucleus 72. In the centre of protoplasm lies disc shaped------

nucleus 73. Nucleus is------shaped.

disc 74. Nucleus and protoplasm are interdependent i.e. Protoplasm will not survive without ------and vice versa.
nucleus 75. Separation of nucleus from the———, results in the death of both as they are inter-dependent upon each other.

protoplasm 76. Protoplasm and nucleus———(can/cannot) survive without each other.

connot 77. Nucleus regulates the different activities of the cell body i.e. all activities are controlled by———

nucleus 78. The different cell activities are controlled and co-ordinated by———

nucleus 79. Controlling centre of the cell activities is———

CONTRACTILE VACUOLE:

nucleus 80. The outer part of endo———, contains a round space filled with watery fluid.

endoplasm 81. This round space, which is filled with———fluid is called contractile vacuole.

watery 82. The contractile vacuole is filled with———fluid.

watery 83. This contractile———, is present in the outer region of endoplasm, is filled with watery fluid.

vacuole 84. The round space, which is found in the endoplasm is called———vacuole.

contractile 85. The watery fluid is filled in the round space called———
contractile 86. This round space i.e. controls and regulates the water contents of the body.

87. Contractile vacuole helps to regulate contents of the body.

water 88. The contractile vacuole is concerned with regulation of contents of the body.

water 89. It is the function of to regulate the water contents of the body.

C. FOOD VACUOLES

90. Scattered here and there within the protoplasm are present another type of vacuoles called Food vacuoles.

As the name suggests, food vacuoles contain in them.

92. Food is present inside the vacuoles.

93. The vacuoles which contain food in them are called vacuoles.

94. Food is digested and stored within these vacuoles.

RECAPITULATION

95. In the figure given below, label the parts indicated by guide lines.
96. Amoeba is ______ in shape.

97. It is found at places where there is ______

98. The irregular shape of amoeba is due to the presence of ______

99. 'Pseudo' means ______ and 'Podia' means ______

100. Body wall of amoeba is known as ______

101. The cell membrane allows ______, and ______ to pass through it.

102. The living matter lying inside the cell membrane is known as ______

103. Name the two parts of protoplasm.
   1. ______
   2. ______

104. Tick the part of protoplasm that can flow:
   1. Ectoplasm. ( )
   2. Endoplasm. ( )

105. Name three inclusions of endoplasm.
   1. ______
   2. ______
   3. ______

105. What is cyclosis?

ANSWERS:
95. 1. Cell membrane
    2. Nucleus
    3. Contractile vacuole
    4. Food vacuole
    5. Endoplasm
    6. Ectoplasm
96. irregular
97. water
98. pseudopodia
99. false, feet
100. cell membrane
101. water, oxygen and CO$_2$
102. protoplasm
103. ectoplasm 2. endoplasm
104. 2. (V)
105. 1. Nucleus
2. Contractile vacuole
3. Food vacuoles
106. It is the cycle like movement of endoplasm
UNIT III

This part of the programme deals with the physiology of amoeba. Here we shall study:
1. Locomotion
2. Nutrition
3. Osmoregulation
4. Respiration
5. Response to stimuli
6. Reproduction in amoeba

LOCOMOTION:
1. Amoeba can move from one place to another with the help of false feet called---------

2. Amoeba puts out these-------------- in whichever direction it wants to move.

3. The formation of pseudopodia starts with the appearance of a bulge in the cell membrane and outer part of the protoplasm i.e.----------—------

NOTE: Refer to figure given above for frames from 3 to 9.

4. During the formation of----------------, a bulge appears in cell membrane and ectoplasm.

5. A bulge appears in the----------and ectoplasm during the formation of pseudopodia.

6. Endoplasm flows in the bulge formed by cell membrane and ectoplasm.

7. Pseudopodia is formed by the inflow of............plasm in the bulge formed by cell membrane and ectoplasm.

8. In the bulge formed by cell membrane and ectoplasm,---------flows.

9. Formation of bulge and inflow of---------in it results in the formation of pseudopodia.
Amoeba moves in the direction in which these pseudo-... are put out.

Another ———— may be formed in some other direction, if amoeba wants to move in that particular direction.

Amoeba can change its direction by putting out ———— in that particular direction.

The organelle that help amoeba to move and change its direction are called———

The organelle that help amoeba to move and change its direction are called———

NUTRITION:

Bacteria, minute algae, diatoms etc. which are present in water where amoeba lives, form food of the animal.

Amoeba eats Bac ———— minutes algae, dia——— etc.

Food of amoeba consists of ——— algae, ——— etc.

Amoeba lives by eating ————, ——— diatoms etc.

Food can be taken in at any point from the body of amoeba through the cell mem ——— with the help of pseudopodia.

Taking in of food is called ingestion and it can take place at any point through the ———.

Taking of food inside the body is called ingestion———.

The term used for intake of food is———

Ingestion takes place through the ——— with the help of pseudopodia

The organelle that help in ingestion of food are pseudo———.
Pseudopodia help in **ingestion** of food.

Ingestion of food is brought about with the help of pseudopodia.

When amoeba comes in contact with a solid food particle it puts out its pseudopodia.

These put out pseudopodia form a cup like structure around the food particle.

Pseudopodia form cup like structure around the food particle.

This cup like structure formed by pseudopodia, ingests the food.

Thus food is ingested through the pseudopodia with the help of pseudopodia.

During respiration amoeba like all living organisms takes in oxygen and throws out carbon dioxide during respiration.
33. Gases pass in and out of the body of amoeba through the semipermeable body wall called cell.

34. Gases are exchanged through the semipermeable cell.

35. The exchange of gases is brought about by diffusion through the semipermeable cell.

36. Concentration of oxygen outside the body of amoeba is more than inside it, so this gas enters the body by diffusion through the cell membrane.

37. Oxygen enters the body of amoeba by diffusion through the cell membrane.

38. Oxygen is taken in the body through the cell membrane by the method of diffusion.

39. During respiration, oxygen is used inside the body and (gas) is produced.

40. Oxygen is used up and carbon dioxide is produced during respiration.

41. After respiration, concentration of carbon dioxide inside the body of amoeba becomes more than outside, so it leaves the body by the method of diffusion.

42. Higher concentration of carbon dioxide inside the body makes it leave the body by the method of diffusion.

43. Thus gaseous exchange takes place through the cell membrane by the process of diffusion.

44. The exchange of gases takes place through the cell membrane by diffusion.
OSMOREGULATION:

45. Regulation of water contents of the body of the animal is called Osmoregulation i.e. osmoregulation is the regulation of ———— contents.

46. Osmoregulation is the regulation of ———— contents.

47. Regulation of water contents is known as ————

48. Osmoregulation is ———— of water contents.

49. The term used for regulation of water contents of the body is ————

50. Osmoregulation is ———— of ———— contents of the body.

51. As the concentration of water outside the body of amoeba is more than inside it, so it keeps on entering the body through the cell—————

52. Difference in concentration of ———— inside and outside the body, results in its diffusion in the body.

53. If this ———— goes on diffusing in the body, the animal will swell up and may burst.

54. Continuous entry of ———— may result in bursting of the body.

55. The body of the animal may ————, if water keeps on entering the body.

56. So, to save the body from bursting ———— contents of the body must be controlled.
water 57. This control of water contents inside the body of amoeba is known osmo...........

osmo-regulation 58. Contractile vacuole present in ------- (ectoplasm/endoplasm) helps to eliminate excess of water from the body.

endoplasm 59. The organelle that helps in Osmoregulation is contractile -------

vacuole 60. Excess of water is removed from the body by ------- vacuole.

contractile 61. Osmoregulation is brought about by ------- -------

contractile vacuole 62. Contractile ------- -- goes an collecting excess of water inside it.

vacuole 63. When this contractile vacuole becomes full of------- which it is collecting in it, it moves towards the cell membrane.

water 64. Water filled------- -------, upon reaching the cell membrane, bursts and throws its water contents out of the body.

contractile vacuole 65. When contractile vacuole reaches the------- -------, it bursts to throw out its water contents.

cell-membrane 66. Thus, the animal gets rid of the excess of-------present in its body.

* water 67. Immediately, a new contractile------- is formed at the place of old one.

vacuole 68. Thus, the organelle, that helps to bring about osmoregulation is called------- ----
RESPONSE TO STIMULI:

contractile 69. Amoeba changes its shape, puts out pseudo-......., moves around etc., these changes take place in response to external conditions.

podia 70. All changes in ext..........-conditions of an organism are termed as stimuli (Singular-stimulus).

external 71. Stimuli, are changes in the—-conditions of the organisms.

external 72. Thus stimuli, are the changes acting not internally but—--. on the organisms.

externally 73. External changes acting on the body of an organism are called sti.............

stimuli 74. Changes working on the body of an organism, from outside are termed as---

stimuli 75. Reaction shown by the organism to these external changes i.e.———-is called response.

Stimuli 76. Reaction shown to the stimulus is known as res............

response 77. Organisms show ——- to the stimuli.

response 78. Amoeba responds to a number of—-----, acting on it from outside.

stimuli 79. Responses shown by Amoeba to the——, are of two types.

stimuli 80. Responses are of—-----types.
two 81. The first type of response is known as negative response.

82. The first type of response is called response.

negative 83. The second type of response shown by amoeba is positive response.

84. One type of response shown by amoeba is negative response and the other type is response.

positive 85. 'Negative Response' and responses are two types of response shown by amoeba to stimuli.

positive 86. The two types of response are response and response.

87. Amoeba shows negative by moving away from the stimulus.

88. While showing response, amoeba moves away from the stimulus.

negative 89. Amoeba shows negative response by moving away from the stimulus.

away 90. 'Negative response' is shown by moving from the stimulus.

away 91. While showing response, amoeba moves from the stimulus.

away 92. Amoeba moves away from strong alkalies, salts and sugar i.e. it shows a response to these substances.

93. To alkalies, sugar and salt it shows a response.

negative 94. Amoeba also avoids darkness as well as bright light i.e. it shows a response to them.

negative 95. It shows a negative response to darkness and bright light by moving from it.
To darkness and bright light it shows a response.

Amoeba shows a negative response to very high and very low temperatures and moves from such places.

It shows a negative response to very high and very low temperatures.

Thus, we conclude that amoeba shows a negative response to Alk., salts and very dim and bright.

Amoeba shows the second type of response i.e. ‘response’ by moving towards the stimulus.

‘Positive response’ is shown by moving the stimulus.

While showing ‘response, amoeba moves towards the stimulus.

Amoeba shows a positive response to normal light by moving it.

Amoeba moves towards normal light i.e. it shows a response to normal light.

Amoeba shows a positive response to light.

It shows a positive to temperature ranging from 20°C to 25°C.

Amoeba moves the zone with temperature ranging from 20°C to 25°C.
towards 109. To the temperature ranging from 20°C to 25°C, amoeba shows a ————response.

positive 110. 'Positive response' is shown to temperature ranging from ————°C to ————°C.

20.25 111. Thus, amoeba shows a positive response to normal ———— and ———— range of 20°C to 25°C.

REPRODUCTION:

light, 112. Amoeba reproduces to multiply its number i.e. new amoebae are formed when temperature amoeba rep...-------

reproduces 113. As a result of reproduction, ne ........., amoeba are formed.

new 114. New amoeba are formed as a result of ————.

reproduction 115. Amoeba rep ...... by two method, (i) Binary fission and (ii) Multiple fission.

reproduces 116. Amoeba multiplies its number i.e. reproduces by methods.

two 117. The two methods of reproduction in amoeba are ; (i) Binary fission, and (ii) ————fission

multiple 118. Binary fission and ————fission are two methods of reproduction.

multiple 119. multiple fission and ————fission are the methods by which amoeba reproduces.

A. BINARY FISSION

Binary 120. 'Binary' means two, thus Binary fission means fission into t.........

two 121. Binary means ————

two 122. 'Fission means' division, hence Binary fission means ———— into two.

division 123. 'Fission' means ————
During Binary Fission, amoeba divides into two new amoebae.

As a result of Binary fission, new amoebae are formed.

First of all, the nucleus of amoeba divides into two nuclei.

The nucleus of amoeba divides into nuclei during Binary fission.

First of all, the nucleus of amoeba divides into nuclei, during the Binary fission.

The division of nucleus is followed by division of the cytoplasm into two parts.

After the division of nucleus, cytoplasm divides into two parts.

A constriction appears in the middle of the body, which goes on deepening and ultimately divides the cytoplasm and hence the body into two parts.

As a result of division of the cytoplasm, the body of amoeba divides into parts.

The body of amoeba divides into parts after the division of cytoplasm.

Thus, two daughter amoebae are formed from a single amoeba, as a result of Binary fission.

Out of the nuclei formed as a result of nuclear division, one nucleus goes to one daughter amoeba and the second one moves to the other.
two 136. Hence, each daughter amoeba contains one nucleus each.

amoeba 137. one of the two daughter amoeba formed has the original contractile vacuole.

amoeba 138. One daughter amoeba has the original vacuole.

contractile 139. one of the two new formed amoeba has the original vacuole, while the other develops a new one.

contractile 140. Each of the two new amoeba formed leads an independent life.

vacuole

two 141. An independent life is lead by each of the new amoeba formed.

B MULTIPLE FISSION

two 142. The second method of reproduction in amoeba is multiple fission.

fission 143. Amoeba reproduces by fission also, in addition to Binary fission.

multiple 144. ‘Multiple means ‘many’, thus multiple fission means division into many.

many 145. Multiple means many.

many 146. Multiple fission is, division into many.

many 147. Under unfavourable environmental conditions, amoeba reproduces by multiple fission.

fission 148. Multiple fission takes place during unfavourable environmental conditions.

unfavourable 149. During unfavourable environmental conditions, the animal develops hard, thick wall around it.

unfavourable 150. The thick, hard formed around amoeba is called the cyst.
The cyst is a thick, hard wall formed around amoeba during unfavourable conditions.

The hard wall formed around amoeba is called the cyst.

Amoeba reproduces within this wall called cyst, during unfavourable conditions.

Amoeba reproduces by multiple fission within this wall known as the cyst.

Inside the cyst, during fission, nucleus of amoeba divides repeatedly.

The nucleus divides repeatedly into many nuclei, during fission.

During multiple fission, the nucleus divides to form two (many) nuclei.

Each new formed nucleus gets enveloped by a bit of cytoplasm.

A small amount of cytoplasm envelops each new formed nucleus.

Each of the new formed nucleus gets surrounded by a bit of cytoplasm.

Each small mass of cytoplasm with a nucleus in the centre is called a spore.

A spore is a bit of cytoplasm, which has a nucleus in the centre.

A nucleus with a small amount of cytoplasm around it is called a spore.

A number of such spores are present within a cyst.

A cyst contains a number of spores in it.
spores 166. A number of --- lie within a cyst.

spores 167. On the arrival of favourable conditions, this cyst --- breaks.

cysts 168. The cyst breaks open on the onset of --- conditions.

favourable 169. When cyst breaks during --- conditions, the spores lying inside it are liberated.

favourable 170. The spores are liberated, when --- breaks on the return of favourable conditions.

cyst 171. On breaking up of the cyst --- are set free.

spores 172. Each liberated --- develops into an adult amoeba.

spore 173. As a number of spores lie within, one cyst --- so a number of new amoebae are formed from one cyst.

cyst 174. Thus as a result of --- fission, a number of new amoebae are formed.

multiple 175. During --- fission two new amoebae are formed from one amoeba, whereas during --- fission many of them are formed.

Binary, multiple 176. During Binary fission one amoeba produces --- new amoebae, whereas during multiple fission, it forms --- such ones.

IMMORTALITY:

two 177. In amoeba, the parent wholly changes itself into daughter amoebae, both during --- fission and --- fission.

Binary, multiple 178. While reproducing, the parent amoeba transforms itself into daughter ---.

amoebae 179. As one amoeba transforms itself into new ---, so we can say that it never dies.

amoeba 180. Amoeba never ---, as parent changes into daughter amoeba and the cycle continues.
As there is no natural death for ————, so it is said to be potentially immortal.

Amoeba is said to be potentially immortal, as it does not ————.

Amoeba does not die a natural death, so it is potentially ————.

Amoeba, unlike other living beings is potentially ————.

Thus we can say that amoeba is ————. Potentially Immortal

RECAPITULATION:

Amoeba moves with the help of processes known as ————.

Illustrate formation of pseudopodium in amoeba.

What does amoeba eat?

What is ingestion?

Ingestion takes place through ————.

The organelle that help to ingest food are ————.

The gases pass in and out of the body through ————.

Define osmoregulation.

Explain the mechanism of Osmoregulation

The two types of responses shown by amoeba are:

1. ————.
2. ————.

Name the methods by which amoeba reproduces:

1. ————.
2. ————.
197. Why is amoeba said to be potentially immortal?

ANSWERS:

186. pseudopodia

187. Refer to fig. given above frame No. 4, unit III

188. Bacteria, algae, diatoms

189. Taking in of food is called ingestion.

190. cell membrane

191. pseudopodia

192. cell membrane

193. Regulation of water contents of the body of the animal.

194. Contractile vacuole goes on collecting excess of water in it and when full of water it moves towards the cell membrane, where it bursts and throws out its water contents.

195. 1. Negative 2. positive

196. 1. Binary fission 2. Multiple fission

197. As it never dies a natural death, so it is said to be potentially immortal.
AN ADJUNCT PROGRAMME ON
MICRO-ORGANISMS

SWEEN
DEPARTMENT OF EDUCATION,
PANJAB UNIVERSITY, CHANDIGARH
INTRODUCTION

You have been given a new type of book to study. This in fact is an 'Adjunct Programmed Text'. Here the information is given through two techniques. Some parts of the topic have been dealt through the programme, where the information is given in small bits within two Parallel lines ( ). This is called a frame. On the other hand, some information is given in paragraphs like those of text-books. Text-book format gives information in simple form about the concepts.

INSTRUCTIONS

1. No lecture will be given but you will read the book yourself.
2. Do not leave any sentence or paragraph unread otherwise you will lose the link and it will become difficult for you to understand the concept.
3. Try to grasp the idea of one concept before you proceed to the next one.
4. Read carefully the main points given at the end of paragraphs.

To study through the programme, you will read the matter given in each frame. You will find one or two blanks given at the end of each frame you will have to fill this blank on the basis of knowledge of information that has been presented in the frame. The response blank in the frame has been provided in the programme in any of the following forms:

5. There can be a straight line (---) towards the end of the frame, which shows that here the response of one word is required.
   EXAMPLE: "The term 'organisms' means living---", here the answer is being.

6. If there are two straight lines (-----) towards the end of the frame, then it requires a response consisting of two words.
   EXAMPLE: "The term 'organism' means-----", the answer is 'living being'.

7. If there is a letter/s ending in a dotted line (..................) your answer word has to begin with the letter/s given before the dotted line.
   EXAMPLE: The term 'organism' means li............being'. Here the required answer is 'living'.
8. If there are two words or group of words, which have been separated by an oblique line, given in a bracket and there is a straight line before the bracket, then you have to strike off the incorrect answer and write the correct answer.

EXAMPLE: Amoeba ------ (is/is not) found at dry places. Here the required answer 'is not' is to be written in the blank and 'is' is to be struck off.

9. When you have read the frame also given the response, check your answer, which is given on the left side of the next frame. This is necessary. The word or group of words written on the left side of the next frame is the correct answer. Compare it with the answer that you have written. If it is correct, proceed to the next frame. If your answer is incorrect, do not change your wrong answers for the right one. Only keep it in mind. Do not make any correction in your answer. Before proceeding to the next frame, make sure that you have checked your answer.

10. Do not make haste. Take your own time to read the frame and to write the response.

11. After completing the programme, you will be given a "Criterion Test". This will tell you how much you have learned through this method.

12. Do not leave any frame unread. Do not skip over any frame, otherwise you will lose the link and the possibility of committing more mistakes will increase.

13. Do not feel scared of. This is not a test. It is a new method of learning and now please start with it.
Micro-Organisms

UNIT—I

In this part, we shall study:

—Meaning and definition of Micro-Organisms,
—Types of Micro-Organisms.
—Examples of Micro-Organisms.

MEANING OF MICRO-ORGANISMS

1. The term 'Micro-organisms' is made up of two words i.e. this term consists of two parts.

2. The parts of this term are; (i) Micro and (ii) Organism.

3. 'Micro' means minute or very small, therefore 'Micro-organism' means very small organism.

4. 'Micro' means very small.

5. 'Organism' means 'living being'. Hence, 'Micro-organism' means very small living being.

6. 'Organism' means living.

7. The word 'Organism' stands for...
living beings are called or.............
organisms
organism
very small

DEFINITION OF MICRO-ORGANISMS

The organisms, which are too small to be seen with the naked eyes and can be seen only with the help of magnifying glass are called Micro-organisms.

The emphasis in this definition is on:
(a) Organisms are very small.
(b) They cannot be seen with naked eyes.
(c) They can be seen with the help of magnifying glass.

TYPES OF MICRO-ORGANISMS

Micro-organisms are of following two types:
—Unicellular micro-organisms
—Multicellular micro-organisms

UNICELLULAR MICRO-ORGANISMS

DEFINITION

The organisms, which are made up of one cell only, are called unicellular micro-organisms.

MEANING

1. “Uni” means one thus Unicellular organisms are those, which are made up of only———cell.
2. 'Uni' means

3. 'Cellular' means 'made up of cells', when we say all living beings are cellular, we mean that all living beings are made up of

4. All living beings are made up of, hence they are all cellular.

5. 'Cellular' means made up of.

6. Living organisms are made up of cells, hence they are all said to be.

7. 'Uni', means and cellular means.

EXAMPLES

Examples of unicellular micro-organisms are as follows:

(i) Amoeba

(ii) Paramecium

MULTICELLULAR MICRO-ORGANISMS

DEFINITION

There are some micro-organisms, which are made up of more than one cell. These are made up of two or more than two cells. The organisms which have many cells in their bodies are called multicellular micro-organisms.
MEANING
1. 'Multi' means many and 'cellular' means made up of—
cells
2. 'Multi' means..............
3. Hence multicellular micro-organisms are made up of—
   (I/many) cells.
4. EXAMPLE
   Nostoc is an example of multicellular micro-organisms.

RECAPITULATION
1. What are micro-organisms?
2. The term 'micro' means—
3. The word 'organism' stands for———
4. Micro-organisms are of—types.
5. The two types of micro-organisms are (i) —— and (ii) ———
6. Unicellular micro-organisms are made up of—cell only.
7. The two examples of unicellular micro-organisms are (i) ——— and (ii) ———
8. Multicellular micro-organism are made up of——
9. 'Uni' means———
10. Give an example of Multicellular Organisms——
11. The term multi means———
ANSWERS
1. The organisms which are very small and cannot be seen with the naked eye.
2. Very small
3. Living being
4. Two
5. Unicellular, Multicellular
6. One
7. Amoebe, Paramecium
8. Many
9. One
10. None
11. Many.
UNIT—II

In this part, we shall study ‘Amoeba’, a representative of unicellular micro-organisms.
The study, here, will include:

— Morphology
— Habitat
— Structure

MORPHOLOGY

SHAPE

Amoeba is an unicellular micro-organism. It does not have any definite shape, rather it keeps on changing it constantly. Under the microscope it appears as an irregular or shapeless living matter.

HABITAT

Amoeba is found at places where there is water. It lives in ponds, in the slow moving streams, muddy ditches etc.

POINTS TO REMEMBER ARE:
1. Amoeba is irregular in shape.
2. It lives in water.

STRUCTURE

PSEUDOPODIA

Fig. 8(r)
1. The continuous change in the form and shape of the body is due to pseudopodia. (Singular—Pseudopodium)

2. Pseudopodia are fingerlike processes, which help amoeba to change its shape.

3. The body of amoeba is shapeless due to the presence of fingerlike processes called pseudopodia.

4. Amoeba appears shapeless because of pseudopodia.

5. Amoeba can change its shape with the help of fingerlike processes known as pseudopodia.

6. These fingerlike processes called pseudopodia are being constantly given out or withdrawn from the body.

7. The fingerlike pseudopodia can be given out or withdrawn on its own will.

8. 'Pseudo' means false, hence pseudopodia means false feet.

9. 'Pseudo' means false.

10. 'Podia' means feet, thus pseudopodia means false feet.

11. The word 'podia' means feet.

12. Pseudopodia are false feet of amoeba.

13. False feet of amoeba are called pseudopodia.

14. The fingerlike projections found on the body of amoeba, which help it to move, are called pseudopodia.
BODY WALL

The body of amoeba, on the outside is covered by a very thin envelop called cell-membrane. This cell-membrane forms the body wall of amoeba. It is very thin, tough, elastic and semipermeable.

CELL-MEMBRANE

POINTS TO PONDER

(i) Bodywall of amoeba is called cell-membrane.
(ii) Cell-membrane is thin, tough, elastic and semipermeable.

NATURE OF CELL-MEMBRANE

1. The body wall, called cell---is semipermeable in nature.

membrane

2. The cell-membrane is semi-------------------in nature i.e. it allows only certain substances to pass through it.

membrane permeable

3. This semipermeable cell-------------------, permits the passage of water, oxygen, carbon dioxide etc. but does not allow the cell protoplasm to go out.

membrane oxygen, water

4. The cell-membrane allows the passage of ox----------, wat------ and carbon dioxide etc.

oxygen, water

5. Through the cell-membrane, cell-protoplasm cannot pass, whereas--------, water and------------------- can pass.

membrane oxygen, carbon dioxide

6. The cell-membrane does not allow cell------------------to pass through it.

protoplasm

7. The cell-------------------cannot pass through the cell-membrane.

protoplasm
PROTOPLASM

Inside the cell, enclosed by the cell membrane lies the living matter. This living matter is known as protoplasm. The protoplasm can be distinguished into two parts, viz.

(a) The outer ectoplasm
(b) The inner endoplasm

POINTS TO REMEMBER

(i) The living matter of cell is called protoplasm.
(ii) The outer part of protoplasm is called ectoplasm.
(iii) The inner part of protoplasm is called endoplasm.

NATURE OF ECTOPLASM

1. Ectoplasm, which lies towards the outside is thick, colourless, transparent and firm.

2. The thick, colourless, transparent part of the protoplasm is called ectoplasm.

3. Ectoplasm is thick, colourless and transparent.

4. Ectoplasm is colourless, transparent and thick.

5. Ectoplasm does not flow.

NATURE OF ENDOPLASM

6. Endoplasm, which lies towards the inside is thin, fluid like and granular.

7. Endoplasm is fluid like, granular and

8. Endoplasm is fluid like, granular and
9. The thin, fluid like, granular part of the protoplasm is called endoplasm.

10. As endoplasm is thin and fluid like, it can flow.

11. Endoplasm can flow, because it is fluid like.

12. The part of the protoplasm that can flow is called endoplasm.

13. The part of the protoplasm that cannot flow is called ectoplasm.

CYCLOSIS

Endoplasm is moving constantly. It moves around the nucleus in a cycle-like motion. This cycle-like motion of the endoplasm is known as cyclosis. During cyclosis, the inclusions of the endoplasm also move along with it.

INTERCHANGEABILITY OF ECTO—AND ENDOPLASM

The difference between the two parts of the protoplasm is not permanent. Ectoplasm and endoplasm are interchangeable, i.e., ectoplasm can change into endoplasm and vice-versa.

INCLUSIONS OF ENDOPLASM

NUCLEUS

In the centre of the protoplasm lies a small disc-shaped body called nucleus. Nucleus and protoplasm are interdependent upon each other. Infact, nucleus regulates, controls and co-ordinates the different activities of the cell-body like the nervous system of higher organisms. Separation of the nucleus from the protoplasm results in the death of both.
POINTS TO BE REMEMBERED

(i) The cyclelike motion of the endoplasm is called cyclosis.
(ii) The difference between ecto-and endoplasm is not permanent.
(iii) Nucleus is disc shaped.
(iv) Nucleus regulates, controls and co-ordinates the cell-activities.

CONTRACTILE VACUOLE

1. The outerpart of endoplasm contains a round space filled with watery fluid.

2. This round space, which is filled with—fluid is called contractile vacuole.

3. The contractile vacuole which is present in the outer-region of the endoplasm is filled with watery fluid.

4. The round space which is found in the endoplasm is called—.

5. This round space i.e.—controls and regulates the water contents of the body.

6. The contractile vacuole is concerned with the regulation of—contents of the body.

7. It is the function of—to regulate the water contents of the body.
FOOD VACUOLE

Scattered here and there within the protoplasm are present another type of vacuoles called ‘Food Vacuoles’. As the name suggests, these vacuoles contain food in them. Food is digested and stored in these vacuoles.

![Food Vacuole](image)

POINTS TO PONDER

(i) Food vacuoles contain food in them.
(ii) These are present scattered in the protoplasm.

RECAPITULATION

1. In the figure below, label the parts indicated by guidelines.

2. Amoeba is ———— in shape.
3. It is found at places where there is ————
4. The irregular shape of amoeba is due to the presence of ————
5. ‘Pseudo’ means ———— and ‘Podia’ means ————
6. Body wall of amoeba is known as ————
7. The cell-membrane allows ———— and ———— to pass through it.
8. The living matter lying inside the cell-membrane is known as ————
9. Name the two parts of protoplasm.
   1. ————
   2. ————
10. Tick the part of protoplasm that can flow;
   1. Ectoplasm ( )
   2. Endoplasm ( )

11. What is cyclosis?
   ... .................................................................

12. Name three inclusions of endoplasm
   1. ................
   2. ................
   3. ................

ANSWERS
2. irregular
3. water
4. pseudopodia
5. false, feet
6. cell-membrane
7. water, oxygen, carbon dioxide
8. protoplasm
9. ectoplasm, endoplasm
10. 2 (√)
11. It is the cyclolike movement of endoplasm
12. (1) Nucleus (2) Contractile vacuole (3) Food vacuole
This part deals with the physiology of amoeba. Here, we shall study:

—Locomotion
—Nutrition
—Osmo-regulation
—Respiration
—Response To stimuli
—Reproduction in amoeba

**LOCOMOTION**

Amoeba moves from one place to another, with the help of its false feet called pseudopodia. Amoeba puts out these pseudopodia in whichever direction it wants to move.

**FORMATION OF PSEUDOPODIA**

1. The formation of pseudopodia starts with the appearance of a bulge in the cell-membrane and outer part of protoplasm called-------------------

- The formation of pseudopodia starts with the appearence of a bulge in the cell-membrane and outer part of protoplasm called-------------------

2. During the formation of-------------------, a bulge appears in cell-membrane and ectoplasm.

3. A bulge appears in the-------------------and ectoplasm during the formation of pseudopodia.

4. Endoplasm flows in the bulge formed by cell-membrane and-------------------.

5. Pseudopodia is formed by the inflow of-------------------plasm in the bulge formed by cell-membrane and ectoplasm.

6. In the bulge formed by ectoplasm and cell-membrane,-------------------flows.

7. Formation of bulge and inflow of-------------------in it, results in the formation of pseudopodia.

---

**PSEUDOPODIUM**

---

ectoplasm

cell-membrane

endoplasm

endoplasm
CHANGE OF DIRECTION

Amoeba moves in the direction in which these pseudopodia are put. Amoeba can change its direction, by putting out pseudopodia in that particular direction. Thus, these false feet of amoeba, take it from place to place.

NUTRITION

FOOD OF AMOEBA

Amoeba eats Bacteria, minute algae, diatoms etc. This food is available in water, where amoeba lives.

INGESTION

Taking in of food is called ingestion. There is no mouth in amoeba. Hence the food is taken in at any point from the body. It is ingested through the cell membrane. Pseudopodia, finger-like processes, help in the ingestion of food.

POINTS TO REMEMBER

(i) Pseudopodia help amoeba to change its direction.
(ii) Amoeba eats Bacteria, minute algae, diatoms etc.
(iii) Taking in of food is called ingestion.
(iv) Ingestion takes place through the cell membrane with the help of pseudopodia.

MECHANISM OF INGESTION

1. When amoeba comes in contact with a solid food particle, it puts out its finger like———-

2. These put out———form a cup like structure around the food particle.
pseudopodia 3. Pseudopodia form a cup-like structure around the particle.

food 4. This cup-like structure formed by the ingests the food.

--- INGESTED FOOD ---

pseudopodia 5. Thus food is ingested through the with the help of pseudopodia.

cell-membrane

pseudopodia

RESPIRATION
Like all living beings, amoeba takes in oxygen and throws out carbon dioxide. The interchange of oxygen coming inwards and carbon dioxide going outwards, forms the process of respiration. Amoeba has no special respiratory organs. There is a free exchange of gases through the cell-membrane, which is semipermeable.

EMPHASIS LIES ON
(i) Exchange of oxygen and carbon dioxide takes place during respiration.
(ii) The gaseous exchange takes place through cell-membrane.

MECHANISM OF RESPIRATION
1. The exchange of gases is brought about by diffusion through the semipermeable

<table>
<thead>
<tr>
<th>cell-membrane</th>
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<tbody>
<tr>
<td>2. Concentration of oxygen outside the body of amoeba is more than inside it, so this gas enters the body by diffusion through the.</td>
</tr>
<tr>
<td>cell-membrane</td>
</tr>
<tr>
<td>3. Oxygen enters the body of amoeba by the method of diffusion through the cell-membrane.</td>
</tr>
<tr>
<td>diffusion</td>
</tr>
<tr>
<td>4. Oxygen is taken in the body through the cell-membrane by the method of diffusion</td>
</tr>
<tr>
<td>diffusion</td>
</tr>
<tr>
<td>5. During respiration, oxygen is used inside the body and (gas) is produced.</td>
</tr>
</tbody>
</table>
carbon dioxide 6. Oxygen is used up and carbon dioxide is produced during respiration.

7. After respiration, concentration of carbon dioxide inside the body of amoeba becomes more than outside, so it leaves the body by the method of diffusion.

8. Higher concentration of carbon dioxide inside the body than outside makes it leave the body by the method of diffusion.

9. Carbon dioxide leaves the body by the method of diffusion.

10. Thus the gaseous exchange takes place through the cell-membrane by the process of diffusion.

OSMOREGULATION

DEFINITION

Regulation of water-contents of the body of the animal is called osmoregulation.

NEED

Amoeba lives in water. So the concentration of water outside the body of amoeba is more than inside the body. A steady water-current enters the body, due to the difference in its concentration, inside and outside the body. If the excess of water is not removed, the animal might burst and die. So, to save the body from this fate, water contents of the body must be controlled.

MAIN POINTS TO BE REMEMBERED

(i) Osmoregulation is the regulation of water-contents of the body.
(ii) In the absence of osmoregulation, the body of amoeba may burst.

PROCESS OF OSMOREGULATION

1. Contractile vacuole present in (ectoplasm/endoplasm) helps to eliminate excess of water from the body.

2. The organelle that helps in Osmoregulation is contractile (endoplasm).
18

vacuole 3. Excess of water is removed from the body by vacuole.
contractile 4. Osmoregulation is brought by contractile.
contractile vacuole 5. Contractile vacuole goes on collecting excess of water inside it.
vacuole 6. When this contractile vacuole becomes full of water, which it is collecting in it, if moves towards the cell-membrane.
water 7. Water filled, upon reaching the cell-membrane, burst and throws its water-contents out of the body.
contractile vacuole 8. When contractile vacuole reaches the cell-membrane, it bursts to throw out its water contents.
cell-membrane 9. Thus, the animal gets rid of excess of present in its body.
water 10. Immediately, a new contractile vacuole is formed at the place of old one.
vacuole contractile vacuole 11. Thus, the organelle that helps to bring about osmoregulation is contractile vacuole.

RESPONSE TO STIMULI

STIMULI

All changes in the external conditions of an organism are termed as stimuli. (singular-stimulus).

RESPONSE

Reaction shown by the organism, to these stimuli is called response.

TYPES OF RESPONSES

Amoeba responds differently to different stimuli. It either moves towards the stimulus or away from it while responding, to stimuli. When it moves towards the stimulus, response is said to be (i) POSITIVE RESPONSE, and when it moves away from the stimulus, it is said to be (ii) NEGATIVE RESPONSE.
19

POINTS TO BE KEPT IN MIND
(i) Stimuli are the changes in external conditions of an organism.
(ii) Response is the reaction shown to the stimulus.
(iii) Responses are of two types:
(a) Positive Response
(b) Negative Response

CONDITIONS CAUSING NEGATIVE RESPONSE
1. Amoeba moves away from strong alkalies, salts and sugar i.e. it shows a-negative response to those substances.

2. To alkalies, sugar and salts, it shows a-negative response.

3. Amoeba also avoids darkness as well as bright light i.e. it shows a-negative response to them.

4. It shows a negative response to darkness and bright light by moving-away from it.

5. To darkness and bright light, it shows a-negative response.

6. Amoeba shows a negative response to very high and very low temperatures and moves-away from such places.

7. It shows a negative response to very-high and very-low-temperatures.

8. Thus we conclude that amoeba shows a negative response to Alkalies, sugar, very dim and bright, very high and very low-temperatures.

Alkalies, sugar, light, temperature
CONDITIONS CAUSING POSITIVE RESPONSE

9. Amoeba shows a positive response to normal light by moving towards it.

10. Amoeba moves towards normal light i.e. it shows a positive response to normal light.

11. Amoeba shows a positive response to light.

12. It shows a positive response to temperature ranging from 20°C to 25°C.

13. To the temperature ranging from 20°C to 25°C, amoeba shows a positive response.

14. Positive response is shown to temperature ranging from 20°C to 25°C.

15. Thus, amoeba shows a positive response to normal range of 20°C to 25°C.

REPRODUCTION

NEED

All living beings reproduce to produce young ones like themselves. Amoeba also reproduces to multiply its own number. New amoebae are formed as a result of reproduction.

METHODS

Amoeba multiplies its number by two methods:
- Binary Fission
- Multiple Fission

POINTS TO PONDER

(i) Amoeba reproduces to multiply its number.
(ii) Amoeba reproduces by two methods viz.
   (a) Binary fission
   (b) Multiple fission
BINARY FISSION

MEANING

1. Binary means two, thus Binary fission, means fission into two.

2. Binary means division, hence Binary fission means division into two.

3. Fission means division, hence Binary fission means division into two.

4. Fission means division.

5. During Binary fission, amoeba divides into (2/3) new amoeba.

6. As a result of Binary fission, new amoebae are formed.

PROCESS

7. During Binary fission, first of all, the nucleus of amoeba divides into two.

8. The nucleus of amoeba divides into nuclei during Binary fission.

9. First of all, the nucleus of amoeba divides into nuclei during Binary fission.

10. The division of nucleus is followed by the division of the cytoplasm into two parts.

11. After the division of nucleus, cytoplasm divides into two parts.

12. A constriction appears in the middle of the body, which goes on deepening and ultimately divides the cytoplasm and hence the body into two parts.
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<tr>
<td><strong>cytoplasm</strong> 13. As a result of division of the cytoplasm, the body of amoeba divides into parts.</td>
<td></td>
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<tr>
<td>two 14. The body of amoeba divides into parts after the division of cytoplasm.</td>
<td></td>
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<tr>
<td>two 15. Thus (2/many) daughter amoebae are formed from a single amoeba as a result of Binary fission.</td>
<td></td>
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<tr>
<td>two 16. Out of the nuclei formed as a result of nuclear division, one nucleus goes to one daughter amoeba and the second one moves to the other.</td>
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<tr>
<td>two 17. Hence, each daughter amoeba contains one nucleus each.</td>
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<tr>
<td>amoeba 18. One of the two daughter-formed, has the original contractile vacuole.</td>
<td></td>
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<tr>
<td>amoeba 19. One daughter amoeba has original vacuole.</td>
<td></td>
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<tr>
<td>contractile 20. One of the two formed amoeba has the original vacuole, while the other develops a new one.</td>
<td></td>
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</tr>
<tr>
<td>contractile Vacuole 21. Each of the new amoeba formed leads an independent life.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>two 22. An independent life is led by each of the new amoeba formed.</td>
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### MULTIPLE FISSION

**MEANING**

In addition to Binary fission, amoeba reproduces by multiple fission as well. 'Multiple' means many and 'Fission' means division, hence the term 'Multiple fission' means division into many. As a result of Multiple fission many new amoeba are formed.

**CONDITIONS**

Multiple fission, in amoeba, takes place during unfavourable weather conditions.

**CYST**

During unfavourable weather conditions amoeba secretes a hard, thick wall around it. This thick wall is known as cyst. Amoeba reproduces within this cyst, during unfavourable conditions i.e. multiple fission takes place within the cyst.
1. Amoeba reproduces by multiple fission within this wall known as cyst.

2. Inside the cyst, during fission, the nucleus of amoeba divides repeatedly.

3. The nucleus divides repeatedly into many nuclei, during fission.

4. During multiple fission, the nucleus divides to form (2/many) nuclei.

5. Each new formed nucleus, gets enveloped by a bit of cytoplasm.

6. A small amount of cytoplasm envelopes each new formed nucleus.

7. Each of the new formed nucleus gets surrounded by a bit of cytoplasm.

8. Each small mass of cytoplasm with a nucleus in the centre is called a spore.

9. A spore is a bit of cytoplasm, which has a nucleus in the centre.

10. A nucleus with a small amount of cytoplasm around it is called a spore.

11. A number of such spores are present within a cyst.

12. A cyst contains a number of spores in it.

13. A number of spores lie within a cyst.

14. On the arrival of favourable conditions, this cyst breaks open.

15. The cyst breaks open, on the onset of conditions.
16. When cyst breaks during favourable conditions, the spores lying inside it are liberated.

17. The spores are liberated, when cyst breaks on the return of favourable conditions.

18. On breaking of the cyst, are set free.

19. Each liberated develops into an adult amoeba.

20. As a number of spores within one cyst, so a number of new amoebae are formed from one cyst.

21. During fission two new amoebae are formed from one amoeba, whereas during fission, many of them are formed.

22. During Binary fission amoeba produces new amoebae, whereas during multiple fission, it forms such ones.

IMMORTALITY

There is no natural death in amoeba. An adult amoeba, who transforms itself into daughter amoebae. These daughter amoebae grow and again reproduce to form more amoebae. This cycle continues, with the result, amoeba does not die a conventional death. As there is no natural death in amoeba, it is said to be potentially immortal.

POINTS TO REMEMBER :

(i) There is no natural death in amoeba

(ii) Amoeba is potentially immortal.

RECAPITULATION :

1. Amoeba moves with the help of processes known as.................
2. Illustrate formation of pseudopodia

3. What does amoeba eat?
   ........................................

4. What is ingestion?
   ........................................
   ........................................

5. Ingestion takes place through..............

6. The organelle that help to digest food are.............

7. The gases pass in and out of the body through.............

8. Define Osmoregulation
   ........................................

9. Explain mechanism for osmoregulation
   ................................................................
   ................................................................
   ................................................................

10. The two types of responses, shown by amoeba are:
    1. ........................................
    2. ........................................

11. Name the methods by which amoeba reproduces.
    1. ........................................
    2. ........................................
12. Why is amoeba said to be potentially immortal.

ANSWERS:
1. pseudopodia
2. Refer to fig. given above frame No. 4 Unit-III.
3. Bacteria, algae, diatoms.
4. Taking of food is called ingestion
6. pseudopodia.
8. Regulation of water contents of the body of the animal.
9. Contractile vacuole goes on collecting excess of water in it and when full of water it moves towards the cell-membrane, where it bursts and throws out its water.
10. 1. Negative
    2. Positive
11. 1. Binary fission
    2. Multiple fission
12. As it never dies a natural death, so it is said to be potentially immortal.
CRITERION TEST

SWEEN
DEPARTMENT OF EDUCATION,
PANJAB UNIVERSITY, CHANDIGARH
CRITERION TEST

PART-I

Note : Complete the following sentences :

1. 'Uni' means------------------------

2. Amoeba is ------------------------(uni/multicellular) micro-organism

3. The term 'multi' means------------------------

4. An example of multicellular organisms is ------------------------

5. Pseudopodia------------------------(can/cannot) be withdrawn

6. Cell-membrane is------------------------(Permeable/semipermeable) in nature.

7. The two parts of Protoplasm are (i)------------------------ and (ii)------------------------

8. The thick, clear, transparent part of the protoplasm is called------------------------

9. The thin granular, fluid like part of the protoplasm is called------------------------

10. The disc shaped body present in the centre of en
cioplasm is called------------------------

11. Food is digested within the------------------------vacuoles

12. Food of amoeba consists of------------------------,------------------------and diatoms

13. During respiration------------------------gas enters the body, whereas------------------------leaves it

14. The exchange of gases takes place through the------------------------

15. The gaseous exchange is brought about by a method called------------------------

16. Osmoregulation is brought about by------------------------

17. The reaction shown by the organism to an external change is called------------------------

18. Positive response is shown by moving------------------------the stimulus

19. Amoeba shows negative response by moving------------------------from the stimulus

20. The cyst in amoeba is formed during------------------------fission

1. The cyst breaks open to release------------------------during favourable conditions
PART-II

Note: In questions given below, each statement is provided with four responses, out of which only one is correct. Place a tick mark (√) against the correct response.

22. The organisms which cannot be seen with the naked eyes are called:
   (a) multicellular organisms
   (b) living organisms
   (c) micro-organisms
   (d) pseudopodia

23. Unicellular micro-organisms are made up of:
   (a) two cells
   (b) without any cell
   (c) one cell only
   (d) more than two cells

24. Multicellular organisms are made up of:
   (a) one cell only
   (b) three cells only
   (c) two or more than two cells
   (d) five cells only

25. Paramecium is unicellular organism because it is made up of:
   (a) protoplasm
   (b) one cell
   (c) living cell matter
   (d) many cells

26. Amoeba cannot be seen with naked eyes because:
   (a) it is very small
   (b) it has pseudopodia
   (c) it never dies
   (d) it is irregular
27. Amoeba is found
   (a) in homes
   (b) at dry places
   (c) on rocks
   (d) in ponds and ditches

28. Amoeba change its body shape because
   (a) it has pseudopodia
   (b) it is unicellular
   (c) it is a micro-organism
   (d) none of the above

29. The term pseudopodia means:
   (a) single celled
   (b) very small
   (c) made up of cells
   (d) false feet

30. The outermost covering of the body of amoeba is called:
   (a) protoplasm
   (b) contractile vacuole
   (c) endoplasm
   (d) cell membrane

31. The cell-membrane does not allow the passage of
   (a) carbondioxide
   (b) protoplasm
   (c) oxygen
   (d) water

32. The living matter that lies inside the cell-membrane is
   (a) food vacuole
   (b) cyst
   (c) protoplasm
   (d) body wall
33. The round space filled with water, present in ectoplasm is called:
   (a) nucleus
   (b) food vacuole
   (c) contractile vacuole
   (d) spore

34. Contractile vacuole helps to:
   (a) ingest food
   (b) regulate water contents
   (c) reproduce
   (d) all the above

35. Amoeba moves with the help of:
   (a) nucleus
   (b) endoplasm
   (c) cell-membrane
   (d) pseudopodia

36. Amoeba ingests food through the:
   (a) cell membrane
   (b) mouth
   (c) ectoplasm
   (d) contractile vacuole

37. The organelle that help to ingest food is:
   (a) contractile vacuole
   (b) nucleus
   (c) pseudopodia
   (d) cyst

38. A stimulus is:
   (a) change in external conditions
   (b) reaction shown to changes
39. Amoeba shows negative response to
   (a) bright and dim light
   (b) very high and low temperature
   (c) salts and alkalies
   (d) all of them

40. Amoeba shows a positive response by
   (a) moving away from the stimulus
   (b) moving towards the stimulus
   (c) not moving at all
   (d) rounding off

41. Amoeba reproduces to
   (a) multiply its number
   (b) decrease its number
   (c) die a natural death
   (d) none of the above

42. As a result of Binary fission, amoeba forms:
   (a) four new amoebae
   (b) two new amoebae
   (c) three new amoebae
   (d) innumerable amoebae
PART III

Note: Do as directed

43. Draw a neat diagram of an amoeba and label
   (i) — ectoplasm
   (ii) — endoplasm
   (iii) — nucleus
   (iv) — contractile vacuole
   (v) — food vacuole

44. Illustrate formation at pseudopodium in amoeba

45. Show ingestion in amoeba with the help of diagrams

46. Draw diagrams showing binary fission in amoeba

47. Illustrate multiple fission in amoeba
PART IV

Note: Some statements are given below, which are either 'True' or 'False'. Put a tick mark (✓) over 'T' if the statement is 'True' and over 'F' if the statement is 'False'.

48. Amoeba has a regular body shape T/F
49. Ectoplasm and endoplasm are not interchangeable T/F
50. Contractile vacuole is square in shape T/F
51. Pseudopodia help amoeba to change path T/F
52. During Binary fission, nucleus of amoeba divides after the cytoplasm T/F

PART V

Note: In the following items, two lists are given under column A and B. Match the two columns by writing the number of column A in the brackets given against column B.

53. A                 B
   (i) Cellular        ( ) many
   (ii) Binary         ( ) division
   (iii) Multi         ( ) made up of cells
                        ( ) two

54. A                 B
   (i) Cyclosis        ( ) living matter
   (ii) Osmoregulation ( ) intake of food
   (iii) Ingestion     ( ) cycle like movement
                        ( ) control of water contents

55. A                 B
   (i) Pseudo          ( ) living being
   (ii) Micro          ( ) foot
   (iii) Podia         ( ) very small
                        ( ) false
56. A
(i) Binary Fission
(ii) Unicellular
(iii) Multiple Fission

B
( ) division in to many
( ) many celled
( ) one celled
( ) division into two

57. A
(i) Diffusion
(ii) Spore
(iii) Immortality

B
( ) Selective to passage of substances
( ) flow due to unequal concentration
( ) nucleus with a bit of cytoplasm
( ) no natural death

58. A
(i) Organism
(ii) Multicellular
(iii) Semipermeable

B
( ) reproductive structure
( ) living being
( ) many celled
( ) Selective to passage of substances

59. A
(i) Pseudopodia
(ii) Nucleus
(iii) Food vacuole

B
( ) food filled space
( ) temporary projections
( ) water filled space
( ) disc like body

60. A
(i) Ectoplasm
(ii) Endoplasm
(iii) Cyst

B
( ) herd thick wall
( ) inner part of protoplasm
( ) thin, semipermeable
( ) outer part of protoplasm
61. A
   (i) Nucleus
   (ii) Endoplasm
   (iii) Stimulus

B
   ( ) false feet
   ( ) changes acting externally
   ( ) shows cyclosis
   ( ) controlling centre of the cell

62. A
   (i) Nucleus
   (ii) contractile vacuole
   (iii) Food vacuole

B
   ( ) scattered in protoplasm
   ( ) in the centre of protoplasm
   ( ) on the body wall
   ( ) in the outer part of protoplasm

63. A
   (i) Fission
   (ii) Contractile vacuole
   (iii) Protoplasm

B
   ( ) water filled space
   ( ) division
   ( ) food filled space
   ( ) living matter

64. A
   (i) Food vacuole
   (ii) Cell-membrane
   (iii) Contractile vacuole

B
   ( ) water regulation
   ( ) change in direction
   ( ) gaseous exchange
   ( ) digestion of food

65. A
   (i) Negative Response
   (ii) Positive Response
   (iii) Multiple Fission

B
   ( ) favourable weather condition
   ( ) sugar and alkalies
   ( ) temperature ranging from 20°C to 25°C and normal light
   ( ) unfavourable weather conditions
PART VI

Note: Write answers in a few lines to the questions asked:

66. Give definition of micro-organisms

67. Name the two types of micro-organisms
   (i) __________________________
   (ii) __________________________

68. What are unicellular micro-organisms?

69. Define multi-cellular micro organisms

70. Give six examples of unicellular organisms
   (i) __________________________
   (ii) __________________________

71. What is cyclosis?
72. How can amoeba change its direction?

73. What is osmoregulation?

74. Explain briefly the process of osmoregulation

75. What is the necessity of osmoregulation?

76. Name the two types of responses shown by amoeba
   
   (i) 

   (ii)
77. Name the two ways by which amoeba reproduces

(i) ___________________________

(ii) ___________________________

78. Explain Binary fission in amoeba

79. Explain the process of Multiple fission in amoeba

80. Why is amoeba said to be potentially immortal?

______________________________
मानसिक योग्यता की सामूहिक परीक्षा (72)

इस प्रश्न-पुर्तिलिका के सभी जवाबों को केवल उत्तर-पत्र पर ही लिखित होना चाहिए।
इस परीक्षा पुर्तिलिका पर कुछ लिखना या फिसलना न करें।

प्रश्न 20 मिनट का समय है। भाव के साथ 100 प्रश्न कामयाबी।

इस परीक्षा के आस्थापन होने के पहले इसमें विद्यार्थियों के लिए दी गई शिक्षा, उपलब्ध रहती है।

प्रश्न के उत्तरों और प्रश्न की विकल्प संख्या दी गई है।

प्रश्नक्रम प्रश्न के उत्तरों को उत्तर-पत्र पर लिखित होने के अनुसार मानक की।

सभी प्रश्न सामान्य शास्त्रीय एवं अनुभवी विद्यार्थी के लिए सीमित है।

इस प्रश्न-पुर्तिलिका के सभी जवाबों को केवल उत्तर-पत्र पर ही लिखित होना चाहिए।

प्रश्नक्रम प्रश्न के साथ परीक्षा का उत्तर-पत्र पर लिखित होने के अनुसार मानक की।

प्रश्न 20 मिनट का समय है। भाव के साथ 100 प्रश्न कामयाबी।

इस प्रश्न-पुर्तिलिका के सभी जवाबों को केवल उत्तर-पत्र पर ही लिखित होना चाहिए।

इस प्रश्न-पुर्तिलिका के सभी जवाबों को केवल उत्तर-पत्र पर ही लिखित होना चाहिए।

इस प्रश्न-पुर्तिलिका के सभी जवाबों को केवल उत्तर-पत्र पर ही लिखित होना चाहिए।
महाभारत के लिए उद्धरण

इस परिचाय में चित्र प्रकार के बारे में जिंदगी है, तब के जो युद्ध के पशुओं का प्रदर्शन भी उद्धरण जीवन में है। विवरण दुर्गोपाल का उचित समय वे अपना भाग वहाँ जाने के कर रहीं।

बाद में वहाँ इस की पहल, और इस को हजार लोगों की पुकार से उन्हें बताया—

उद्धरण संक्षेप

1. बुद्ध का भाव है, (1) देव, (2) अभिनेता, (3) पाषाण, (4) वाणी।
2. स्त्री का भव है, (1) ब्रह्म, (2) रामायणी, (3) शिष्याः, (4) प्रासाद।
3. सेवाएँ का उद्देश्य है, (1) भक्ति, (2) सुधारणी, (3) चन्द्रप्र, (4) सम्प्रदाय।
4. अर्जुण का उद्देश्य है, (1) निर्माण, (2) अलमारी, (3) सिद्धी, (4) मृग।
5. सोच हेतु संवाद जन्म के स्वारूप बालों की एक संख्या उत्तर-पत्र पर फिरें— 1, 2, 3, 4, 5, 6 ... (5)
6. सोच हेतु संवाद जन्म के स्वारूप बालों की एक संख्या उत्तर-पत्र पर फिरें— 1, 14, 13, 12, 11, 10 ... (6)
7. इन तीनों में से जब राम के संवाद जन्म के स्वारूप उत्तर-पत्र पर फिरें— (1) श्रीमण, (2) गुरुमण, (3) सचिन, (4) बोर, (5) मोहक।
8. इन तीनों में से जब राम के संवाद जन्म के स्वारूप उत्तर-पत्र पर फिरें— (1) शिक्षा, (2) कैलाक, (3) शास्त्रार्थ, (4) काशी, (5) सत्यन।
9. राम एक साधारण बाल है। इसलिए वह कभी-कभी (1) बालकों का उद्देश्य है।
10. राम एक साधारण बाल है। इसलिए वह कभी-कभी (1) बालकों का उद्देश्य है।
11. राम का दर्शन बालकों से ज्ञात है। (1) अर्थ, (2) कारण, (3) विधि, (4) मान्यता।
12. कारण का दर्शन बालकों विधि सहित है, (1) प्रवर्तक, (2) योगी, (3) सुधा, (4) सूती।
13. हर्षप्रेम का दर्शन सहित है, (1) अभिनेता के उपकरण सहित है। तो सब में सर्वोच्च बाल है?
14. राम के दर्शन गोधर्म है। गोधर्म से गोधर्म भाद्र है। और दुर्गी के दुर्गी बालक बाल है, तो सब में दुर्गी भाद्र है? (1) राम, (2) गोधर्म, (3) प्रथाम, (4) हर्षप्रेम।

— २ —

परिचाय संबंध के अन्य संबंध हों जो आपने अपनी सामान्य लोकिक।
61 संपादकः विभागः वर्ष-     
(1) सलर, (2) विनायक, (3) दुलाल, (4) समाधार
62. बालकृपा का भवन हैः (1) बिनायक, (2) विनायक, (3) पवनि, (4) सुमुख
63. खर्चावलीः नवीनीः (1) सलर, (2) मनमोहन, (3) सुभा (4) सुदीप
64. इस एड. बालो में ते वेलु वचन को संगती उत्तर पत पर निम्नः
(1) गोविंद, (2) गावर, (3) फक्कू (4) सूजी, (5) डिब्बा निम्न 64
65. संगति का सम्बन्ध हैः (1) फलक, (2) फला, (3) वन, (4) फला
66. निम्न दिए संत्वर वचन को अनुसार वांचनी की एक संगति उत्तर पत
पर निम्नः 9, 12, 14, 17, 19, 22 ...
67. इस एड. बालो में ते वेलु वचन का अनुसार पत पर निम्नः
(1) पुकार, (2) मन, (3) वचन, (4) वचन, (5) हारा
68. शायद ते सुरारी वचन हैः ति मुंगरी विनायक साहि है। राय निम्नः ते सुरारी वचन हैः
(1) वारामिता, (2) मुंगरी, (3) बिनायक, (4) मिलिनी 68
69. सूत्रः वचनः वचनः (1) वरूर, (2) वचन, (3) मिलिनी, (4) मिलिनी
70. निम्न दिए संत्वर वचन के अनुसार वांचनी की एक संगति उत्तर-वचन
पर निम्नः 8, 9, 12, 13, 16, 17 ...
71. वेसा निम्नः अविभाज्यः (1) पुकार, (2) मन, (3) कर्मचारी, (4) धर्म
72. विशेषकरः में राम मे गांवः गांवः हैः किन्तु उहाँ वारा होलाहर पत हैः वहाँ वारे
सुन्दर को हैः (1) साज़, (2) वारा, (3) मन 72
73. इस एड. बालो में ते वेलु वचन का अनुसार पत पर निम्नः
(1) गोविंद, (2) गावर, (3) वन, (4) वचन, (5) साज़
74. विशेषः वचनः मिलिनीः (1) वचन, (2) मनम, (3) हारा, (4) राम
75. निम्न दिए संत्वर वचन के अनुसार वांचनी की संगति उत्तर पत
पर निम्नः 29, 28, 26, 23, 19, 14 ...
76. वे निर्देश मे वचन मे सुन्दर पत हैः किन्तु मुंगरी के वचन निम्नः निदिश्यते पत हैः और सुन्दर के राा मन
(1) मुंगरी, (2) मुंगरी, (3) मनम 76
77. निम्न दिए संत्वर वचन के अनुसार वांचनी की एक संगति उत्तर पत
पर निम्नः 7, 8, 10, 13, 17, 19 ...
78. सूत्रः का ग्रहणः (1) कर्म, (2) वन, (3) धर्म, (4) सहस्त्र
79. विभाजनी झोपदीमे गांव संत्वर बहुत का अविभाज्य हैः दो (1) में वचन के नाम वारा बहुत
होता हैः (2) बिनायक वचन का वचन वांचनी पत हैः (3) भाँजी देश कर शंक बिनायक
पत देते हैः 79
80. चुराविंदकः निम्नः संपादितः (1) वनम, (2) मन, (3) पुकार, (4) साज़ 80

[खण्ड 81 के लिए एड. उत्तरपत, वेलु वचन 5 (पंक्तिया)]

[विभाषा वे पार्थ कर]
1. प्रभाव का उत्पन्न है, (1) सत्ता, (2) लेना, (3) हट जाने, (4) अनुभव (1)
2. इतिहास का भर्ती है, (1) मस्तक, (2) सम, (3) पता चलाने के लिए, (4) सामग्री (2)
3. पुस्तक वाला विद्वान पत्रकार में नया रूपांतर है, के कारण (1) पुस्तक विकल्पों के 24 पढ़े का नेतृत्व रखता है। (2) मुख़्य नाम और (3) तालिका को प्रस्ताव देने का अभ्यास हो सकता है। (3) पुस्तक वालों को नित रूप से पता करने की आवश्यकता होती है। (3)
4. तीतर का कारण है, (1) शोध, (2) माहिका, (3) तलाक, (4) परिप्रेक्ष्य (4)
5. पत्र का सम्बन्ध है, (1) भीमी, (2) परिचारक, (3) महान, (4) समर्थ (5)
6. इस प्रकार शब्द में दो-नैन शब्द का जो उत्तर पता लगाए जाते हैं: (1) रोम, (2) दया, (3) मान, (4) रोम, (5) साक्षर (6)
7. तीतर का उत्तर है, (1) शब्द, (2) पुस्तक, (3) मान, (4) तलाक (7)
8. तीतर का वर्ण है, (1) आशा, (2) दया, (3) रोम, (4) विवेक (8)
9. तीतर के आँखों में तीतर बताया गया है, तब इनमें जो फल होगा है? (1) प्रकरण (2) वर्ण (3) सौंत (9)
10. सौंत का उत्तर है, (1) आशा, (2) दया, (3) सपना, (4) तलाक (10)
11. इस प्रकार शब्द में से बहने वाला का जो उत्तर पता लगाए जाते हैं: — (1) मोहर, (2) साक्षर, (3) मान, (4) तलाक, (5) रोमाक (11)
12. तीतर का उत्तर है, (1) भीमी, (2) चम्की, (3) अभ्यास, (4) दया (12)
13. ऐतिहासिक से वर्णन मात्र है, (1) कृष्णप्प, (2) शब्द, (3) अभ्यास, (4) तलाक (13)
14. वर्णन का वर्ण है, (1) भीमी, (2) चम्की, (3) प्रवाह, (4) सत्ता (14)
15. इस प्रकार शब्द में से बहने वाला का जो उत्तर-न्यून पता लगाया जाता है, (1) प्रवाह, (2) चम्की, (3) अभ्यास, (4) दया, (5) भीमी (15)
16. अभ्यास के आँखों में अभ्यास की रोशनी है, (1) अभ्यास, (2) दया, (3) प्रवाह, (4) तलाक, (5) रोमाक (16)
17. इस प्रकार शब्द में से बहने वाला का जो उत्तर-न्यून पता लगाया जाता है, (1) प्रवाह, (2) चम्की, (3) अभ्यास (17)
18. "स्नेह में राम राम में चूमो" का अर्थ है, (1) राम-राम गा गो गो बह गया में छूटी रखता है, (2) राम राम के छींटे में रखा होता है, (3) अन्य कुटूड़ी समय के प्रावधान करता है। (18)
19. पशुएं एवं सौंत-न्यून के कारण गांव की एक संस्थान उत्तर-न्यून - पता लगाया गया : (1) घर, (2) आशा, (3) प्रवाह, (4) तलाक, (5) अभ्यास (19)
20. इस प्रकार शब्द में से बहने वाला का जो उत्तर-न्यून पता लगाया जाता है, (1) घर, (2) आशा, (3) प्रवाह, (4) तलाक, (5) अभ्यास (20)
जब तक कहा न जाए
कृपया यह
पन्ना मत उलटिये
21. इस घटना के इसलिए अंतर्भुक्त हैं। (1) यह अनुसरण व्यक्ति है। (2) यह योग्य पद का धारण से बचना है। (3) यह सब देशों में पाए जाता है।
22. अन्य देशों के अनुसार भारत के अनुसार आमतौर पर निर्माण की है।

23. इस देश का इसिद कौशल उच्च है, इसलिए अंतर्भुक्त है। (1) यह व्यक्ति अग्रणी को आग्रह करने के अनुसार जल्दी करता है।
24. अन्य देशों के अनुसार भारत का इस देश के अनुसार निर्माण की है। इसे निर्माण की है।

25. इस देश के लिए नोटिस प्रदान करते हैं, इसलिए कि (1) इससे शोध में भाग लिया है।
26. यह भवन पहले के से-पैदा बनाए जाने के लिए साइट पर निर्माण की है।

27. इसका नाम सर्वाधिक रहता है, इसलिए कि (1) व्यक्ति अग्रणी का बना प्रोफा पैड़ा है।
28. यह अन्य देशों के अनुसार भारत की एक शासक बनाने के लिए साइट पर निर्माण की है।

29. इस देश में बनें इस का बनना होता है, इसलिए कि (1) इस देश के अनुसार अनुसार निर्माण की है। (2) इस देश के व्यक्ति का लाभ होता है। (3) इसके अंतर्भुक्त देश में बनने वाली पश्चिम का मुक्त कर हो जाता है।

30. इस के अंतर्भुक्त हैं (1) भोज, (2) गहरा, (3) गहरा, (4) अभ्यास।

31. अन्य देशों के अनुसार भारत की सर्वाधिक बनाए जाने के लिए साइट पर निर्माण की है।

32. इस पैकेज सूची में से बेलेन पैनेल का बनने उद्देश्य पर निर्माण की है।

33. अन्य देशों के अनुसार भारत के अनुसार बनाया जाने के लिए साइट पर निर्माण की है।

34. इस पैकेज सूची में से बेलेन पैनेल का बनने उद्देश्य पर निर्माण की है।

35. इस पैकेज सूची में से बेलेन पैनेल का बनने उद्देश्य पर निर्माण की है।

36. अन्य देशों के अनुसार भारत की सर्वाधिक बनाए जाने के लिए साइट पर निर्माण की है।

37. इस पैकेज सूची में से बेलेन पैनेल का बनने उद्देश्य पर निर्माण की है।

38. इस पैकेज सूची में से बेलेन पैनेल का बनने उद्देश्य पर निर्माण की है।

39. अन्य देशों के अनुसार भारत के अनुसार बनाया जाने के लिए साइट पर निर्माण की है।

40. इस पैकेज सूची में से बेलेन पैनेल का बनने उद्देश्य पर निर्माण की है।
53. नोटिक: नम्न नक्शे के भूमिकाओं द्वारा की एक रेखा-ट्रांज़ॅसन प्रभावित उत्तर की संख्या गित्तें।

नम्न संख्या:

41. नोटिक: दिए हुए संख्या के क्रमांक के साथ-साथ उत्तर की संख्या दिशे।

42.
43. नोटिक: हेन्ड ब्राइट ग्राफिक लाइन के अनुसार दिशे।

44. नोटिक: दिए हुए संख्या के क्रमांक के साथ-साथ उत्तर की संख्या दिशे।

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(सीमाओं के बारे में)

(चौथा 3 चरण)
A boy is sitting on a cot. He has a book in his hand. An almirah full of books is lying nearby.

i) He is preparing questions suggested by his teacher for the forthcoming examination.
ii) He is trying to find out the meaning of that word which no one in the class could explain.
iii) He is looking at the coloured picture given in a book.
iv) He is quickly doing the home task given by the teacher.
v) He is thinking about a new application of the principles given in a book.
vi) He is reading a story.

A boy is reading a picture.

i) He is thinking whether to complete the picture or to leave it unfinished.
ii) He is practising to make pictures.
iii) He is making a picture to participate in the annual art competition to be held in the school.
iv) He is thinking whether he should colour the picture.
v) He is learning the art of making pictures.
i) He is thinking that when he will have learned drawing well, then he would make beautiful pictures.

A boy is holding a model of an aeroplane and is looking at it.

i) He is thinking of becoming an engineer.
ii) He is guessing the price of the aeroplane.
iii) He is observing as to how the aeroplane has been made.
iv) He is carefully checking the aeroplane before demonstrating his flying skill.
v) He is waiting for his friend so that he can get the aeroplane started by him.
vi) He is thinking whether to complete the picture or to leave it unfinished.

Two boys are standing, facing the mountains.

i) They are enjoying the beauty of nature.
ii) They are planning to climb up to the highest peak of the mountain.
iii) They are studying the herbs available on the mountain.
iv) They have become tired after a lot of walking and are just relaxing.
v) They are thinking about the new techniques of mountaineering.
vi) They are thinking of writing a report after having inspected the mountainous region.

A farmer's son is ploughing the field.

i) He is contributing his share to make up the deficit of food in the country.
ii) He is thinking of sowing after he has ploughed the land.
iii) He is trying to get the maximum possible yield from his field.
iv) He is ploughing the land to get sufficient food for himself and his family.
v) He is ploughing the field to sow seeds.
v) He is using chemical fertilizers to make the land more productive.

A boy is doing something in the laboratory.

i) He is thinking that he should discover something new.
ii) He is practising an experiment for the examination.
iii) He is cleaning the instruments kept in the laboratory.
iv) He is busy in discovering new things.
v) He is doing an experiment in science.
v) He is looking at instruments placed in the laboratory.
7. A man and a boy are sitting with a tabla.
   i) The boy is learning to play on the tabla.
   ii) The boy is learning the tricks of the trade from his teacher in order to become a good artist or a good musician.
   iii) They are wondering as to why other persons have not turned up so far.
   iv) The boy is preparing for the examination in music.
   v) The boy is absorbed in learning new music compositions from that man.
   vi) They are playing on the tabla to entertain themselves.

8. Two boys are playing hockey.
   i) They are playing hockey to pass the evening.
   ii) They are learning hockey from the instructor.
   iii) They are practising hockey to regain the trophy lost by them in the last competition.
   iv) They are playing for their amusement.
   v) They are playing hockey to check whether the ground is suitable for playing a hockey match.
   vi) They are preparing for the final hockey match.

9. A teacher and some boys are in the class.
   i) They are participating in a discussion competition on 'How to check the growth of indiscipline in schools.'
   ii) They are learning a new lesson from the teacher.
   iii) They are getting a complicated problem solved by the teacher.
   iv) They are taking part in a group discussion to evolve indigenous methods to solve the food problem.
   v) They are talking with the teacher.
   vi) They are learning a new formula in mathematics from their teacher.

10. A teacher is sitting in a chair. A boy is standing by his side.
    i) The boy is informing the teacher about the truants.
    ii) That boy has just now developed a new thing and he is eager to show it to the teacher.
    iii) The boy is standing beside the teacher to recite his lesson.
    iv) The boy is standing there to hand over a letter from his father to the teacher.
    v) He is standing there to show the teacher the essay that he has prepared to submit for the essay competition.
    vi) He is standing there to understand a problem from his teacher.

11. A boy is reading something.
    i) He is looking for the meaning of that word which nobody could tell in the class.
    ii) He is reading a book of stories to pass the time.
    iii) He is reading about new discoveries made in the different fields.
    iv) He is preparing the lesson assigned to him by his teacher.
    v) He is enjoying a book of film songs.
    vi) He is preparing for some competitive examination.

12. The principal is giving something to a boy.
    i) He is presenting a certificate to that boy for keeping up the name of the school in the inter-school competition.
    ii) He is praising that boy for maintaining discipline in the class.
    iii) He is giving some important instructions to that boy.
    iv) He is giving a prize to the boy for his courageous act.
    v) He is giving a booklet of rules and regulations to the boy for forthcoming region competition.
    vi) He is giving the attendance register to the boy for taking attendance of the class in the absence of the class teacher.
13. Some boys are playing cricket.
   i) They are learning to play cricket.
   ii) They are trying to improve their game.
   iii) They are playing to pass their recess.
   iv) They are practising the game.
   v) They are preparing to take part in the annual school competition.
   vi) They are playing an exhibition match to collect funds.

14. A boy is holding some arrows in his hand. There is a target board placed at some distance.
   i) That boy is waiting for the end of the P. T. period, so that he can go home.
   ii) He is learning the art of arrow-shooting.
   iii) He is practising arrow-shooting to become a good arrow-shooter.
   iv) He is trying to finish this game quickly so that he can play some other game.
   v) He is thinking of different techniques of shooting.
   vi) He is practising in order to get the first position in the arrow-shooting competition.

15. A doctor is sitting with a patient.
   i) He is talking to the patient.
   ii) He is carefully examining the patient.
   iii) The doctor has given an injection to the patient and now he is waiting for his fee.
   iv) The doctor is prescribing the diet for him.
   v) The doctor is carefully listening to the patient so that he can diagnose his disease properly.

16. A boy is sitting under a lamp. He has a book in his hand.
   i) He is thinking of doing some great work after completing his studies.
   ii) He is thinking that now he should start preparing for the examination.
   iii) He is trying to write something in the book.
   iv) He is preparing all the possible questions which can be asked in the examination, so that he may score the highest marks in the class.
   v) He is turning the pages of the book and trying to find out that page on which the questions to be asked by the teacher on the following day is given.
   vi) He is checking whether there is any name written on the book that he found on way back from school.

17. A boy is doing something with the help of a hammer and a chisel.
   i) He is making a model.
   ii) He is trying to improve his skill in the craft.
   iii) He is checking whether the hammer and chisel work properly.
   iv) He is repairing the broken model.
   v) He is trying to become a sculptor.
   vi) By doing this he is getting physical exercise.

18. A boy is standing with a pen in his hand. He has a notebook.
   i) He will fill in the ink and write something on the note-book.
   ii) He is thinking of writing an interesting story.
   iii) He is imagining that he will become a writer.
   iv) He is checking whether the pen writes properly.
   v) He is thinking of the outlines for an essay for a competition.
   vi) He is solving assigned questions on the note-book with the help of that pen.
19. Some persons are doing various types of work.
   i) They are discussing as to what they would do so that they can progress.
   ii) They are busy in their respective tasks.
   iii) They are working to earn money.
   iv) They are thinking about various ways to march ahead on the path of progress.
   v) They are doing their work.
   vi) A man has to do something to earn his livelihood. These people are also doing some such work.

20. A boy is flying a kite.
   i) He is amusing himself.
   ii) He is thinking as to how he should fly the kite so that he may win the kite-flying competition.
   iii) He is wondering whether he should participate in the kite-flying competition on the following day.
   iv) He has just bought the kite out of the money that he got from his mother and is now trying to fly it.
   v) He is thinking of becoming a good kite-flier so that he may compete with his companions.
   vi) He is thinking whether he should compete with the other kite-flier.

21. The teacher is teaching in the class.
   i) The teacher is trying to complete the course.
   ii) He is teaching to earn his salary.
   iii) He is making a study of the effective methods of teaching.
   iv) He is answering the questions put to him by the students.
   v) He is punishing those students who have not done their work.
   vi) He is making a difficult lesson easier by giving new examples.

22. Three boys are running a relay race.
   i) They are practising in order to improve their performance.
   ii) They are learning the relay race during the games period.
   iii) They are carrying out instructions.
   iv) They are trying to surpass each other in the race.
   v) They are demonstrating their skill.
   vi) They are observing Sports Day.
## APPENDIX - B

### DISTRIBUTION OF SCORES ON THE FIRST DRAFT OF CRITERION TEST

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<td>24.</td>
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<tr>
<td>27.</td>
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<tr>
<td>30.</td>
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<td>60.</td>
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</tbody>
</table>

Mean = 89.05

S.D. = 18.07

\[ ttt = \frac{122 \times (18.07)^2 - 89.05 \times (122-89.05)}{(122-1) \times (18.07)^2} \]

\[ = 0.934 \]
## DISTRIBUTION OF SCORES ON THE SECOND DRAFT OF CRITERION TEST.

<table>
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<tr>
<th>S.No.</th>
<th>Scores</th>
<th>S.No.</th>
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</thead>
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<td>79</td>
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<td>118</td>
<td>60.</td>
<td>103</td>
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<td>111</td>
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<td>114</td>
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<td>96</td>
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<td>117</td>
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<td>116</td>
</tr>
<tr>
<td>33.</td>
<td>114</td>
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</table>

**Mean = 100.21**  
**S.D. = 17.09**  

\[
\text{r_t} = \frac{119 \times (17.09)^2 - 100.21(119-100.21)}{(119-1) \times (17.09)^2} = .982
\]
## VALIDITY OF THE CRITERION TEST

### Unit-I

<table>
<thead>
<tr>
<th>Objective</th>
<th>Item on the Criterion Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Matches the term 'micro' with its meaning.</td>
<td>55(ii)</td>
</tr>
<tr>
<td>2. Matches the term 'Organism' with its meaning.</td>
<td>58(i)</td>
</tr>
<tr>
<td>3. Defines the term micro-organism.</td>
<td>66</td>
</tr>
<tr>
<td>4. Identifies the term (micro-organism), whose definition has been given,</td>
<td>22</td>
</tr>
<tr>
<td>out of a given list of four.</td>
<td></td>
</tr>
<tr>
<td>5. Writes the names of two types of micro-organisms.</td>
<td>67</td>
</tr>
<tr>
<td>6. Defines Unicellular micro-organisms.</td>
<td>68</td>
</tr>
<tr>
<td>7. Chooses the response that goes with unicellular micro-organisms, out of</td>
<td>23</td>
</tr>
<tr>
<td>the given list.</td>
<td></td>
</tr>
<tr>
<td>8. Ticks the number of cells present in unicellular micro-organism, out of</td>
<td>23</td>
</tr>
<tr>
<td>a given list.</td>
<td></td>
</tr>
<tr>
<td>9. Writes the meaning of 'uni' in the given blank.</td>
<td>1</td>
</tr>
<tr>
<td>10. Matches the meaning with the term 'cellular', out of a given list.</td>
<td>53(i)</td>
</tr>
<tr>
<td>11. Matches the meaning with the term 'unicellular'.</td>
<td>56(ii)</td>
</tr>
<tr>
<td>Objective</td>
<td>Item on the Criterion Test</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>12. Writes two examples of unicellular micro-organisms.</td>
<td>70</td>
</tr>
<tr>
<td>13. Fills the name of the type of micro-organism, of which amoeba is an</td>
<td>2</td>
</tr>
<tr>
<td>example, in the given blank.</td>
<td></td>
</tr>
<tr>
<td>14. Chooses the correct reason as to why amoeba is not visible with</td>
<td>26</td>
</tr>
<tr>
<td>naked eyes.</td>
<td></td>
</tr>
<tr>
<td>15. Selects a reason, as to why is paramecium considered a unicellular</td>
<td>25</td>
</tr>
<tr>
<td>organism, out of a given list.</td>
<td></td>
</tr>
<tr>
<td>16. Defines the term 'multicellular micro-organisms'.</td>
<td>69</td>
</tr>
<tr>
<td>17. Ticks the response, that goes with multicellular organisms, out of a</td>
<td>24</td>
</tr>
<tr>
<td>given list of four.</td>
<td></td>
</tr>
<tr>
<td>18. Writes the meaning of 'multi' in the given blank.</td>
<td>3</td>
</tr>
<tr>
<td>19. Matches the meaning with the term 'multi' out of a given list.</td>
<td>53(iii)</td>
</tr>
<tr>
<td>20. Matches the correct meaning of the term multicellular with it.</td>
<td>58(ii)</td>
</tr>
<tr>
<td>21. Writes the name of a multicellular organism in the given blank.</td>
<td>4</td>
</tr>
</tbody>
</table>

**Unit - II**

<table>
<thead>
<tr>
<th>Objective</th>
<th>Item on the Criterion Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>22. Ticks as true or false a given statement about the shape of amoeba.</td>
<td>48</td>
</tr>
<tr>
<td>23. Identifies the habitat of amoeba out of a given list of four.</td>
<td>27</td>
</tr>
<tr>
<td>24. Ticks the correct reason, responsible for change of shape of amoeba out of a given list.</td>
<td>28</td>
</tr>
<tr>
<td>Objective Item on the Criterion Test</td>
<td>Item on the Criterion Test</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>25. Writes in the given blank, whether pseudopodia can be withdrawn or not.</td>
<td>5</td>
</tr>
<tr>
<td>26. Matches the nature of pseudopodia with it, out of a given list.</td>
<td>59(i)</td>
</tr>
<tr>
<td>27. Matches the correct meaning of 'Pseudopodia' with it, out of a given list.</td>
<td>55(i)</td>
</tr>
<tr>
<td>28. Matches the correct meaning with the term 'podia', out of a given list.</td>
<td>55(iii)</td>
</tr>
<tr>
<td>29. Ticks the correct meaning of pseudopodia out of a given list.</td>
<td>29</td>
</tr>
<tr>
<td>30. Identifies the name of body covering of amoeba, out of a given list.</td>
<td>30</td>
</tr>
<tr>
<td>31. Identifies the nature of cell-membrane and fills it in the given blank.</td>
<td>6</td>
</tr>
<tr>
<td>32. Ticks the substance that is not allowed to pass through the cell-membrane, out of a given list.</td>
<td>31</td>
</tr>
<tr>
<td>33. Chooses the term used for living matter of cell, out of a given list of four.</td>
<td>32</td>
</tr>
<tr>
<td>34. Matches the meaning with the term 'Semi-permeable' out of a given list.</td>
<td>58(iii)</td>
</tr>
<tr>
<td>35. Matches the appropriate response, out of a given list, which goes with protoplasm.</td>
<td>63(iii)</td>
</tr>
<tr>
<td>36. Writes the names of two parts of protoplasm in the given blanks</td>
<td>7(i) &amp; (ii)</td>
</tr>
<tr>
<td>37. Illustrates positions of ectoplasm and endoplasm.</td>
<td>43(i) &amp; (ii)</td>
</tr>
<tr>
<td>38. Matches the positions of ectoplasm and endoplasm with them, out of a given list.</td>
<td>60(i) &amp; (ii)</td>
</tr>
<tr>
<td>39. Writes the name of the part of protoplasm, which fits the given description, in the given blank.</td>
<td>8</td>
</tr>
<tr>
<td>Objective Item on the Criterion Test</td>
<td></td>
</tr>
<tr>
<td>-------------------------------------</td>
<td></td>
</tr>
<tr>
<td>40. Writes the name of the part of protoplasm, which conforms to the given description, in the given blank.</td>
<td></td>
</tr>
<tr>
<td>41. Matches the appropriate response with Endoplasm, out of a given list.</td>
<td></td>
</tr>
<tr>
<td>42. Writes a few lines about 'Cyclosis'.</td>
<td></td>
</tr>
<tr>
<td>43. Ticks as true or false, the given statement about interchangeability of two parts of protoplasm.</td>
<td></td>
</tr>
<tr>
<td>44. Matches the correct response with the term 'Cyclosis' out of a given list.</td>
<td></td>
</tr>
<tr>
<td>45. Writes the name of disc-shaped body found in endoplasm, in the given blank.</td>
<td></td>
</tr>
<tr>
<td>46. Matches the position of nucleus with it, out of a given list.</td>
<td></td>
</tr>
<tr>
<td>47. Matches the shape with the nucleus, out of a given list.</td>
<td></td>
</tr>
<tr>
<td>48. Illustrates the position of nucleus.</td>
<td></td>
</tr>
<tr>
<td>49. Matches, with the nucleus, its functions, out of a given list of four.</td>
<td></td>
</tr>
<tr>
<td>50. Matches the correct position of contractile vacuole, with it, out of a given list.</td>
<td></td>
</tr>
<tr>
<td>51. Illustrates the position of contractile vacuole.</td>
<td></td>
</tr>
<tr>
<td>52. Ticks as true or false, a given statement about the shape of contractile vacuole.</td>
<td></td>
</tr>
<tr>
<td>53. Identifies the organelle (C.V.), out of a given list, which is appropriate to the given description.</td>
<td></td>
</tr>
<tr>
<td>54. Matches the correct response with the term contractile vacuole.</td>
<td></td>
</tr>
<tr>
<td>Objective</td>
<td>Item on the Criterion Test</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>55. Chooses the correct function of contractile vacuoles, out of a given list.</td>
<td>34</td>
</tr>
<tr>
<td>56. Illustrates the position of food vacuoles.</td>
<td>43(v)</td>
</tr>
<tr>
<td>57. Matches the correct position, with the vacuole, out of a given list.</td>
<td>62(iii)</td>
</tr>
<tr>
<td>58. Matches the appropriate response, which goes with food vacuoles, out of a given list.</td>
<td>59(iii)</td>
</tr>
<tr>
<td>59. Matches the correct function, which goes with food vacuoles, out of a given list.</td>
<td>64(i)</td>
</tr>
<tr>
<td>60. Writes the name of vacuoles, in which food is digested, in the given blank.</td>
<td>11</td>
</tr>
</tbody>
</table>

**Unit-III**

<table>
<thead>
<tr>
<th>Objective</th>
<th>Item on the Criterion Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>61. Identifies the name of the organelle, that helps amoeba to move, out of a given list.</td>
<td>35</td>
</tr>
<tr>
<td>62. Writes briefly how does amoeba change its path.</td>
<td>72</td>
</tr>
<tr>
<td>63. Ticks as true or false the name of the organelle that brings about change in direction.</td>
<td>51</td>
</tr>
<tr>
<td>64. Illustrates formation of pseudopodia.</td>
<td>44</td>
</tr>
<tr>
<td>65. Writes the names of substances, which amoeba eats, in the given blanks.</td>
<td>12</td>
</tr>
<tr>
<td>66. Matches the correct meaning with the term 'ingestion'.</td>
<td>54(iii)</td>
</tr>
</tbody>
</table>
Objectives

67. Ticks the correct place at which ingestion takes place, out of a given list.
68. Identifies the organelle that helps in ingestion, out of a given list.
69. Draws diagrams to show the process of ingestion.
70. Writes the names of gases that enter and leave the body during respiration, in the given blank.
71. Mentions the name of the body part through which gaseous exchange takes place, in the given blank.
72. Writes the name of the method that facilitates gaseous exchange, in the given blank.
73. Matches the correct meaning with the term 'diffusion', out of a given list.
74. Defines Osmoregulation.
75. Matches the correct meaning with the term 'Osmoregulation', out of a given list.
76. Writes the name of organelle that brings about osmoregulation, in the given blank.
77. Explains briefly the process of Osmoregulation.
78. Writes a few lines about the necessity of Osmoregulation.
79. Identifies the correct meaning of stimulus, out of a given list.
80. Matches the meaning with the term stimulus, out of a given list.
<table>
<thead>
<tr>
<th>Objective Item on the Criterion Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>81. Writes the term (response), description of which is given, in the given blank.</td>
</tr>
<tr>
<td>82. Lists the two types of responses shown by Amoeba.</td>
</tr>
<tr>
<td>83. Specifies the manner by which amoeba shows a negative response.</td>
</tr>
<tr>
<td>84. Identifies the manner by which amoeba shows a positive response.</td>
</tr>
<tr>
<td>85. Recognizes the conditions, under which amoeba shows a negative response.</td>
</tr>
<tr>
<td>86. Matches the appropriate conditions to the response, out of a given list.</td>
</tr>
<tr>
<td>87. Specifies the manner by which amoeba shows a positive response, in the given blank.</td>
</tr>
<tr>
<td>88. Matches the conditions with the positive response, out of a given list.</td>
</tr>
<tr>
<td>89. Identifies the need for reproduction in amoeba, out of a given list of four.</td>
</tr>
<tr>
<td>90. Lists two methods by which amoeba reproduces.</td>
</tr>
<tr>
<td>91. Matches the meaning of Binary, with the term, out of a given list.</td>
</tr>
<tr>
<td>92. Matches the meaning with the term 'fission', out of a given list.</td>
</tr>
<tr>
<td>93. Matches the correct meaning with the term 'Binary fission', out of a given list.</td>
</tr>
<tr>
<td>94. Explains the process of Binary fission</td>
</tr>
<tr>
<td>Objective</td>
</tr>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>95. Chooses the correct number of amoeba formed after Binary fission, out of a given list.</td>
</tr>
<tr>
<td>96. Illustrates Binary fission in amoeba.</td>
</tr>
<tr>
<td>97. Ticks as true or false, the statement about the relative time of nuclear and cytoplasmic division.</td>
</tr>
<tr>
<td>98. Matches the correct meaning of multiple fission, with the term out of a given list.</td>
</tr>
<tr>
<td>99. Mentions, the type of fission during which the cyst is formed, in the given blank.</td>
</tr>
<tr>
<td>100. Matches the meaning of cyst with it, out of a given list.</td>
</tr>
<tr>
<td>101. Writes the name of the structures set free from the cyst, in the given blank.</td>
</tr>
<tr>
<td>102. Explains the process of multiple fission.</td>
</tr>
<tr>
<td>103. Matches the appropriate conditions, with the multiple fission, out of a given list.</td>
</tr>
<tr>
<td>104. Illustrates multiple fission.</td>
</tr>
<tr>
<td>105. Matches the meaning with the term immortality, out of a given list.</td>
</tr>
<tr>
<td>106. Explains why is amoeba said to be immortal.</td>
</tr>
</tbody>
</table>
### Means, S.Ds. & S.E., of Different Combinations of AxixS Interaction.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Group</th>
<th>Mean</th>
<th>S.D.</th>
<th>S.E.</th>
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<tbody>
<tr>
<td>1</td>
<td>$A_{1}I_{1}S_{1}$</td>
<td>103.5</td>
<td>7.21</td>
<td>1.44</td>
</tr>
<tr>
<td>2</td>
<td>$A_{1}I_{1}S_{2}$</td>
<td>101.87</td>
<td>7.52</td>
<td>1.50</td>
</tr>
<tr>
<td>3</td>
<td>$A_{1}I_{2}S_{1}$</td>
<td>67.62</td>
<td>10.02</td>
<td>2.00</td>
</tr>
<tr>
<td>4</td>
<td>$A_{1}I_{2}S_{2}$</td>
<td>61.08</td>
<td>5.11</td>
<td>1.02</td>
</tr>
<tr>
<td>5</td>
<td>$A_{2}I_{1}S_{1}$</td>
<td>95.58</td>
<td>6.28</td>
<td>1.25</td>
</tr>
<tr>
<td>6</td>
<td>$A_{2}I_{1}S_{2}$</td>
<td>50.37</td>
<td>7.43</td>
<td>1.48</td>
</tr>
<tr>
<td>7</td>
<td>$A_{2}I_{2}S_{1}$</td>
<td>50.04</td>
<td>7.19</td>
<td>1.44</td>
</tr>
<tr>
<td>8</td>
<td>$A_{2}I_{2}S_{2}$</td>
<td>50.54</td>
<td>8.38</td>
<td>1.67</td>
</tr>
</tbody>
</table>