

# Biological Classification

## 2.0 Introduction

- Five kingdom system of classification suggested by R.H. Whittaker is not based on
  - presence or absence of a well defined nucleus
  - mode of reproduction
  - mode of nutrition
  - complexity of body organisation. (2014)
- Maximum nutritional diversity is found in the group
  - fungi
  - animalia
  - monera
  - plantae. (2012)
- In the five kingdom classification, *Chlamydomonas* and *Chlorella* have been included in
  - protista
  - algae
  - plantae
  - monera. (Mains 2012)
- In which kingdom would you classify the archaea and nitrogen-fixing organisms, if the five kingdom system of classification is used?
  - Plantae
  - Fungi
  - Protista
  - Monera (2003)
- In five kingdom system, the main basis of classification is
  - structure of nucleus
  - mode of nutrition
  - structure of cell wall
  - asexual reproduction. (2002)
- In the five kingdom system of classification, which single kingdom out of the following can include blue-green algae, nitrogen fixing bacteria and methanogenic archaeobacteria?
  - Plantae
  - Protista
  - Monera
  - Fungi (1998)
- BGA (blue green algae) are included in which of the following groups?
  - Bryophytes
  - Prokaryotes
  - Protista
  - Fungi (1996)
- An important criterion for modern day classification is
  - resemblances in morphology
  - anatomical and physiological traits
  - breeding habits
  - presence or absence of notochord. (1991)

## 2.1 Kingdom Monera

- Match the organisms in column-I with habitats in column-II.

Column-I	Column-II
A. Halophiles	(i) Hot springs
B. Thermoacidophiles	(ii) Aquatic environment
C. Methanogens	(iii) Guts of ruminants
D. Cyanobacteria	(iv) Salty area

Select the correct answer from the options given below.

- A-(iv), B-(i), C-(iii), D-(ii)
  - A-(i), B-(ii), C-(iii), D-(iv)
  - A-(iii), B-(iv), C-(ii), D-(i)
  - A-(ii), B-(iv), C-(iii), D-(i) (Odisha NEET 2019)
- Which of the following are found in extreme saline conditions?
    - Eubacteria
    - Cyanobacteria
    - Mycobacteria
    - Archaeobacteria (NEET 2017)
  - Which among the following are the smallest living cells, known without a definite cell wall, pathogenic to plants as well as animals and can survive without oxygen?
    - Pseudomonas*
    - Mycoplasma
    - Nostoc*
    - Bacillus* (NEET 2017)
  - Which of the following components provides sticky character to the bacterial cell?
    - Nuclear membrane
    - Plasma membrane
    - Glycocalyx
    - Cell wall (NEET 2017)
  - DNA replication in bacteria occurs
    - within nucleolus
    - prior to fission
    - just before transcription
    - during S phase. (NEET 2017)
  - Methanogens belong to
    - eubacteria
    - archaeobacteria
    - dinoflagellates
    - slime moulds. (NEET-II 2016)

15. The primitive prokaryotes responsible for the production of biogas from the dung of ruminant animals, include the  
 (a) methanogens (b) eubacteria  
 (c) halophiles (d) thermoacidophiles.  
 (NEET-I 2016)
16. Archaeobacteria differ from eubacteria in  
 (a) cell membrane structure  
 (b) mode of nutrition  
 (c) cell shape  
 (d) mode of reproduction. (2014)
17. Which of the following are likely to be present in deep sea water?  
 (a) Blue-green algae (b) Saprophytic fungi  
 (c) Archaeobacteria (d) Eubacteria  
 (NEET 2013)
18. Pigment containing membranous extensions in some cyanobacteria are  
 (a) pneumatophores (b) chromatophores  
 (c) heterocysts (d) basal bodies.  
 (NEET 2013)
19. The cyanobacteria are also referred to as  
 (a) protists (b) golden algae  
 (c) slime moulds (d) blue green algae.  
 (2012)
20. The most abundant prokaryotes helpful to humans in making curd from milk and in production of antibiotics are the ones categorised as  
 (a) cyanobacteria  
 (b) archaeobacteria  
 (c) chemosynthetic autotrophs  
 (d) heterotrophic bacteria. (2012)
21. In eubacteria, a cellular component that resembles eukaryotic cell is  
 (a) plasma membrane (b) nucleus  
 (c) ribosomes (d) cell wall. (2011)
22. Some hyperthermophilic organisms that grow in highly acidic (pH 2) habitats belong to the two groups  
 (a) eubacteria and archaea  
 (b) cyanobacteria and diatoms  
 (c) protists and mosses  
 (d) liverworts and yeasts. (2010)
23. Select the correct combination of the statements (i-iv) regarding the characteristics of certain organisms.  
 (i) Methanogens are archaeobacteria which produce methane in marshy areas.  
 (ii) *Nostoc* is a filamentous blue-green alga which fixes atmospheric nitrogen.  
 (iii) Chemosynthetic autotrophic bacteria synthesize cellulose from glucose.  
 (iv) *Mycoplasma* lack a cell wall and can survive without oxygen.
- The correct statements are  
 (a) (i) and (iii) (b) (i),(ii) and (iii)  
 (c) (ii), (iii) and (iv) (d) (i), (ii) and (iv).  
 (Mains 2010)
24. Bacterial leaf blight of rice is caused by a species  
 (a) *Alternaria* (b) *Erwinia*  
 (c) *Xanthomonas* (d) *Pseudomonas*. (2008)
25. *Thermococcus*, *Methanococcus* and *Methanobacterium* exemplify  
 (a) bacteria whose DNA is relaxed or positively supercoiled but which have a cytoskeleton as well as mitochondria  
 (b) bacteria that contain a cytoskeleton and ribosomes  
 (c) archaeobacteria that contain protein homologous to eukaryotic core histones  
 (d) archaeobacteria that lack any histones resembling those found in eukaryotes but whose DNA is negatively supercoiled. (2008)
26. In the light of recent classification of living organisms into three domains of life (bacteria, archaea and eukarya), which one of the following statements is true about archaea?  
 (a) Archaea completely differ from both prokaryotes and eukaryotes.  
 (b) Archaea completely differ from prokaryotes.  
 (c) Archaea resemble eukarya in all respects.  
 (d) Archaea have some novel features that are absent in other prokaryotes and eukaryotes. (2008)
27. Which one of the following statements about mycoplasma is wrong?  
 (a) They are pleomorphic.  
 (b) They are sensitive to penicillin.  
 (c) They cause diseases in plants.  
 (d) They are also called PPLO. (2007)
28. Curing of tea leaves is brought about by the activity of  
 (a) fungi (b) bacteria  
 (c) mycorrhiza (d) viruses. (2006)
29. All of the following statements concerning the actinomycetous filamentous soil bacterium *Frankia* are correct except that *Frankia*  
 (a) can induce root nodules on many plant species  
 (b) can fix nitrogen in the free-living state  
 (c) cannot fix specialized vesicles in which the nitrogenase is protected from oxygen by a chemical barrier involving triterpene hopanoids  
 (d) like *Rhizobium*, it usually infects its host plant through root hair deformation and stimulates cell proliferation in the host's cortex. (2005)
30. For retting of jute the fermenting microbe used is  
 (a) methanophilic bacteria  
 (b) butyric acid bacteria  
 (c) *Helicobacter pylori*  
 (d) *Streptococcus lactin*. (2005)

31. Basophilic prokaryotes  
 (a) grow and multiply in very deep marine sediments  
 (b) occur in water containing high concentrations of barium hydroxide  
 (c) readily grow and divide in sea water enriched in any soluble salt of barium  
 (d) grow slowly in highly alkaline frozen lakes at high altitudes. (2005)
32. Which statement is correct for bacterial transduction?  
 (a) Transfer of some genes from one bacteria to another bacteria through virus.  
 (b) Transfer of genes from one bacteria to another bacteria by conjugation.  
 (c) Bacteria obtained its DNA directly from mother cell.  
 (d) Bacteria obtained DNA from other external source. (2002)
33. In bacteria, plasmid is  
 (a) extra chromosomal material  
 (b) main DNA  
 (c) non functional DNA  
 (d) repetitive gene. (2002)
34. Organisms which obtain energy by the oxidation of reduced inorganic compounds are called  
 (a) photoautotrophs (b) chemoautotrophs  
 (c) saprozoic (d) coproheterotrophs. (2002)
35. What is true for archaeobacteria?  
 (a) All halophiles (b) All photosynthetics  
 (c) All fossils (d) Oldest living beings (2001)
36. Difference in Gram positive and Gram negative bacteria is due to  
 (a) cell wall (b) cell membrane  
 (c) ribosome (d) cytoplasm. (2001)
37. Transfer of genetic information from one bacterium to another in the transduction process is through  
 (a) bacteriophages released from the donor bacterial strain  
 (b) another bacterium having special organ for conjugation  
 (c) physical contact between donor and recipient strains  
 (d) conjugation between opposite strain bacterium. (1998)
38. A bacterium divides every 35 minutes. If a culture containing  $10^5$  cells per mL is grown for 175 minutes, what will be the cell concentration per mL after 175 minutes?  
 (a)  $35 \times 10^5$  cells (b)  $32 \times 10^5$  cells  
 (c)  $175 \times 10^5$  cells (d)  $85 \times 10^5$  cells (1998)
39. The DNA of *E.coli* is  
 (a) double stranded and linear  
 (b) double stranded and circular  
 (c) single stranded and linear  
 (d) single stranded and circular. (1998)
40. The main role of bacteria in the carbon cycle involves  
 (a) chemosynthesis  
 (b) digestion or breakdown of organic compounds  
 (c) photosynthesis  
 (d) assimilation of nitrogenous compounds. (1998)
41. A few organisms are known to grow and multiply at temperatures of 100-105°C. They belong to  
 (a) thermophilic sulphur bacteria  
 (b) hot spring blue-green algae  
 (c) methanogenic archaeobacteria  
 (d) marine archaeobacteria. (1998)
42. The hereditary material present in the bacterium *E.coli* is  
 (a) single-stranded DNA  
 (b) double-stranded DNA  
 (c) DNA (d) RNA. (1997)
43. *Azotobacter* and *Bacillus polymyxa* are the examples of  
 (a) pathogenic bacteria (b) decomposers  
 (c) symbiotic  $N_2$  fixer  
 (d) non-symbiotic  $N_2$  fixer. (1996)
44. What are the sex organs provided in some bacteria?  
 (a) Sex pili (b) Plasmid  
 (c) Circular DNA (d) Gametes (1996)
45. Which type of DNA is found in bacteria?  
 (a) Circular free DNA  
 (b) Membrane bound DNA  
 (c) Straight DNA (d) Helical DNA (1996)
46. A large number of organic compounds can be decomposed by  
 (a) *Azotobacter* (b) Chemolithotrophs  
 (c) *Mycoplasma* (d) *Pseudomonas*. (1995)
47. Many blue-green algae occur in thermal springs (hot-water springs). The temperature tolerance of these algae have been attributed to their  
 (a) mitochondrial structure  
 (b) importance of homopolar bonds in their proteins  
 (c) cell wall structure  
 (d) modern cell organization. (1994)
48. Organisms, which fix atmospheric nitrogen in the soil, fall under the category of  
 (a) bacteria (b) green algae  
 (c) soil fungi (d) mosses. (1994)
49. Transduction in bacteria is mediated by  
 (a) plasmid vectors (b) phage vectors  
 (c) cosmids (d) F-factors. (1994)
50. Genophore/bacterial genome or nucleoid is made of  
 (a) histones and non-histones

- (b) RNA and histones  
(c) a single double stranded DNA  
(d) a single stranded DNA. (1993)
51. *Escherichia coli* is used extensively in biological research as it is  
(a) easily cultured  
(b) easily available  
(c) easy to handle  
(d) easily multiplied in host. (1993)
52. Bacteria lack alternation of generation because there is  
(a) neither syngamy nor reduction division  
(b) distinct chromosomes are absent  
(c) no conjugation  
(d) no exchange of genetic material. (1992, 1991)
53. Name the organisms which do not derive energy directly or indirectly from sun.  
(a) Chemosynthetic bacteria  
(b) Pathogenic bacteria  
(c) Symbiotic bacteria  
(d) Mould (1991)
54. The main difference in Gram (+)ve and Gram (-)ve bacteria resides in their  
(a) cell wall (b) cell membrane  
(c) cytoplasm (d) flagella. (1990)
55. Which one belongs to Monera?  
(a) *Amoeba* (b) *Escherichia*  
(c) *Gelidium* (d) *Spirogyra* (1990)
- ## 2.2 Kingdom Protista
56. Which of the following organisms are known as chief producers in the oceans?  
(a) Dinoflagellates (b) Diatoms  
(c) Cyanobacteria (d) Euglenoids (NEET 2018)
57. Ciliates differ from all other protozoans in  
(a) using flagella for locomotion  
(b) having a contractile vacuole for removing excess water  
(c) using pseudopodia for capturing prey  
(d) having two types of nuclei. (NEET 2018)
58. Select the wrong statement.  
(a) The walls of diatoms are easily destructible.  
(b) 'Diatomaceous earth' is formed by the cell walls of diatoms.  
(c) Diatoms are chief producers in the oceans.  
(d) Diatoms are microscopic and float passively in water. (NEET-II 2016)
59. Chrysophytes, Euglenoids, Dinoflagellates and Slime moulds are included in the Kingdom  
(a) Fungi (b) Animalia  
(c) Monera (d) Protista. (NEET-I 2016)
60. In which group of organisms the cell walls form two thin overlapping shells which fit together?  
(a) Dinoflagellates (b) Slime moulds  
(c) Chrysophytes (d) Euglenoids (2015)
61. Which one of the following organisms is not an eukaryote?  
(a) *Paramecium caudatum*  
(b) *Escherichia coli* (c) *Euglena viridis*  
(d) *Amoeba proteus* (2011)
62. Which one of the following is a slime mould?  
(a) *Physarum* (b) *Thiobacillus*  
(c) *Anabaena* (d) *Rhizopus* (2007)
63. Auxospores and hormogonia are formed, respectively, by  
(a) some diatoms and several cyanobacteria  
(b) some cyanobacteria and many diatoms  
(c) several cyanobacteria and several diatoms  
(d) several diatoms and a few cyanobacteria. (2005)
64. When a fresh-water protozoan possessing a contractile vacuole, is placed in a glass containing marine water, the vacuole will  
(a) increase in number (b) disappear  
(c) increase in size (d) decrease in size. (2004)
65. The chief advantage of encystment of an *Amoeba* is  
(a) the ability to survive during adverse physical conditions  
(b) the ability to live for sometime without ingesting food  
(c) protection from parasites and predators  
(d) the chance to get rid of accumulated waste products. (2003)
66. In which of the following animals dimorphic nucleus is found?  
(a) *Amoeba proteus*  
(b) *Trypanosoma gambiense*  
(c) *Plasmodium vivax*  
(d) *Paramecium caudatum* (2002)
67. In protozoa like *Amoeba* and *Paramecium*, the organ for osmoregulation is  
(a) contractile vacuole (b) mitochondria  
(c) nucleus (d) food vacuole. (2002)
68. Which of the following organisms possesses characteristics of a plant and an animal?  
(a) *Euglena* (b) *Paramecium*  
(c) Bacteria (d) *Mycoplasma* (1995)
69. The function of contractile vacuole, in protozoa, is  
(a) osmoregulation (b) reproduction  
(c) locomotion (d) digestion of food. (1995)
70. The protists have  
(a) only free nucleic acid aggregates

- (b) membrane bound nucleoproteins lying embedded in the cytoplasm
- (c) gene containing nucleoproteins condensed together in loose mass
- (d) nucleoprotein in direct contact with the rest of the cell substance. (1994)

71. In *Amoeba* and *Paramecium* osmoregulation occurs through  
 (a) pseudopodia (b) nucleus  
 (c) contractile vacuole (d) general surface. (1991)
72. *Plasmodium*, the malarial parasite, belongs to class  
 (a) sarcodina (b) ciliata  
 (c) sporozoa (d) dinophyceae. (1990)
73. Which is true about *Trypanosoma*?  
 (a) Polymorphic (b) Monogenetic  
 (c) Facultative parasite (d) Non-pathogenic (1990)
74. Genetic information in *Paramecium* is contained in  
 (a) micronucleus (b) macronucleus  
 (c) both micronucleus and macronucleus  
 (d) mitochondria. (1990)
75. *Trypanosoma* belongs to Class  
 (a) Sarcodina (b) Zooflagellata  
 (c) Ciliata (d) Sporozoa. (1989)

### 2.3 Kingdom Fungi

76. Which of the following statements is incorrect?  
 (a) Yeasts have filamentous bodies with long thread like hyphae.  
 (b) Morels and truffles are edible delicacies.  
 (c) *Claviceps* is a source of many alkaloids and LSD.  
 (d) Conidia are produced exogenously and ascospores endogenously. (NEET 2019)

77. Match column - I with column - II.

**Column-I**      **Column-II**

- |               |   |
|---------------|---|
| A. Saprophyte | (i) Symbiotic association of fungi with plant roots |
| B. Parasite   | (ii) Decomposition of dead organic materials        |
| C. Lichens    | (iii) Living on living plants or animals            |
| D. Mycorrhiza | (iv) Symbiotic association of algae and fungi       |

Choose the correct answer from the options given below.

- |           |       |       |      |
|-----------|-------|-------|------|
| (A)       | (B)   | (C)   | (D)  |
| (a) (ii)  | (iii) | (iv)  | (i)  |
| (b) (i)   | (ii)  | (iii) | (iv) |
| (c) (iii) | (ii)  | (i)   | (iv) |
| (d) (ii)  | (i)   | (iii) | (iv) |
- (NEET 2019)

78. Which among the following is not a prokaryote?

- (a) *Saccharomyces*
  - (b) *Mycobacterium*
  - (c) *Nostoc*
  - (d) *Oscillatoria*
- (NEET 2018)

79. After karyogamy followed by meiosis, spores are produced exogenously in

- (a) *Neurospora*
  - (b) *Alternaria*
  - (c) *Agaricus*
  - (d) *Saccharomyces*.
- (NEET 2018)

80. Which one of the following is wrong for fungi?

- (a) They are eukaryotic.
  - (b) All fungi possess a purely cellulosic cell wall.
  - (c) They are heterotrophic.
  - (d) They are both unicellular and multicellular.
- (NEET-II 2016)

81. Which one of the following statements is wrong?

- (a) Eubacteria are also called false bacteria.
  - (b) Phycomycetes are also called algal fungi.
  - (c) Cyanobacteria are also called blue-green algae.
  - (d) Golden algae are also called desmids.
- (NEET-I 2016)

82. One of the major components of cell wall of most fungi is

- (a) cellulose
  - (b) hemicellulose
  - (c) chitin
  - (d) peptidoglycan.
- (NEET-I 2016)

83. The imperfect fungi which are decomposers of litter and help in mineral cycling belong to

- (a) Phycomycetes
- (b) Ascomycetes
- (c) Deuteromycetes
- (d) Basidiomycetes. (2015)

84. Choose the wrong statement.

- (a) Morels and truffles are poisonous mushrooms.
- (b) Yeast is unicellular and useful in fermentation.
- (c) *Penicillium* is multicellular and produces antibiotics.
- (d) *Neurospora* is used in the study of biochemical genetics. (2015)

85. Which one of the following matches is correct?

- |                         |                             |                |
|-------------------------|-----------------------------|----------------|
| (a) <i>Mucor</i>        | Reproduction by conjugation | Ascomycetes    |
| (b) <i>Agaricus</i>     | Parasitic fungus            | Basidiomycetes |
| (c) <i>Phytophthora</i> | Aseptate mycelium           | Basidiomycetes |
| (d) <i>Alternaria</i>   | Sexual reproduction absent  | Deuteromycetes |
- (2015 Cancelled)

86. Which one of the following fungi contains hallucinogens?

- (a) *Morchella esculenta*
- (b) *Amanita muscaria*
- (c) *Neurospora* sp.
- (d) *Ustilago* sp. (2014)

87. Which one of the following is true for fungi?

- (a) They lack a rigid cell wall.
- (b) They are heterotrophs.
- (c) They lack nuclear membrane.
- (d) They are phagotrophs. (Karnataka NEET 2013)

88. The pathogen *Microsporium* responsible for ringworm disease in humans belongs to the same kingdom of organisms as that of  
 (a) *Taenia*, a tapeworm  
 (b) *Wuchereria*, a filarial worm  
 (c) *Rhizopus*, a mould  
 (d) *Ascaris*, a round worm. (Mains 2011)
89. Single-celled eukaryotes are included in  
 (a) protista (b) fungi  
 (c) archaea (d) monera. (2010)
90. Membrane-bound organelles are absent in  
 (a) *Saccharomyces* (b) *Streptococcus*  
 (c) *Chlamydomonas* (d) *Plasmodium*. (2010)
91. Black (stem) rust of wheat is caused by  
 (a) *Alternaria solani* (b) *Ustilago nuda*  
 (c) *Puccinia graminis* (d) *Xanthomonas oryzae*.  
 (Mains 2010)
92. Which one is the wrong pairing for the disease and its causal organism?  
 (a) Black rust of wheat-*Puccinia graminis*  
 (b) Loose smut of wheat-*Ustilago nuda*  
 (c) Root knot of vegetables-*Meloidogyne* sp.  
 (d) Late blight of potato-*Alternaria solani* (2009)
93. Which pair of the following belongs to basidiomycetes?  
 (a) Puffballs and *Claviceps*  
 (b) *Peziza* and stink horns  
 (c) *Morchella* and mushrooms  
 (d) Birds nest fungi and puffballs (2007)
94. Which of the following environmental conditions are essential for optimum growth of *Mucor* on a piece of bread ?  
 A. Temperature of about 25°C  
 B. Temperature of about 5°C  
 C. Relative humidity of about 5%  
 D. Relative humidity of about 95%  
 E. A shady place  
 F. A brightly illuminated place  
 Choose the answer from the following options.  
 (a) B, C and F only (b) A, C and E only  
 (c) A, D and E only (d) B, D and E only (2006)
95. Which fungal disease spreads by seed and flowers?  
 (a) Loose smut of wheat  
 (b) Corn smut  
 (c) Covered smut of barley  
 (d) Soft rot of potato (2002)
96. Which of the following secretes toxins during storage conditions of crop plants?  
 (a) *Aspergillus* (b) *Penicillium*  
 (c) *Fusarium* (d) *Colletotrichum* (2002)
97. Black rust of wheat is caused by  
 (a) *Puccinia* (b) *Ustilago*  
 (c) *Albugo* (d) *Phytophthora*. (2000)
98. Columella is a specialized structure found in the sporangium of  
 (a) *Spirogyra* (b) *Ulothrix*  
 (c) *Rhizopus* (d) none of these. (1999)
99. *Puccinia* forms uredia and  
 (a) telia on wheat leaves  
 (b) aecia on barberry leaves  
 (c) pycnia on barberry leaves  
 (d) aecia on wheat leaves. (1998)
100. Mycorrhiza is correctly described as  
 (a) parasitic association between roots and some fungi  
 (b) symbiotic relationship between fungi and roots of some higher plants  
 (c) symbiosis of algae and fungi  
 (d) relation of ants with the stem of some trees. (1996)
101. The black rust of wheat is a fungal disease caused by  
 (a) *Albugo candida*  
 (b) *Puccinia graminis tritici*  
 (c) *Melampsora lini*  
 (d) *Claviceps purpurea*. (1995)

## 2.4 Kingdom Plantae

102. Select the wrong statement.  
 (a) Cell wall is present in members of fungi and plantae.  
 (b) Mushrooms belong to basidiomycetes.  
 (c) Pseudopodia are locomotory and feeding structures in sporozoans.  
 (d) Mitochondria are the powerhouse of the cell in all kingdoms except monera. (NEET 2018)
103. Cell wall is absent in  
 (a) *Mycoplasma* (b) *Nostoc*  
 (c) *Aspergillus* (d) *Funaria*. (2015)
104. True nucleus is absent in  
 (a) *Vaucheria* (b) *Volvox*  
 (c) *Anabaena* (d) *Mucor*.  
 (2015 Cancelled)
105. Nuclear membrane is absent in  
 (a) *Penicillium* (b) *Agaricus*  
 (c) *Volvox* (d) *Nostoc*. (2012)
106. Absorptive heterotrophic nutrition is exhibited by  
 (a) algae (b) fungi  
 (c) bryophytes (d) pteridophytes. (1990)

## 2.5 Kingdom Animalia

107. Pick up the wrong statement.  
 (a) Some fungi are edible.  
 (b) Nuclear membrane is present in Monera.



- (c) Cell wall is absent in Animalia.
- (d) Protists have photosynthetic and heterotrophic modes of nutrition. (2015)

**108.** Which one of the following living organisms completely lacks a cell wall?  
 (a) Cyanobacteria (b) Sea-fan (*Gorgonia*)  
 (c) *Saccharomyces* (d) Blue-green algae (2014)

## 2.6 Viruses, Viroids, Prions and Lichens

**109.** Which of the following is correct about viroids?  
 (a) They have RNA with protein coat.  
 (b) They have free RNA without protein coat.  
 (c) They have DNA with protein coat.  
 (d) They have free DNA without protein coat. (NEET 2020)

**110.** Mad cow disease in cattle is caused by an organism which has  
 (a) inert crystalline structure  
 (b) abnormally folded protein  
 (c) free RNA without protein coat  
 (d) free DNA without protein coat. (Odisha NEET 2019)

**111.** Which of the following statements is incorrect?  
 (a) Prions consist of abnormally folded proteins.  
 (b) Viroids lack a protein coat.  
 (c) Viruses are obligate parasites.  
 (d) Infective constituent in viruses is the protein coat. (NEET 2019)

**112.** Viroids differ from viruses in having  
 (a) DNA molecules without protein coat  
 (b) RNA molecules with protein coat  
 (c) RNA molecules without protein coat  
 (d) DNA molecules with protein coat. (NEET 2017)

**113.** Which of the following statements is wrong for viroids?  
 (a) They cause infections.  
 (b) Their RNA is of high molecular weight.  
 (c) They lack a protein coat.  
 (d) They are smaller than viruses. (NEET-I 2016)

**114.** Select the wrong statement.  
 (a) The term '*contagium vivum fluidum*' was coined by M. W. Beijerinck.  
 (b) Mosaic disease in tobacco and AIDS in human being are caused by viruses.  
 (c) The viroids were discovered by D.J. Ivanowsky.  
 (d) W.M. Stanley showed that viruses could be crystallised. (2015)

**115.** Which of the following shows coiled RNA strand and capsomeres?  
 (a) Polio virus (b) Tobacco mosaic virus  
 (c) Measles virus (d) Retrovirus (2014)

**116.** Viruses have  
 (a) DNA enclosed in a protein coat  
 (b) prokaryotic nucleus

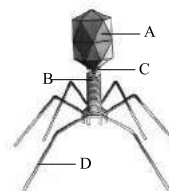
- (c) single chromosome
- (d) both DNA and RNA. (2014)

**117.** Which statement is wrong for viruses?  
 (a) All are parasites.  
 (b) All of them have helical symmetry.  
 (c) They have ability to synthesize nucleic acids and proteins.  
 (d) Antibiotics have no effect on them. (2012)

**118.** Which one single organism or the pair of organisms is correctly assigned to its or their named taxonomic group?  
 (a) *Paramecium* and *Plasmodium* belong to the same kingdom as that of *Penicillium*.  
 (b) Lichen is a composite organism formed from the symbiotic association of an algae and a protozoan.  
 (c) Yeast used in making bread and beer is a fungus.  
 (d) *Nostoc* and *Anabaena* are examples of protista. (2012)

**119.** Virus envelope is known as  
 (a) capsid (b) virion  
 (c) nucleoprotein (d) core. (2010)

**120.** Given below is the diagram of a bacteriophage. In which one of the options all the four parts A, B, C and D are correct?



- | A               | B           | C      | D           |
|-----------------|-------------|--------|-------------|
| (a) Tail fibres | Head        | Sheath | Collar      |
| (b) Sheath      | Collar      | Head   | Tail fibres |
| (c) Head        | Sheath      | Collar | Tail fibres |
| (d) Collar      | Tail fibres | Head   | Sheath      |

(Mains 2010)

**121.** T.O. Diener discovered a  
 (a) free infectious DNA (b) infectious protein  
 (c) bacteriophage (d) free infectious RNA. (2009)

**122.** There exists a close association between the alga and the fungus within a lichen. The fungus  
 (a) provides protection, anchorage and absorption for the algae  
 (b) provides food for the alga  
 (c) fixes the atmospheric nitrogen for the alga  
 (d) releases oxygen for the alga. (2005)

**123.** Which of the following statements is not true for retroviruses?  
 (a) DNA is not present at any stage in the life cycle of retroviruses.  
 (b) Retroviruses carry gene for RNA-dependent DNA polymerase.

- (c) The genetic material in mature retroviruses is RNA.  
 (d) Retroviruses are causative agents for certain kinds of cancer in man. (2004)
- 124.** Viruses that infect bacteria multiply and cause their lysis, are called  
 (a) lysozymes (b) lipolytic  
 (c) lytic (d) lysogenic. (2004)
- 125.** Lichens are well known combination of an alga and a fungus where fungus has  
 (a) a saprophytic relationship with the alga  
 (b) an epiphytic relationship with the alga  
 (c) a parasitic relationship with alga  
 (d) a symbiotic relationship with alga. (2004)
- 126.** Which one of the following statements about viruses is correct?  
 (a) Viruses possess their own metabolic system.  
 (b) All viruses contain both RNA and DNA.  
 (c) Viruses are obligate parasites.  
 (d) Nucleic acid of viruses is known as capsid. (2003)
- 127.** Tobacco mosaic virus is a tubular filament of size  
 (a)  $300 \times 10$  nm (b)  $300 \times 5$  nm  
 (c)  $300 \times 20$  nm (d)  $700 \times 30$  nm. (2003)
- 128.** Viruses are no more “alive” than isolated chromosomes because  
 (a) they require both RNA and DNA  
 (b) they both need food molecules  
 (c) they both require oxygen for respiration  
 (d) both require the environment of a cell to replicate. (2003)
- 129.** Cauliflower mosaic virus contains  
 (a) ss RNA (b) ds RNA  
 (c) ds DNA (d) ss DNA. (2001)
- 130.** Viruses possess  
 (a) ribosomes to synthesize protein  
 (b) organelle for its vital mechanism  
 (c) either DNA or RNA  
 (d) none of these. (1997)
- 131.** Most of the lichens consist of  
 (a) green algae and ascomycetes  
 (b) brown algae and higher plant  
 (c) blue green algae and basidiomycetes  
 (d) red algae and ascomycetes. (1997)
- 132.** What is the genetic material in influenza virus?  
 (a) Double helical DNA (b) RNA  
 (c) Single helix DNA (d) None of these (1996)
- 133.** Which one of the following statement about lichens is wrong?  
 (a) These grow very rapidly (2 cm per day).  
 (b) They show fungal and algal symbiotic relationships.  
 (c) Some of its species are eaten by reindeers.  
 (d) These are pollution indicators. (1996)
- 134.** The tailed bacteriophages are  
 (a) motile on surface of bacteria  
 (b) non-motile  
 (c) motile on surface of plant leaves  
 (d) actively motile in water. (1995)
- 135.** Tobacco mosaic virus (TMV) genes are  
 (a) single stranded RNA  
 (b) double stranded DNA  
 (c) proteinaceous  
 (d) double stranded RNA. (1994)
- 136.** Organisms which are indicator of  $\text{SO}_2$  pollution of air  
 (a) mosses (b) lichens  
 (c) mushrooms (d) puffballs. (1992)
- 137.** Lichens indicate  $\text{SO}_2$  pollution because they  
 (a) show association between algae and fungi  
 (b) grow faster than others  
 (c) are sensitive to  $\text{SO}_2$   
 (d) flourish in  $\text{SO}_2$  rich environment. (1989)

### ANSWER KEY

1. (b) 2. (c) 3. (a) 4. (d) 5. (b) 6. (c) 7. (b) 8. (b) 9. (a) 10. (d)  
 11. (b) 12. (c) 13. (b) 14. (b) 15. (a) 16. (a) 17. (c) 18. (b) 19. (d) 20. (d)  
 21. (a) 22. (a) 23. (d) 24. (c) 25. (c) 26. (d) 27. (b) 28. (b) 29. (b) 30. (b)  
 31. (a) 32. (a) 33. (a) 34. (b) 35. (d) 36. (a) 37. (a) 38. (b) 39. (b) 40. (b)  
 41. (a) 42. (b) 43. (d) 44. (a) 45. (a) 46. (b) 47. (c) 48. (a) 49. (b) 50. (c)  
 51. (a) 52. (a) 53. (a) 54. (a) 55. (b) 56. (b) 57. (d) 58. (a) 59. (d) 60. (c)  
 61. (b) 62. (a) 63. (d) 64. (d) 65. (a) 66. (d) 67. (a) 68. (a) 69. (a) 70. (b)  
 71. (c) 72. (c) 73. (a) 74. (a) 75. (b) 76. (a) 77. (a) 78. (a) 79. (c) 80. (b)  
 81. (a) 82. (c) 83. (c) 84. (a) 85. (d) 86. (b) 87. (b) 88. (c) 89. (a) 90. (b)  
 91. (c) 92. (d) 93. (d) 94. (c) 95. (a) 96. (a,b) 97. (a) 98. (c) 99. (a) 100. (b)  
 101. (b) 102. (c) 103. (a) 104. (c) 105. (d) 106. (b) 107. (b) 108. (b) 109. (b) 110. (b)  
 111. (d) 112. (c) 113. (b) 114. (c) 115. (b) 116. (a) 117. (b) 118. (c) 119. (a) 120. (c)  
 121. (d) 122. (a) 123. (a) 124. (c) 125. (d) 126. (c) 127. (c) 128. (d) 129. (c) 130. (c)  
 131. (a) 132. (b) 133. (a) 134. (a) 135. (a) 136. (b) 137. (c)



## Hints & Explanations

**1. (b) :** R.H. Whittaker considered complexity of cell structure and structural (body) organisation, mode of nutrition, ecological life style and phylogenetic relationships for the five kingdom system of classification.

**2. (c) :** Compared to many other group, monerans (bacteria) show the most extensive metabolic diversity. Some of the bacteria are autotrophic, *i.e.*, they synthesize their own food from inorganic substrates. They may be photosynthetic autotrophic or chemosynthetic autotrophic. The vast majority of bacteria are heterotrophs, *i.e.*, they do not synthesize their own food but depend on other organisms or on dead organic matter for food.

**3. (a) :** In order to develop phylogenetic classification, R.H. Whittaker (1969), an American taxonomist, divided all the organisms into five kingdoms. Whittaker has used five criteria for delimiting the different kingdoms. (i) Complexity of cell structure, prokaryotic and eukaryotic (ii) Complexity of body structure or structural organization, unicellular and multicellular. (iii) Mode of nutrition which is divergent in multicellular kingdoms. (iv) Ecological life style like producers (plantae), decomposers (fungi) and consumers (animalia), (v) Phylogenetic relationship. When such characteristics were considered, the fungi were placed in a separate kingdom – Kingdom Fungi. All prokaryotic organisms were grouped together under Kingdom Monera and the unicellular eukaryotic organisms were placed in Kingdom Protista. Kingdom Protista has brought together *Chlamydomonas*, *Chlorella* (earlier placed in Algae within Plants and both having cell walls) with *Paramecium* and *Amoeba* (which were earlier placed in the animal kingdom which lack cell wall). It has put together organisms which, in earlier classifications, were placed in different kingdoms. This happened because the criteria for classification has changed.

**4. (d) :** The Kingdom Monera includes all prokaryotes. They are basically unicellular. The archaea and nitrogen-fixing organisms are placed under monera. All others fungi, plantae, protists and animalia are eukaryotic.

**5. (b) :** Whittaker's system is based on the following three criteria –

- complexity of cell structure
- complexity of the body organization
- mode of nutrition.

On the basis of these criteria, Whittaker divided organisms into five kingdoms. These five kingdoms are monera, protista, algae, fungi and animalia. In the

five kingdom classification, all prokaryotes have been placed in Kingdom Monera, all unicellular eukaryotes in Kingdom Protista, Fungi (except slime moulds and water moulds) in their separate Kingdom while Kingdom Plantae and Kingdom Animalia have been retained for multicellular, autotrophic and multicellular holozoic organisms respectively.

**6. (c) :** R.H. Whittaker had proposed a five kingdom system of biological classification in 1969. It is based on complexity of cell structure, body organization and mode of nutrition. The Kingdom Monera includes all prokaryotes. The blue-green algae, nitrogen fixing bacteria and methanogenic archaeobacteria are all unicellular prokaryotes so they are included in the Kingdom Monera.

**7. (b)                      8. (b)                      9. (a)**

**10. (d) :** Halophiles, a type of archaeobacteria, usually occur in extreme saline conditions like salt pans, salt beds and salt marshes.

**11. (b) :** Mycoplasmas are the smallest living cells, known without a definite cell wall. They are pathogenic to both plants and animals and can survive without oxygen.

**12. (c) :** Glycocalyx is the outermost mucilage layer of the cell envelope which consists of non-cellulosic polysaccharides with or without proteins. It gives sticky character to the cell.

**13. (b) :** DNA replicates in bacteria just before they divide by fission.

**14. (b) :** Methanogens belong to archaeobacteria. They include methane producing genera such as *Methanobacillus* and *Methanothrix*. Methanogens are obligate anaerobes found in oxygen-deficient environments, such as marshes, swamps, sludge (formed during sewage treatment) and the digestive systems of ruminants. Mostly they obtain their energy by reducing carbon dioxide and oxidising hydrogen, with the production of methane.

**15. (a)**

**16. (a) :** The archaeobacteria are the 'ancient' bacteria that include extremophiles like methanogens, halophiles and thermophiles. They represent some of the most ancient of life forms that persist today. They have both eubacterial and eukaryotic characters besides the features unique to them. Their mode of reproduction, nutrition and cell shape and size resembles a typical eubacteria. Their cell walls are made of a variety of polymers, but

do not contain peptidoglycan unlike eubacteria. Lipids of their cytoplasmic membranes are either linked unlike eubacteria which contain glycerol ester lipids in their cell membrane.

**17. (c) :** Archaeobacteria belong to a group of prokaryotic organisms called Monera. These include the methanogens, which produce methane; the thermoacidophilic bacteria, which live in extremely hot and acidic environments (such as hot springs); and the halophilic bacteria, which can only function at high salt concentrations and are abundant in the world's oceans.

**18. (b) :** Chromatophore is a pigmented lamellar or vesicular structure that can be isolated from disrupted photosynthetic bacteria or cyanobacteria. Their plasma membrane may be projected in folds into the cytoplasm forming lamellae that have, therefore, double unit-membrane structure. The pigments and most of the enzymes required for the light-induced electron transport and phosphorylation processes of photosynthesis, are located in the plasma membrane and lamellae.

**19. (d) :** Cyanobacteria consist of two groups of photosynthetic eubacteria: the blue-green bacteria (formerly known as blue-green algae, or cyanophyta), which comprise the vast majority of members and the grass-green bacteria, or chloroxybacteria.

**20. (d) :** Maximum number of antibiotics are produced by mycelial bacteria known as actinomycetes and most of the actinomycetes are saprotrophic (heterotrophic). Lactic acid bacteria that are used in preparation of curd are also heterotrophic ones.

**21. (a) :** Plasma membrane of eubacteria resembles plasma membrane of eukaryotic cell. But nucleus, ribosomes and cell wall are little different in eukaryotic cell in their structure and organization from eubacterial cell.

**22. (a) :** There are two major groups of monerans archaeobacteria (ancient bacteria) and eubacteria (true bacteria). Eubacteria is of further two types – bacteria and cyanobacteria. Thermoacidophiles are a type of archaeobacteria which live in extremely acidic environment (pH 2) that have extremely high temperatures (upto 110°C). They are found in hot sulphur springs. Some of the eubacteria are also famous for living under the most hostile environment like salt pans, petroleum pans, spilled oil, hot springs, sulphur springs, snow, etc.

**23. (d) :** Chemosynthetic autotrophic bacteria oxidise various inorganic substances such as nitrates, nitrites and ammonia and use the released energy for their ATP production. They play a great role in recycling nutrients like nitrogen, phosphorus, iron and sulphur.

**24. (c) :** Bacterial leaf blight of rice is caused by *Xanthomonas oryzae* a bacterium which is gram-negative, aerobic, capsulated and motile with a single polar flagellum.

**25. (c) :** *Thermococcus*, *Methanococcus* and *Methanobacterium* are examples of archaeobacteria which are characterized by a unique cell wall that lack peptidoglycan and consist of polysaccharides and protein and closely resemble the eukaryotic cell in the mechanism of protein synthesis, structural protein and RNA compliments of the ribosomes.

**26. (d) :** Archaeobacteria represent a cell type that seems to possess the characteristics of both prokaryotes as well as eukaryotes. In size, the archaeobacteria are about 1 µm in diameter, the size of typical prokaryotes lack membrane-bound organelles, nuclear bodies are not bound by nuclear membranes as it is in eukaryotes and ribosomes are 70S, the size of those found in typical prokaryotes. They have unique cell wall that lacks peptidoglycan, closely resemble the eukaryotic cells in the mechanisms of protein synthesis, structural proteins. Archaeobacteria also possess unique characteristic found in neither eukaryotes nor prokaryotes. For example, their membrane contain branched chain lipids with ether. This enables them to tolerate extremes of heat and pH.

**27. (b) :** Mycoplasma are small, unicellular, (non-motile) prokaryotic organisms. They are pleomorphic. Therefore they are known as pleuro pneumonia like organisms (PPLO). They lack cell wall. It contains cytoplasm, ribosomes and DNA. They are inhibited by tetracyclines but insensitive to penicillin. They cause various diseases.

**28. (b) :** Curing is a process done to add special flavour and taste in tea leaves. It is also done for tobacco. In this process after harvesting the cured leaves are hung in shade and are permitted for the action of bacteria. The curing of tea leaves is done by *Micrococcus candidans*. *Micrococcus* is a gram positive aerobic bacterium which is a member of micrococcaceae.

**29. (b) :** *Frankia*, is a nitrogen fixing symbiotic bacteria. It induces root nodules just like *Rhizobium*. It is associated symbiotically with the root nodules of several non-legume plants like *Casuarina*, *Alnus*, *Rubus*, etc. It cannot fix nitrogen in free state.

**30. (b) :** Retting is the process of separating fibres that are held together in close association using a variety of bacteria. Fibres of jute are held together in close association and they are separated by the action of butyric acid bacteria, e.g., *Clostridium butyricum*. These plants are immersed in water so that they absorb water and swell. Due to the activity of bacteria, the pectic

substances of middle lamella are hydrolysed and the fibres are separated. These separated fibres are used in making of ropes and sacks.

**31. (a) :** Basophilic prokaryotes are facultatively anaerobic bacteria. They grow and multiply in very deep marine sediments. Most basophiles grow better at a pH of 8.5 or higher.

**32. (a) :** In transduction, genetic material of one bacterial cell goes to other bacterial cell by agency of bacteriophages or phages (viruses, infecting bacteria).

Transduction was first of all reported in *Salmonella typhimurium* by Zinder and Lederberg (1952).

Transduction is used for gene mapping and analysis in bacteria and also for strain construction.

**33. (a) :** In addition to the nucleoid, bacterial cytoplasm normally contains many small, separate pieces of DNA, called plasmids. These circular DNA units are 1/100 the size of the main nuclear DNA (nucleoid) and are also not enclosed in a membrane structure. When found in cytoplasm, entirely independent of the bacterial chromosome, they replicate autonomously. Sometimes it becomes integrated into the main DNA and replicates with it. During conjugation, the plasmids, sometimes called episomes, help in the transfer of the genetic material between different bacteria. It may carry some genes of resistance to a variety of antibiotics.

**34. (b) :** Chemoautotrophs are organisms that are capable of manufacturing their organic food utilising chemical energy released in oxidation of some inorganic substances. The process of manufacture of food in such organisms is called chemosynthesis. It includes some aerobic bacteria. Photoautotroph obtain energy for their synthesis of food from light.

Fungi living on dead or decaying plant or animal remains and also growing on dung of herbivores are saprophytes.

**35. (d) :** Archaeobacteria are believed to have originated at a time when there were extreme conditions in the biosphere. Even today they are found in environments where other kinds of bacteria cannot survive. So they are considered to be the oldest of the living fossils, e.g., *Methanobacterium*, *Methanococcus*, etc.

All of them are not halophiles. Only some forms like *Halobacterium*, *Halococcus* can survive under extreme saline conditions. All of them are not fossils because many forms are still surviving and flourishing.

**36. (a) :** Using Gram stain, developed by Danish physician, Christian Gram in 1884, two kinds of bacteria were noted - those species of bacteria that are decolorized by alcohol are called Gram negative and those that retain the stain are called Gram positive. This property of bacteria is related with the structure and compositional

differences between the walls of gram positive and gram negative forms. In the cell wall of Gram+ve bacteria, both horizontal and vertical peptide linkages are present, due to which mesh is dense and hence the stain does not come out. Further outer layer of cell wall of Gram +ve bacteria is made of teichoic acid. In the cell wall of Gram-ve bacteria, either horizontal or vertical peptide linkage are present, due to which mesh is loose and hence stain comes out. Further outermost layer of cell wall of Gram-ve bacteria is made of lipopolysaccharides.

**37. (a) :** Transduction is the phenomenon of transfer of genetic material from one bacterial cell to another through the agency of virus. The viruses carry a segment of DNA from one host and infect another host which is different from the first one, the latter may inherit some of the properties of the former host due to transfer of DNA segment through infecting phage.

**38. (b) :** A bacterium divides every 35 minutes.

∴ In 175 minutes it would be  $2^{175/35}$  times =  $2^5$  times.

∴ In 175 minutes  $10^5$  bacterium cells would be  
=  $2^5 \times 10^5 = 32 \times 10^5/\text{mL}$ .

**39. (b) :** *E. coli* is a Gram-negative, rod shaped, motile or non-motile bacteria. *E. coli* contains a double stranded DNA as its genetic material. The DNA is not associated with any histone proteins so it is referred to as naked DNA. This DNA is circular with no free ends.

**40. (b) :** Bacteria are responsible for maintaining the conditions of life as the earth by virtue of their powers of decomposition of plant and animal bodies by which the limited supply of  $\text{CO}_2$  available for photosynthesis is replenished. Thus, they act as decomposers in the carbon cycle. Bacteria mainly function as decomposers in the carbon cycle.

**41. (a) :** Thermoacidophiles (temperature and acid loving) archaeobacteria are found in hot sulphur springs. Although they are microscopic, single-celled organisms, they flourish under conditions which would kill higher organisms. These are aerobic bacteria and have the capacity to oxidize sulphur to  $\text{H}_2\text{SO}_4$  at high temperature and high acidity (pH = 2.0). Some of them are also able to reduce sulphur to  $\text{H}_2\text{S}$  under anaerobic conditions. As a rule, they grow best between  $80^\circ\text{C}$  and  $100^\circ\text{C}$  and several species do not grow below  $80^\circ\text{C}$ .

**42. (b) :** Refer to answer 39.

**43. (d) :** Symbiosis is a mutually beneficial relationship or interaction between individuals of two different species with none of the two capable of living separately. E.g., *Rhizobium* is associated with root nodules of legumes. It fixes nitrogen for the plant and the plant provides it food and shelter. *Azotobacter* is a free-living bacteria which occurs in the soil and fixes nitrogen

directly. *Bacillus* is also a free living bacteria which acts upon nitrogenous excretions and proteins of dead bodies of living organisms. These are therefore, non-symbiotic  $N_2$  fixing bacteria.

**44. (a) :** Sex pili are minute and non-flagellar hair like structures projecting from the wall of many Gram negative bacteria and few Gram positive ones. They are entirely composed of a protein called pilin. They are used as sex organs during conjugation, forms conjugation tube during conjugation. They confer the property of stickiness whereby bacteria tend to adhere to one another (clump formation).

Naked circular DNA is the genetic material which is not enclosed by nuclear membrane and non complexed with proteins. It is called nucleoid or genophore. Plasmids (Hayes and Lederberg, 1952) are additional or extrachromosomal small rings of DNA having a few useful but non-vital genes, e.g., for fertility factor, R-factors or resistance factor.

**45. (a) :** Bacterial cells do not have nucleus. Nuclear material of bacteria lies free in the cell in the form of an irregular, thin fibrillar and circular single molecule of DNA called nucleoid or chromatin body.

**46. (b) :** Chemolithotrophs can derive the energy required for growth from the oxidation of inorganic components.

**47. (c) :** Some algae withstand or tolerate a very high temperature and these are often called thermal algae. Such forms are known to grow upto  $85^\circ\text{C}$ , nearly boiling water.

Their cell wall is hard and protective. A typical cell wall of algae consists of two nonliving layers. The inner layer is firm consisting of microfibrils and outer layer is gelatinous and amorphous. Various polysaccharides such as cellulose, pectin, mucilage constitute the typical cell wall. The mucilage covering of the cell is thick and dense and is called the sheath. This sheath holds the cells in colonies together, is having water absorbing and water retaining capacity. It thus protects them under desiccating conditions. Thus they are able to survive under high temperature.

**48. (a) :** A few free living bacteria are able to pick up dinitrogen from the soil atmosphere and convert it into organic nitrogenous materials like amino acids, e.g., *Azotobacter*. Symbiotic nitrogen fixing bacteria of the genus *Rhizobium* occur in the root nodules of a number of legumes. Root nodules containing symbiotic nitrogen bacteria also occur in *Casuarina* and *Alnus*. Leaf nodules containing such bacteria are found in *Ardisia*. Many cyanobacteria (blue-green algae) fix atmospheric nitrogen due to presence of heterocysts.

**49. (b) :** Refer to answer 32.

**50. (c) :** Bacteria has no nuclear membrane hence it is called as nucleoid. The genetic material is referred to as genophore. Genophore is the bacterial chromosome. It has a double stranded circular supercoiled DNA. DNA has about 10,000 genes in *E.coli*. Double stranded DNA in bacteria is without histones.

**51. (a) :** *E. coli* bacteria acts as a human symbionts and it is found in human intestine, synthesise vitamin K and B and also help in food fermentation. It is easily cultured in any nutrient medium in the laboratory.

**52. (a) :** In sexual reproduction, syngamy and meiotic division takes place but in bacteria, during sexual reproduction there is no formation of gametes hence no syngamy and reduction division occurs, bacteria lack alternation of generation. Conjugation and exchange of genetic material takes place in bacteria.

**53. (a) :** Chemosynthetic bacteria do not derive energy directly or indirectly from sun. The source of energy of these bacteria is inorganic substances. They utilise the energy liberated by oxidation of inorganic compounds and synthesise organic compounds.

**54. (a) :** Refer to answer 36.

**55. (b) :** All prokaryotic organisms come under Kingdom Monera. *Escherichia coli* is a bacterium. Monera includes bacteria, mycoplasmas, cyanobacteria (blue green algae) and actinomycetes.

**56. (b) :** Diatoms are the most common form of phytoplankton in the ocean. They have the pigment chlorophyll which helps in photosynthesis. Since, they are the primary producers of the aquatic food chain and the marine ecosystem depends on them. They are called chief producers in the oceans.

**57. (d) :** Ciliates differ from other protozoans in having two types of nuclei : macronucleus and micronucleus (nuclear dimorphism). E.g., *Paramecium* has macronucleus which controls metabolic activities as well as growth and micronucleus that takes part in reproduction.

**58. (a) :** Diatoms are marine or freshwater unicellular organisms which have cell walls (frustules) composed of pectin impregnated with silica and consisting of two halves, one overlapping the other. The siliceous frustules of diatoms do not decay easily.

**59. (d) :** Protista is a kingdom of unicellular eukaryotic organisms. It includes photosynthetic protists (dinoflagellates, chrysophytes and euglenoids), consumer-decomposer protists (slime moulds) and protozoan protists.

**60. (c) :** Chrysophytes include diatoms and desmids. The body of diatoms is covered by a transparent siliceous shell (silica deposited in cell wall) known as frustule. The frustule is made of two valves, epitheca and hypotheca, which fit together like a soap box.

**61. (b) :** *Escherichia coli* (bacterium) is not an example of eukaryotic cell. It is a typical example of prokaryotic cell.

**62. (a) :** Slime moulds are peculiar protists that normally take the form of amoebae, but under certain conditions develop fruiting bodies that release spores, superficially similar to the sporangia of fungi. The order physarales include *Physarum* species. The fruiting bodies (sporangia) are characterized by the presence of abundant amount of calcium salt. The order comprises 142 species which are placed under 12 genera. *Physarum polycephalum* is the best known. The somatic phase is multinucleate, diploid holocarpic plasmodium which is the product of syngamy.

**63. (d) :** Until 1907, auxospore formation was regarded as asexual process but now it is considered as an act of sexual process. The auxospores may be autogamous, isogamous, anisogamous or oogamous. Their pattern of formation differs in pennate and centric diatoms. Formation of hormogonia is the common method of reproduction in *Nostoc* which are produced by accidental breaking of trichome into several pieces. It may also be formed by death and decay of ordinary intercalary cells. Soon, the hormogonium escapes from mucilage and grows into a new filament and then into a new colony.

**64. (d) :** *Amoeba* is a fresh water protozoan containing contractile vacuole that is meant for osmoregulation. When *Amoeba* is placed in a marine water, then the water from the contractile vacuole will move out resulting in decrease in size of it. Contractile vacuole will increase in size if it is placed in hypotonic solution. Water will enter into contractile vacuole, thus increasing its size and ultimately it will burst and disappear.

**65. (a) :** *Amoeba* forms a cyst and reproduces by multiple fission, during adverse environmental conditions. The animal secretes a three-layered, protective, chitinous cyst around it and becomes inactive. Inside the cyst, the nucleus repeatedly divides to form several daughter nuclei, which arrange themselves near the periphery. Each daughter nucleus becomes enveloped by a small amount of cytoplasm, thus forming a daughter *Amoeba*, called amoebula or pseudopodiospore. When favourable conditions arrive, the cyst breaks off liberating the young pseudopodiospores, each with fine pseudopodia. They feed and grow rapidly to become adults and lead an independent life.

**66. (d) :** Dimorphic nucleus means two types of nuclei are present in *P. caudatum* – large macronucleus and small micronucleus. The macronucleus is roughly kidney-shaped and with inconspicuous nuclear membrane. Macronucleus is the somatic or vegetative nucleus and controls the day-to-day metabolic activities of the cell. The micronucleus is lodged in a depression on the surface of the macronucleus. It is usually spherical, with a nuclear membrane and with diploid number of chromosomes. It controls the reproductive activities of the organism. *Amoeba*, *Trypanosoma* and *Plasmodium* have only one nucleus.

**67. (a) :** The function of contractile vacuole is osmoregulatory. Water in freshwater protozoan enters the organism by endosmosis during feeding. If the organism does not possess a mechanism to get rid of this excess water, it will swell to the point of rupture and dissolution. The mechanism which is assumed to effect water regulation is the contractile vacuole. The vacuole periodically increases in volume (diastole) to get filled with water and contracts (systole) to discharge its water content to the surrounding environment.

**68. (a) :** *Euglena* possesses the characteristics of both plant and animal. It has chlorophyll, thus it is autotrophic like plants. In contrast to this, it has flagellated locomotion like animals.

**69. (a) :** Refer to answer 67.

**70. (b) :** Protists include all unicellular and colonial eukaryotes except those of green and red algae. They are broadly divided into three groups - photosynthetic, slime moulds and protozoans. The protistan cells are typically eukaryotic having membrane bound organelles like mitochondria, chloroplasts, Golgi bodies, endoplasmic reticulum, nucleus, etc., Nucleus is well defined. Protists can be uninucleate, binucleate or multinucleate. The genetic material is linear DNA, enclosed by nuclear envelope, complexed with proteins and organised into distinct chromosomes.

**71. (c) :** In *Amoeba* and *Paramecium*, osmoregulation occurs through contractile vacuole. Osmoregulation is a phenomenon in which contractile vacuole plays an important role in maintaining the water balance of the cell. *Paramecium* contains two contractile vacuoles which have fixed position. One contractile vacuole is present near the anterior end while another is present towards posterior end of the body. Each contractile vacuole is surrounded by 5-12 radial canals. Excess of water is transferred from the cytoplasm to the radial canals. The latter pour water into the contractile vacuole. The contractile vacuole expels water outside the body. Thus the contractile vacuoles and radial canals are for osmoregulation. In *Amoeba* the endoplasm, at its

posterior end, contains a single, clear rounded and pulsating contractile vacuole, filled with a watery fluid and enclosed by a unit membrane. Surrounding this membrane is a region containing many tiny feeder vacuoles and mitochondria. It helps in the osmoregulatory and excretory activities of the animal.

**72. (c)**

**73. (a) :** *Trypanosoma* is polymorphic, i.e., it has more than one form. It has at least four forms that are recognized on the basis of the positions of kinetoplast and blepharoplast and the course taken by the flagellum. Two or more such forms occur either in one or both the hosts in the life cycles of various species of *Trypanosoma*. These forms are

(i) Leishmanial (amastigote) : Round or oval form with a nucleus, blepharoplast and kinetoplast. Flagellum reduced and fibril-like, embedded in cytoplasm.

(ii) Leptomonad (promastigote) : Body elongate, nucleus large and anteriorly located blepharoplast and kinetoplast. Flagellum short and unattached.

(iii) Crithidial (epimastigote) : Body elongate blepharoplast and kinetoplast placed immediately anterior to nucleus. Undulating membrane inconspicuous.

(iv) Trypanosomid (trypomastigote) : Body elongate and slender. Blepharoplast and kinetoplast situated at or near posterior end. Undulating membrane conspicuous. *Trypanosoma* is digenetic, i.e., it completes its life cycle in two hosts. It is an obligate parasite and is pathogenic.

**74. (a) :** *Paramecium* contains a single large macronucleus and one small micronucleus. The macronucleus controls metabolism such as feeding and maintenance, whereas the micronucleus takes an important role in reproduction and stores genetic information, hence it is also termed as reproductive nucleus whereas macronucleus is termed as vegetative nucleus.

**75. (b)**

**76. (a) :** Yeast is a non-mycelial unicellular ascomycetes fungus.

**77. (a)**

**78. (a) :** *Saccharomyces*, i.e., yeast is a eukaryote unicellular fungus. Prokaryotes include bacteria (*Mycobacterium*), cyanobacteria (*Nostoc* and *Oscillatoria*), mycoplasma and archaeobacteria.

**79. (c) :** In *Agaricus*, (member of Basidiomycetes), basidium commonly produces four meiospores or basidiospores exogenously. *Neurospora* (member of Ascomycetes) produces ascospores, endogenously inside the fruiting body, ascus. *Alternaria* (member of Deuteromycetes) does not produce any sexual spores. *Saccharomyces* (member of Ascomycetes) produces ascospores endogenously.

**80. (b) :** Cell wall in fungi is composed of chitin, a polysaccharide comprising N-acetyl-D-glucosamine (a derivative of glucose).

**81. (a) :** Eubacteria are also called true bacteria.

**82. (c) :** Fungal cell wall contains chitin or fungal cellulose along with other polysaccharides, proteins, lipids and a number of other substances.

**83. (c) :** Deuteromycetes are the imperfect fungi which include all those fungi in which sexual stage is either absent or not known. Some members are saprophytes or parasites while a large number of them are decomposers of litter and help in mineral cycling. E.g., *Colletotrichum*, *Helminthosporium*, etc.

**84. (a) :** Morels are Ascomycetes with edible ascocarps that have fleshy sponge-like conical cap or pileus and a stalk like stipe, e.g., *Morchella esculenta*. Truffles are also edible members of Ascomycetes with tuber-like subterranean ascocarps that are often dug out with the help of trained dogs and pigs, e.g., *Tuber aestivum*.

**85. (d) :** *Alternaria* is a Deuteromycetes member which are also known as fungi imperfecti. Their perfect stages (sexually reproducing stages) are either absent or not known. Now, *Alternaria* belongs to Ascomycetes.

**86. (b) :** *Amanita muscaria* is a member of Class Basidiomycetes. It is a poisonous mushroom and has hallucinogenic properties. It produces a toxic alkaloid, muscarine, which mimics the effects of acetylcholine and binds to muscarinic receptors as well as ibotenic acid which also binds to different receptors. This leads to excitation of neurons bearing these receptors and hence hallucinations.

**87. (b) :** Fungi are achlorophyllous, heterotrophic, spore forming, non-vascular, eukaryotic organisms which often contain chitin or fungal cellulose in their walls. Hence, their cell wall is rigid.

**88. (c) :** The pathogen *Microsporum* is genus of Kingdom Fungi that causes diseases of skin and hair in humans and animals like dog, cat, monkey.

Ringworm is caused by the dermatophyte fungi- species of *Microsporum*, *Trichophyton* and *Epidermophyton*.

*Rhizopus*, a black bread mould belongs to group zygomycetes of Kingdom Fungi.

**89. (a) :** Protista include all unicellular and colonial eukaryotes except those of green and red algae. The protistan cells are typically eukaryotic having membrane bound organelles like mitochondria, chloroplasts, Golgi bodies, endoplasmic reticulum, nucleus, etc. Protista is commonly known as kingdom of unicellular eukaryotes. Kingdom Fungi contains achlorophyllous, spore producing, heterotrophic, multicellular or multinucleate eukaryotic organisms (unicellular yeasts

are also included amongst fungi because their sexual reproduction is similar to that of some fungi). Monerans are basically unicellular prokaryotes. Archaea (ancient bacteria) are also a type of monerans which live in primitive environment like high temperature, high salt content, acidic pH, etc.

**90. (b) :** *Streptococcus* is a bacteria which is included under Kingdom Monera. Monerans have prokaryotic cell organisation in which membrane bound organelles like mitochondria, E.R., Golgi bodies, etc., are absent. All the other three i.e., *Saccharomyces* (a fungus), *Chlamydomonas* (an algae) and *Plasmodium* (a protozoan protist) are eukaryotes containing true membrane bound organelles.

**91. (c) :** Black stem rust is caused by *Puccinia graminis tritici*. The genus *Puccinia* includes 700 species, which cause rust diseases of many economic plants such as wheat, barley, oats, etc.

**92. (d) :** Late blight of potato disease is caused by *Phytophthora infestans*. It is a phycomycetes fungus. *Alternaria solani* is the causal organism of early blight of potato disease.

**93. (d) :** The *Cyathus* is known as bird's nest fungi, and *Lycoperdon* is called puffballs. Both these fungi belong to the group of club fungi or basidiomycetes. These fungi produce spores inside club shaped fruit bodies called basidium. Typically basidium has 4 basidiospores produced exogenously. *Peziza*, *Morchella* and *Claviceps* belong to ascomycetes (produce ascospores in ascocarps). Mushroom are basidiomycetes fungi.

**94. (c) :** *Mucor* is a filamentous fungus found in the humus of soil decaying fruits, vegetables. It is commonly known as black mould. Most of the *Mucor* sp. are unable to grow at 37°C and the strains isolated from human infections are usually one of the few thermotolerant *Mucor* sp. Colonies of *Mucor* grow rapidly at 25-30°C, humidity about 90-95% and quickly cover the surface of the agar. It requires moist and shady place for its growth. Many sp. of *Mucor* are responsible for causing rotting of fruit and vegetables. A few sp. e.g., *Mucor pusillus* are pathogenic to man.

**95. (a) :** Loose smut of wheat infects the healthy wheat plants at the time of flowering. Here chlamydospores, from smutted heads (blown by the wind) germinate on the stigmas and produce infection threads, infecting the ovaries and stigma. Ultimately, the fungus continues to grow within the embryo, as the seed matures. With the germination of these infected seeds, internal dormant fungal mycelium resumes its activity again. In covered smut of Barley, fungal spores are liberated out only by rupturing the wall of the grains, specially at the time

of threshing. This type of infection takes place during the young seedling stage. Seedling infection occurs in covered smut of Barley. Shoot infection occurs in corn smut.

**96. (a, b) :** *Penicillium* and *Aspergillus* both produce toxins in stored seeds and grains. *Aspergillus* produces aflatoxin in fruits, vegetables, food grains and seeds, etc. *Penicillium* produces yellow rice toxins in rice, barley and corns.

**97. (a) :** Black stem rust is caused by *Puccinia graminis tritici*. The genus *Puccinia* includes 700 species, which cause rust diseases of many economic plants such as wheat, barley, oats, etc.

**98. (c) :** *Rhizopus* is a saprophytic fungus that grows on dead organic matter. The mycelium is differentiated into three kinds of hyphae rhizoidal, stolons and sporangiophores. The rhizoidal hyphae are for anchorage and absorbing food by secreting enzymes. Stolons grow horizontally over the surface of the substratum. Sporangiophores are specialized hyphae that bear a sporangium at their tip (inside columella a dome shaped sterile portion the sporangia). It helps in dispersal of spores and usually persists even after bursting of the sporangium.

**99. (a) :** *Puccinia* is a macrocyclic and heteroecious rust fungus. It produces uredia and telia stages on wheat plant. The spores produced on wheat are uredospores (stage II) and teleutospores (stage III). Uredospores can re-infect wheat but teleutospores cannot do it. Instead they give rise to basidia (stage IV). Basidiospores infect barberry. Pycnidia (stage I) develop on the upper surface of barberry leaves. Dikaryotisation occurs. It gives rise to aecidial stage (stage zero). Aecidia develop on the lower surface of barberry leaves. They form aecidiospores which infect wheat. Thus basidial stage is produced on ground and pycnidial and aecidial stages are produced on barberry plant.

**100. (b) :** Association between roots of higher plants, e.g., pine, birch and fungal hyphae is called mycorrhiza. It exhibits the phenomenon of symbiosis. Here both the organisms in association are mutually benefitted. In this, fungal hyphae take nutrition from the plant and in return increase surface area for absorption of water and minerals for the plant.

**101. (b) :** *Puccinia graminis tritici* belongs to basidiomycotina and causes black rust of wheat. It is internal obligate parasite. It is found everywhere, where wheat is grown. The teleutospores of the fungus causes the rust. They are produced inside teleutosori. These telia form elongated, dark brown to black pustules on the surface of stems and leaves of the wheat. *Albugo*

*candida* causes white rust of crucifers. *Melampsora lini* causes linseed rust. *Claviceps purpurea* causes ergot of Graminae.

**102. (c) :** Pseudopodia is the locomotory organ in amoeboid protozoans, e.g., *Amoeba*. Flagellated protozoans possess flagella for locomotion, e.g., *Trypanosoma*. In sporozoans, locomotory organelles (cilia, flagella, pseudopodia, etc.) are absent, e.g., *Plasmodium*. Ciliated protozoans possess cilia as locomotory organelles, e.g., *Paramecium*.

**103. (a) :** Mycoplasma (Kingdom-Monera) are the simplest and smallest free living prokaryotes which are devoid of a cell wall. Plasma membrane forms the outer boundary of the cell of mycoplasma. *Nostoc* is a cyanobacterium (Kingdom- Monera), in which cell wall comprises of peptidoglycans. *Aspergillus* is a fungus (Kingdom-Fungi) in which cell wall is mainly made of chitin. *Funaria* is a bryophyte (Kingdom-Plantae) in which cell wall is cellulosic in nature.

**104. (c) :** *Anabaena* is a prokaryotic organism. It is a cyanobacteria (blue-green algae) which belongs to Kingdom Monera. Like all other prokaryotes, it lacks a true nucleus and other cell organelles.

**105. (d) :** *Penicillium* and *Agaricus* are fungi while *Volvox* is an alga. All three are eukaryotes thus have a membrane bound nucleus. *Nostoc* is a cyanobacterium, i.e., prokaryote, so it lacks true nucleus, thus nuclear membrane is absent.

**106. (b) :** The true fungi or the eumycetes are special types of achlorophyllous thallophytic organisms living a parasitic or a saprophytic mode of existence; they are always heterophytes and never autophytes. They depend on others for food, but all other groups as algae, bryophytes and pteridophytes are chlorophyll containing green plants that are autotrophic.

**107. (b) :** Kingdom Monera consists of prokaryotic organisms, characterised by absence of nuclear envelope around nucleus and absence of membrane-bound cell organelles.

**108. (b) :** *Gorgonia* (sea-fan) is an animal belonging to Phylum Coelenterata. All animals lack cell wall.

**109. (b) :** Viroids are free RNA particles that lack protein coat. They are infectious agents smaller than viruses.

**110. (b)**

**111. (d) :** Infective constituent in the viruses is the genetic material, i.e., either DNA or RNA.

**112. (c) :** Refer to answer 109.

**113. (b) :** RNA of viroid has low molecular weight.

**114. (c) :** Viroids are infectious RNA particles which were discovered by T.O. Diener (1971). These are devoid

of protein coat and cause diseases in plants only, e.g., potato spindle tuber, chrysanthemum stunt, etc.

**115. (b) :** Tobacco mosaic virus is a RNA virus that causes tobacco mosaic disease. It has single stranded coiled RNA molecule as its genetic material a part of which hangs outside the protein coat. Protein coat consists of approximately 2130 capsomeres which are helically arranged to form a hollow cylinder of about 4 nm diameter.

**116. (a) :** Viruses are nucleoprotein entities which are able to utilize synthetic machinery of a living cell of the host organism for its multiplication which does not involve growth and division. They have either RNA or DNA as genetic material and a protein coat.

**117. (b) :** In viruses, three architectural forms are found – helical (elongated body, e.g., TMV), cuboidal (short broad body with rhombic, rounded, polyhedral shape, e.g., poliovirus) and binal (with both cuboidal and helical parts, e.g., T<sub>2</sub> phage).

**118. (c) :** Yeast is a group of unicellular fungi of the class ascomycetes. They occur as single cell or as a group or chain of cells. Yeast of the genus *Saccharomyces* ferments sugar and are used to make bread and beer.

**119. (a) :** The nucleic acid of a virus is surrounded by a protein coat called the capsid. The capsid is composed of protein subunits called capsomeres. In some viruses, the capsid is covered by an envelope, which usually consists of some combination of lipids, proteins and carbohydrates.

**120. (c)**

**121. (d) :** Refer to answer 114.

**122. (a) :** Lichens are peculiar dual organisms produced by the intimate association of two organisms: a fungus and an alga. The association between the two organisms is symbiosis. Both the organisms are mutually benefitted in this association and are dependent on each other. The algal cell photosynthesizes with the help of chloroplast. Therefore lichens are autotrophic. A part of these manufactured carbohydrates are used by the alga in its nutrition, the rest is supplied to the fungal partner. The fungus in turn provides water and nutrients which it absorbs from the soil using the rhizoidal hyphae. Thus both the partners get benefitted from each other. The algal partner is called phycobiont and the fungal partner is called mycobiont.

**123. (a) :** Retroviruses contain RNA as genetic material and this RNA is converted to DNA using enzyme reverse transcriptase.

**124. (c) :** Viruses like bacteriophage T<sub>4</sub> undergo lytic cycle that involves lysis of bacteria. The replication cycle



of bacteriophage T<sub>4</sub> consists of following phases –

(i) Adsorption of the phage to bacterial or host cell. Then the viral genetic material penetrates into the host cell.

(ii) Eclipse period involves the synthesis of new phage DNA and proteins.

(iii) Maturation involves the assembly of phage DNA into the protein coat.

(iv) Lysis of host cell occurs and releases infective progeny phases.

**125. (d)**

**126. (c) :** Viruses contain a protein coat known as capsid which encloses a single type of nucleic acid, either RNA or DNA. They do not have enzymes for protein synthesis. They multiply only inside the living host cell and for multiplication they take over the machinery of the host cell. Thus viruses are obligatory intercellular parasites. They lack cell division and enzymes for protein synthesis. They do not have cell organelles like mitochondria, Golgi complex, lysosomes, ribosomes, etc., so they cannot live or reproduce separately.

**127. (c) :** TMV is rod shaped measuring  $300 \times 20$  nm. It is made of RNA and proteins.

**128. (d) :** Refer to answer 126.

**129. (c) :** Cauliflower mosaic virus contain dsDNA. It is circular and shows semidiscontinuous type of replication.

**130. (c) :** Viruses always contain only a single kind of nucleic acid. It can be either DNA or RNA. The nucleic acid may occur as single or double strands.

**131. (a) :** Lichens are peculiar dual organisms produced by the intimate association of two organisms – a fungus and an alga. The association between the two organisms is called symbiosis. On the basis of fungal partner, lichens are of two types :

(i) Ascolichens : In which ascomycetes member is the

fungal partner. Further in ascolichens, algal partner is mostly member of green algae and rarely blue-green algae.

(ii) Basidiolichens : Where basidiomycetes member is fungal partner. In them algal partner is generally blue-green algae. In 80% cases algal partner is member of green algae or chlorophyceae and in 20% cases, blue-green algae or myxophyceae.

Important members of green algae found in lichens are: *Trebauxia*, *Pleurococcus*, *Trentepohlia* and *Cladophora*.

**132. (b) :** Influenza viruses are spherical in shape measuring about 800-1200Å in diameter. It has a protein capsid that encloses a single stranded RNA. The single stranded RNA is generally linear and constitutes about 10% of the virus particle. RNA is genetic material in other viruses like poliomyelitis, foot and mouth disease virus and tobacco mosaic virus, etc.

**133. (a) :** Lichens grow by extending their thallus outwards from either tips or edges. They grow very slowly. Rates of growth can vary from 0.5 mm per year to 500 mm per year. This slow growth rate equates with their long life.

**134. (a) :** The tailed bacteriophages contain a hollow helical tail which serves both as cell attachment organ and as a tube that facilitates the entry of nucleic acid into the host cell. The tail consist of tail plate and the caudal fibres.

**135. (a) :** Tobacco Mosaic Virus is a ribovirus and contains single stranded RNA.

**136. (b) :** Lichens are found in Artic Tundra region where no other plant can grow. Lichens prefer to grow in pollution free environment. They are often used as a indicator of pollution and also they are very sensitive to SO<sub>2</sub>. They are first to die in a polluted environment (more SO<sub>2</sub>).

**137. (c) :** Refer to answer 136.

