CHAPTER

2 Biological Classification

2.1. Kingdom Monera

1. Which among the following is not a prokaryote?
(A) *Nostoc* (B) *Mycobacterium*
(C) *Saccharomyces* (D) *Oscillatoria* **[NEET 2018]**

2. 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?
(A) *Bacillus* (B) *Pseudomonas*
(C) Mycoplasma (D) *Nostoc* **[NEET 2017]**

3. Which of the following are found in extreme saline conditions?
(A) Archaebacteria (B) Eubacteria
(C) Cyanobacteria (D) Mycobacteria
[NEET 2017]

4. Methanogens belong to:
(A) eubacteria (B) archaebacteria
(C) dinoflagellates (D) slime moulds.
[NEET Phase-II 2016]

5. Archaebacteria differ from eubacteria in:
(A) cell membrane structure
(B) mode of nutrition
(C) cell shape
(D) mode of reproduction. **[AIPMT 2014]**

6. Pigment-containing membranous extensions in some cyanobacteria are:
(A) heterocysts (B) basal bodies
(C) pneumatophores (D) chromatophores.
[NEET 2013]

7. Which of the following are likely to be present in deep sea water?
(A) Archaebacteria (B) Eubacteria
(C) Blue-green algae (D) Saprophytic fungi
[NEET 2013]

8. Specialised cells for fixing atmospheric nitrogen in *Nostoc* are:
(A) heterocysts (B) hormogonia
(C) nodules (D) akinetes.
[NEET Karnataka 2013]

9. In eubacteria, a cellular component that resembles eukaryotic cells is:
(A) nucleus (B) ribosomes
(C) cell wall (D) plasma membrane.
[AIPMT Screening 2011]

10. Membrane-bound organelles are absent in:
(A) *Saccharomyces* (B) *Streptococcus*
(C) *Chlamydomonas* (D) *Plasmodium.*
[AIPMT Screening 2010]

11. Some hyperthermophilic organisms that grow in highly acidic (pH = 2) habitats belong to the two groups called:
(A) eubacteria and archaea
(B) cyanobacteria and diatoms
(C) protists and mosses
(D) liverworts and yeasts. **[AIPMT Screening 2010]**

12. Select the correct combination of the statements (I-IV) regarding the characteristics of certain organisms.
(I) Methanogens are Archaebacteria, which produce methane in marshy areas.
(II) *Nostoc* is a filamentous blue-green algae, which fixes atmospheric nitrogen.
(III) Chemosynthetic autotrophic bacteria synthesize cellulose from glucose.
(IV) Mycoplasma lack a cell wall and can survive without oxygen.
Options:
(A) (II), (III) (B) (I), (II), (III)
(C) (II), (III), (IV) (D) (I), (II), (IV)
[AIPMT Mains 2010]

13. Modern detergents contain enzyme preparations of:
(A) acidophiles (B) alkaliphiles
(C) thermoacidophiles (D) thermophiles.
[AIPMT Screening 2008]

14. Most of cyanobacteria (blue-green algae) belong to kingdom ..... .
(A) Monera (B) Deoxythymine
(C) Glyceride (D) Glycerol
[AIPMT Mains 2008]

15. 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. **[AIPMT 2007]**

16. Curing of tea leaves is brought about by the activity of:

(A) fungi (B) bacteria

(C) mycorrhiza (D) viruses **[AIPMT 2006]**

17. The bacterium (*Clostridium botulinum*) that causes botulism is:

(A) an obligate aerobe (B) a facultative anaerobe

(C) an obligate anaerobe (D) a facultative aerobe.

[AIPMT 2006]

18. Which of the following unicellular organism has a macronucleus for trophic function and one or more micronuclei for reproduction?

(A) *Euglena* (B) *Amoeba*

(C) *Paramoecium* (D) *Trypanosoma*

[AIPMT 2005]

19. Barophilic prokaryotes:

(A) grow and multiply in very deep marine sediments

(B) occur in water containing high concentration 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. **[AIPMT 2005]**

20. A free living nitrogen-fixing cyanobacterium which can also form symbiotic association with the water fern *Azolla* is:

(A) *Tolypothrix* (B) *Chlorella*

(C) *Nostoc* (D) *Anabaena*. **[AIPMT 2004]**

21. A few organisms are known to grow and multiply at temperatures of 100-105°C. They belong to:

(A) themophilic sulphur bacteria

(B) hot spring blue green algae

(C) methanogenic archaebacteria

(D) marine archaebacteria. **[AIPMT 1998]**

22. 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. **[AIPMT 1994]**

2.2. Kingdom Protista

23. Match List-I with List-II

List-I (Organisms)	List-II (Mode of Nutrition)
(a) Euglenoid	(i) Parasitic
(b) Dinoflagellate	(ii) Saprophytic
(c) Slime mould	(iii) Photosynthetic
(d) *Plasmodium*	(iv) Switching between photosynthetic and heterotrophic mode

Choose the correct answer from the options given below:

	(a)	(b)	(c)	(d)
(A)	(iii)	(iv)	(ii)	(i)
(B)	(iv)	(ii)	(i)	(iii)
(C)	(iv)	(iii)	(ii)	(i)
(D)	(iv)	(ii)	(iii)	(i)

[Re-NEET 2024]

24. Ciliates differ from all other protozoans in:

(A) using pseudopodia for capturing prey

(B) having a contractile vacuole for removing excess water

(C) using flagella for locomotion

(D) having two types of nuclei. **[NEET 2018]**

25. Which of the following organisms are known as chief producers in the oceans?

(A) Cyanobacteria (B) Diatoms

(C) Dinoflagellates (D) Euglenoids **[NEET 2018]**

26. Chrysophytes, euglenoids, dinoflagellates and slime moulds are included in the Kingdom:

(A) Protista (B) Fungi

(C) Animalia (D) Monera.

[NEET Phase-I 2016]

27. 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 Phase-II 2016]**

28. In which group of organisms the cell walls form two thin overlapping shells which fit together?

(A) Chrysophytes (B) Euglenoids

(C) Dinoflagellates (D) Slime moulds

[AIPMT Latest July 2015]

29. The cyanobacteria are also referred to as:

(A) protists (B) golden algae

(C) slime moulds (D) blue-green algae

[AIPMT Screening 2012]

30. Which one of the following is a slime mould?

(A) *Physarum* (B) *Thiobacillus*

(C) *Anabaena* (D) *Rhizopus*

[AIPMT 2007]

31. The thalloid body of a slime mould (myxomycetes) is known as:

(A) mycelium (B) protonema

(C) plasmodium (D) fruiting body.

[AIPMT 2006]

32. What is common about *Trypanosoma, Noctiluca, Monocystis* and *Giardia*?

(A) These are all parasites.

(B) These are all unicellular protists.

(C) They have flagella.

(D) They produce spores. **[AIPMT 2006]**

33. Auxospores and hormocysts 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.

[AIPMT 2005]

34. Which of the following organisms possesses characteristics of a plant and an animal?

(A) *Euglena* (B) *Paramecium*

(C) Bacteria (D) Mycoplasma

[AIPMT 1995]

35. *Trypanosoma* belongs to class:

(A) Sarcodina (B) Zooflagellata

(C) Ciliata (D) Sporozoa **[AIPMT 1989]**

2.3. Kingdom Fungi

36. Which of the following statements is incorrect?

(A) *Claviceps* is a source of many alkaloids and LSD.

(B) Conidia are produced exogenously and ascospores endogenously.

(C) Yeasts have filamentous bodies with long thread-like hyphae.

(D) Morrels and truffles are edible delicacies.

[NEET 2019]

37. 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 option from the options given below:

	(a)	(b)	(c)	(d)
(A)	(iii)	(ii)	(i)	(iv)
(B)	(ii)	(i)	(iii)	(iv)
(C)	(ii)	(iii)	(iv)	(i)
(D)	(i)	(ii)	(iii)	(iv)

[NEET 2019]

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

(A) *Agaricus* (B) *Alternaria*

(C) *Neurospora* (D) *Saccharomyces*

[NEET 2018]

39. One of the major components of cell wall of most fungi is:

(A) peptidoglycan (B) cellulose

(C) hemicellulose (D) chitin.

[NEET Phase-I 2016]

40. 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 Phase-II 2016]

41. Which one of the following statement is wrong?

(A) Golden algae are also called desmids.

(B) Eubacteria are also called false bacteria.

(C) Phycomycetes are also called algal fungi.

(D) Cyanobacteria are also called blue-green algae.

[NEET Phase-I 2016]

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

(A) deuteromycetes (B) basidiomycetes

(C) phycomycetes (D) ascomycetes.

[AIPMT Latest July 2015]

43. Which one of the following matches is correct?

(A) *Phytophthora*	Aseptate mycelium	Basidiomycetes
(B) *Alternaria*	Sexual reproduction absent	Deuteromycetes
(C) *Mucor*	Reproduction by conjugation	Ascomycetes
(D) *Agaricus*	Parasitic fungus	Basidiomycetes

[AIPMT Cancelled 2015]

44. 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. **[NEET Karnataka 2013]**

45. Single-celled eukaryotes are included in:
(A) Protista (B) Fungi
(C) Archaea (D) Monera.
[AIPMT Screening 2010]

46. Which one is the wrong pairing for the disease and its causal organism?
(A) Late blight of potato—*Alternaria solani*
(B) Black rust of wheat—*Puccinia graminis*
(C) Loose smut of wheat—*Ustilago nuda*
(D) Root-knot of vegetables—*Meloidogyne sp.*
[AIPMT Screening 2009]

47. Which pair of the following belongs to Basidiomycetes?
(A) Puffballs and *Claviceps*
(B) *Peziza* and stink horns
(C) *Morchella* and mushrooms
(D) Bird's nest fungi and puffballs **[AIPMT 2007]**

48. Ergot of rye is caused by a species of:
(A) *Uncinula* (B) *Ustilago*
(C) *Claviceps* (D) *Phytophthora.*
[AIPMT 2007]

49. Which of the following environmental conditions are essential for optimum growth of *Mucor* on a piece of bread?
(I) Temperature of about 25°C
(II) Temperature of about 5°C
(III) Relative humidity of about 5%
(IV) Relative humidity of about 95%
(V) A shady place
(VI) A brightly illuminated place
Choose the answer from the following options.
(A) (II), (III) and (VI) only
(B) (I), (III) and (V) only
(C) (I), (IV) and (V) only
(D) (II), (IV) and (V) only **[AIPMT 2006]**

50. 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. **[AIPMT 2005]**

51. 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. **[AIPMT 2004]**

52. Which of the following secretes toxins during storage conditions of crop plants?
(A) *Aspergillus* (B) *Penicillium*
(C) *Fusarium* (D) *Colletotrichum*
[AIPMT 2002]

2.4. Kingdom Plantae

53. Select the wrong statement.
(A) Pseudopodia are locomotory and feeding structures in sporozoans.
(B) Mushrooms belong to Basidiomycetes.
(C) Cell wall is present in members of Fungi and Plantae.
(D) Mitochondria are the powerhouse of the cell in all kingdoms except Monera. **[NEET 2018]**

54. Cell wall is absent in:
(A) Mycoplasma (B) *Nostoc*
(C) *Aspergillus* (D) *Funaria*
[AIPMT Latest July 2015]

55. True nucleus is absent in:
(A) *Vaucheria* (B) *Volvox*
(C) *Anabaena* (D) *Mucor*
[AIPMT Cancelled 2015]

56. Nuclear membrane is absent in:
(A) *Penicillium* (B) *Agaricus*
(C) *Volvox* (D) *Nostoc* **[AIPMT 2012]**

57. Absorptive heterotrophic nutrition is exhibited by:
(A) algae (B) fungi
(C) bryophytes (D) pteridophytes
[AIPMT 1990]

2.5. Kingdom Animalia

58. 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. **[AIPMT Latest July 2015]**

59. Which one of the following living organisms completely lacks a cell wall?
(A) Cyanobacteria (B) Sea-fan (*Gorgonia*)
(C) *Saccharomyces* (D) Blue-green algae
[AIPMT 2014]

2.6. Viruses, Viroids and Lichens

60. Which of the following statements is incorrect?
(A) Viruses are obligate parasites.
(B) Infective constituent in viruses is the protein coat.
(C) Prions consist of abnormally folded proteins.
(D) Viroids lack a protein coat. **[NEET 2019]**

61. Viroids differ from viruses in having:
(A) DNA molecules with protein coat
(B) DNA molecules without protein coat
(C) RNA molecules with protein coat
(D) RNA molecules without protein coat. **[NEET 2017]**

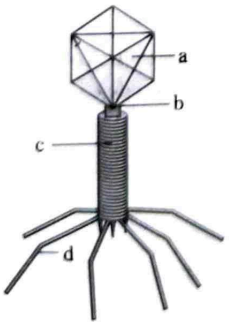
62. Which of the following statements is wrong for viroids?
(A) They are smaller than viruses.
(B) They cause infections.
(C) Their RNA is of high molecular weight.
(D) They lack a protein coat. **[NEET Phase-I 2016]**

63. Select wrong statement.
(A) The viroids were discovered by D.J. Ivanowski.
(B) W.M. Stanley showed that viruses could be crystallized.
(C) The term *'contagium vivum fluidum'* was coined by M.W. Beijerinck.
(D) Mosaic disease in tobacco and AIDS in human being are caused by viruses. **[AIPMT Latest July 2015]**

64. Which of the following shows coiled RNA strand and capsomeres?
(A) Polio virus (B) Tobacco mosaic virus
(C) Measles virus (D) Retrovirus **[AIPMT 2014]**

65. 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.
[AIPMT Screening 2012]

66. The diagram of a bacteriophage is given. 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	Collar	Sheath	Tail fibres
(D)	Collar	Tail fibres	Head	Sheath

[AIPMT Mains 2010]

67. T.O. Diener discovered a:
(A) free infectious RNA (B) free infectious DNA
(C) infectious protein (D) bacteriophage.
[AIPMT Screening 2009]

68. The causative agent of mad cow disease:
(A) virus (B) bacterium
(C) prion (D) worm. **[AIPMT 2006]**

69. Viruses that infect bacteria multiply and cause their lysis, are called:
(A) lysozymes (B) lipolytic
(C) lytic (D) lysogenic. **[AIPMT 2004]**

70. 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.
[AIPMT 2003]

71. 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.
[AIPMT 2003]

72. Which statement is correct for bacterial transduction?
(A) Transfer of some genes from one bacteria to another bacteria through virus.
(B) Transfer of some genes from one bacteria to another bacteria by conjugation.
(C) Bacteria obtained its DNA directly.
(D) Bacteria obtained DNA from other external source.
[AIPMT 2002]

73. 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.
[AIPMT 1998]

74. Transduction in bacteria is mediated by:
(A) plasmid vectors (B) phage vectors
(C) cosmids (D) F-factors. **[AIPMT 1994]**

75. Organisms which are indicator of SO_2 pollution of air:
(A) mossess (B) lichens
(C) mushrooms (D) puffballs. **[AIPMT 1992]**

76. Lichens indicate SO_2 pollution because they:
(A) show association between algae and fungi
(B) grow faster than others
(C) are sensitive to SO_2
(D) flourish in SO_2 rich environment. **[AIPMT 1989]**

*2.7. Introduction

77. Five kingdom system of classification suggested by R.H. Whittaker is not based on:
(A) presence or absence of a well-defined nucleus
(B) mode of reproduction
(C) mode of nutrition
(D) complexity of body organization. **[AIPMT 2014]**

78. Maximum nutritional diversity is found in the group:
(A) fungi (B) animalia
(C) monera (D) plantae **[AIPMT 2012]**

79. In the five kingdom classification, *Chlamydomonas* and *Chlorella* have been included in:
(A) protista (B) algae
(C) plantae (D) monera
[AIPMT Mains 2012]

80. In the five kingdom system of classification, which single kingdom out of the following can include blue-green algae, nitrogen fixing bacteria and methanogenic archaebacteria?
(A) Plantae (B) Protista
(C) Monera (D) Fungi
[AIPMT 2003, 1998]

81. In five kingdom system, the main basis of classification is:
(A) structure of nucleus (B) mode of nutrition
(C) structure of cell wall (D) asexual reproduction.
[AIPMT 2002]

82. BGA (blue green algae) are included in which of the following groups?
(A) Bryophytes (B) Prokaryotes
(C) Protista (D) Fungi **[AIPMT 1996]**

83. An important criterion for modern day classification is:
(A) resemblance in morphology
(B) anatomical and physiological traits
(C) breeding habits
(D) presence or absence of notochord. **[AIPMT 1991]**

SOLUTIONS

1. (C) *Saccharomyces* is a fungus (yeast), and hence, it is an eukaryote. *Nostoc* and *Oscillatoria* are cyanobacteria, while *Mycobacterium* is a true bacteria. Monerans are prokaryotes as they lack a well-defined nucleus and membrane bound cell organelles.

Related Theory
➥ *The fungi constitute a unique kingdom of heterotrophic organisms. They show a great diversity in morphology and habitat. Some unicellular fungi such as yeast are used to make bread and beer.*

2. (C) Mycoplasma are the smallest living organism (0.1–0.3 μm). It lacks a definite cell wall. It is anaerobic in nature and causes disease in plants as well as in animals.

Related Theory
➥ *Mycoplasma is a bacteria that lacks a cell wall around their cell membranes. This characteristic makes them naturally resistant to antibiotics that target cell wall synthesis. They can be parasitic or saprotrophic.*

3. (A) Archaebacteria are the most primitive forms of bacteria. They live in diverse habitats, *e.g.*, extreme temperatures, saline conditions, *etc*. The ability of archaebacteria to survive in such harsh conditions is due to the presence of branched lipid chains in their membrane, which reduces the fluidity of their membrane.

Related Theory
➥ *Archaebacteria have cell membrane made of ether-linked phospholipids, while bacteria and eukaryotes both make their cell membranes out of ester-linked phospholipids. They have a single, round chromosome like bacteria, but their gene transcription is similar to that which occurs in the nuclei of eukaryotic cells. Examples include halophiles (inhabit extremely salty environments), methanogens (produce methane), and thermophiles (thrive in extremely hot environments).*

Caution
➥ *All bacteria are ubiquitous, i.e., they are found in almost every habitat. However, archaebacteria surpass all kinds, in terms of their extreme habitat.*

4. (B) Methanogens are archaeabacteria that produce methane as a metabolic by product. Examples are *Methanobacterium*, *Methanococcus*, *Methanospirillum*, *etc*.

*** Topics/Qs are in NEET latest syllabus but has been removed from NCERT.**

Related Theory

Archaebacteria are a group of most primitive prokaryotes, which are believed to have evolved immediately after the evolution of first life. They are autotrophs and derive their energy from oxidation of chemical energy sources, such as ammonia, methane, etc.

5. (A) Differences between Archaebacteria and Eubacteria are:

Characters	Archaebacteria	Eubacteria
Cell wall	The cell wall is made up of pseudo-peptidoglycan.	The cell wall is made up of peptidoglycan with muramic acid or lipopolysaccharide.
Lipid membrane	Archaea have ether bonds with the branching of aliphatic acids in their lipid membrane.	Eubacteria or bacteria have lipid membrane of ester bonds with fatty acids.

6. (D) Cyanobacteria contain chlorophyll in the infoldings of plasma membrane, called chromatophore, where photosynthesis occurs.
Heterocysts are specialised nitrogen fixing cells formed by filamentous cyanobacteria, such as *Nostoc*.
A basal body is an organelle formed from a centriole and consists of microtubules.
Pneumatophores are lateral roots and function as respiratory organs in marshy plants.

Related Theory

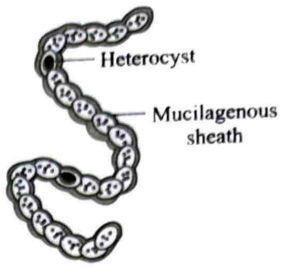
Cyanobacteria are Gram-positive prokaryotes. The chromatophore contains various photosynthetic pigments, i.e., chlorophyll a, carotene and xanthophylls.

7. (A) Archaebacteria are exclusively found in extreme habitats like deep sea waters, hot springs, hydrothermal vents. While other living organisms are unable to survive in such harsh conditions.

8. (A) Heterocysts are found in many species of filamentous blue-green algae. They are cells of slightly larger size and with a more thickened wall than the vegetative cells. Heterocysts are the site of nitrogen fixation in blue-green algae. Their role includes: (i) fixation of nitrogen by all heterocystous algae, (ii) inhibition of heterocyst formation by combined nitrogen and (iii) direct observations on acetylene reduction by isolated heterocyst.

Related Theory

Heterocysts are specialised, pale-yellow, thick-walled cells with the function of nitrogen-fixing formed during nitrogen starvation by some filamentous cyanobacteria, such as Nostoc and Anabaena. They fix nitrogen from di-nitrogen (N_2) in the air using the enzyme nitrogenase, in order to provide the cells in the filament with nitrogen for biosynthesis. Nitrogenase is inactivated by oxygen, so the heterocyst must create a micro-anaerobic environment. Hence, their main function is nitrogen fixation.



Nostoc

9. (D) Both prokaryotic and eukaryotic cells have a plasma membrane, a double layer of phospholipids that separates the cell interior from the outside environment.

Related Theory

Prokaryotic membranes have negatively charged lipids namely phosphatidylglycerol, cardiolipin and phosphatidylserine while the eukaryotic membranes are rich in neutral sphingomyelin and phosphatidylcholine. Sterol is the characteristic of eukaryotic cell membrane.

10. (B) *Streptococcus* is a Gram-positive, spherical bacteria (prokaryote), which lacks cell organelles and well-defined nucleus. *Saccharomyces* (fungi), *Chlamydomonas* (alga) and *Plasmodium* (protozoan) are eukaryotic cells.

11. (A) Eubacteria like BGA (*Synechococcus*, *Phormidium*) and thermoacidophiles (archaebacteria) grow in highly acidic (pH-2) habitats.

Related Theory

Archaea can inhabit extreme environments, typically characterised by high temperature or pressure (e.g., deep sea thermal vents) or extreme salinity, alkalinity, or acidity. These versatile microbes reside in the digestive tracts of ruminants, termites, and marine life (where they produce methane) and in the soil. They can live under anoxic conditions in mud, at the bottom of the ocean, and even in petroleum deposits.

12. (D) Chemosynthetic autotrophs oxidise inorganic substances to produce energy and helps in the cycling of minerals. The energy released during this oxidation process is utilised in synthesis of ATP molecules. Examples include methanogenic bacteria, archaea, and sulphur-oxidising bacteria.

Related Theory

Mycoplasma lack a cell wall around their cell membranes. This characteristic makes them naturally resistant to antibiotics that target cell wall synthesis.

13. (B) Modern detergents contain enzyme preparations of alkaline proteases, which are called alkaliphiles, for removing protein stain.

14. (A) Blue-green algae, also known as cyanobacteria, are photosynthetic bacteria but because they are unicellular and exhibit prokaryotic characteristics such as the absence of a well defined nucleus, they are classified under the Kingdom Monera.

15. (B) Characteristics of Mycoplasma are as follows:

(1) Cell wall is absent and plasma membrane forms the outer boundary of the cell.

(2) Due to the absence of cell wall these organisms can change their shape and are pleomorphic and are inherently resistant to lactam antibiotics (*e.g.*, penicillin).

(3) Lack of nucleus and other membrane-bound organelles. Genetic material is a single DNA duplex and is naked. Ribosomes are of 70S type.

(4) Shows heterotrophic nutrition (saprophytic and parasitic). *M. pneumoniae* causes lung infections such as walking pneumonia.

(5) They are found in the pleural cavities of cattle suffering from pleuropneumonia These organisms are often called PPLO (pleuropneumonia-like organisms).

Related Theory

In the treatment of mycoplasmal pneumonia, antimicrobials against M. pneumoniae are bacteriostatic, not bactericidal. Tetracycline and erythromycin compounds are very effective as they are protein synthesis inhibitors.

16. (B) The curing of tea leaves is done by Gram-positive aerobic bacteria like, *Micrococcus candicans, Bacillus megaterium, etc.*

Related Theory

Curing is a process done to add special flavour and taste in tea leaves and to remove its bitterness. 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. It is essentially an oxidation dry fermentation process, during which, water is driven off, the green colour is lost and the leaves assume a tough texture and undergo chemical changes.

17. (C) The bacterium *Clostridium botulinum* is an obligate anaerobic, endospore-forming, Gram positive, rod-shaped bacterium found in soil and in many freshwater sediments.

Related Theory

Clostridium botulinum causes botulism (food poisoning) when a toxin produced by the bacteria is consumed in improperly preserved foods. The disease is caused by a potent neurotoxin produced by the bacteria.

18. (C) *Paramoecium* has two kinds of nuclei: a small nucleus germinal nucleus, also known as the micronucleus is involved in sexual processes, and a large ellipsoidal somatic nucleus, also known as the macro-nucleus, participates in the process of transcription and ensures the expression of genetic information needed for the everyday functioning of the cell.

Related Theory

Paramoecium belongs to the Phylum Ciliophora. Its whole body is covered with small hair-like filaments called cilia, which are in constant motion and help it move with a speed that is four times its body's length per second. Just as the organism moves forward, rotating around its own axis, this further helps it to push the food into the gullet. By reversing the motion of cilia, Paramoecium can move in the reverse direction.

19. (A) Barophilic prokaryotes grow and multiply in very deep marine sediments. A barophilic prokaryote, also generally defined as a barophile, is a type of organism which occurs and exists at high-pressure zones, like a deep-sea bacterium and archaebacteria.

20. (D) *Azolla* (water fern) and the blue-green alga *Anabaena azollae* maintains a symbiotic relationship where the alga provides nitrogen to the fern, and the fern provides a habitat for the alga.

Related Theory

Frankia shows nitrogen fixation in both symbiotic association with actinorhizal plants, Casuarina and free-living aerobic conditions, while most rhizobia fixes nitrogen in symbiotic form only.

21. (A) Thermoacidophiles are temperature and acid loving archaebacteria 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 oxidise sulphur to H_2SO_4 at high temperature and high acidity (pH = 2.0). Some of them are also able to reduce sulphur to H_2S under anaerobic conditions. They grow best between 80°–120°C and several species do not grow below 80°C.

22. (B) The blue green algae that grow in hot springs are called thermophytes. They are able to live in water having temperature as high as 85°C, because of protein molecules and their homopolar bonds in the protoplasm help the cells to face the extreme heat.

23. (C) Euglenoids perform photosynthesis during sunlight, but in the absence of light, it adopts the hetrotrophic mode of nutrition, there is switching between photosynthetic and heterotrophic mode.

Plasmodium live in humans as parasite and cause disease called malaria.

Slime moulds are saprophytic protists.

Dinoflagellates are mostly photosynthetic autotrophs.

24. (D) Ciliates consist of two types of nuclei, meganucleus and micronucleus. Meganucleus controls metabolism while micronucleus is considered in reproduction. *E.g., Paramoecium*. In protozoan, single nucleus is present, which is involved in both metabolism and reproduction. Ciliates use filter feeding mechanism, while protozoans form pseudopodia. Both protozoan and ciliates have contractile vacuole. Ciliates possess cilia for locomotion.

Related Theory

The two types of nucleus are:

(1) ***Macronucleus:*** *Macronucleus is kidney like or ellipsoidal in shape. It is densely packed within the DNA (chromatin granules). The macronucleus controls all the vegetative functions of Paramoecium and hence, called the vegetative nucleus.*

(2) ***Micronucleus:*** *The micronucleus is found close to the macronucleus. It is a small and compact structure, spherical in shape. The fine chromatin threads and granules are uniformly distributed throughout the cell and control reproduction of the cell. The number in a cell varies from species to species. There is no nucleolus present in P. caudatum.*

25. (B) Diatoms are the chief producers in the oceans and contribute about 40% of marine primary productivity. They constitute a major group of unicellular eukaryotic microalgae and are among the most common types of phytoplanktons.

Related Theory

Diatoms plays an important role in cases involving suspicion related to ante-mortem and post-mortem deaths. Diatoms do not occur naturally in the human body. If diatoms are found in the body, and are of the same species found in the water, where the body was recovered, then it may be a good evidence of drowning as the cause of death.

26. (A) All eukaryotic unicellular organisms are classified into Kingdom Protista. These include chrysophytes, euglenoids, dinoflagellates and slime moulds.

Related Theory

Characteristics of Protists:

(1) Unicellular

(2) Can be heterotrophic or autotrophic

(3) Mostly live in water (though some live in moist soil or even the human body)

(4) All are eukaryotic (have a well defined nucleus)

27. (A) Diatoms are the microscopic, single-celled eukaryotic algae, with siliceous cell walls. They are the chief source of zooplankton food in the marine food chain. They are responsible for the production of 20-25% of the global oxygen. They are microscopic and float passively in water. Diatomaceous earth is made from the fossilized remains, diatoms frustules. These frustules are made of silica and are indestructible.

28. (A) 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. Euglenoids includes *Euglena* and dinoflagellates, which lacks cell wall. Slime moulds are protists and have cellulosic cell walls.

29. (D) Cyanobacteria commonly known as blue-green algae, are not truly eukaryotic algae. They are Gram-negative prokaryotes, perform oxygenic photosynthesis, and also fix atmospheric N_2. They are ubiquitous in ponds, lakes, water streams, rivers, and wetlands.

Related Theory

The other great contribution of the cyanobacteria is in the origin of plants. The chloroplast with which plants make food for themselves is actually a cyanobacterium living within the plant's cells.

30. (A) *Physarum polycephalum*, often referred to as the "many-headed slime," is a slime mould that inhabits shady, cool, moist areas, such as decaying leaves and logs. *Thiobacillus, Anabaena* and *Rhizopus* are examples of prokaryotes.

31. (C) The thalloid body of Myxomycetes is called plasmodium. It is a multinucleate diploid body which propagates through fission or thick-walled cysts or sclerotium-like structures. Fruiting bodies and mycelium are absent in lower fungi. Protonema is a leafy sporophytic stage, which is not formed in fungi, but in bryophytes.

Related Theory

The members of Myxomycetes are called slime moulds because they contain and secrete slime. They are included in lower fungi. Their somatic phase is a multinucleate, diploid holocarpic plasmodium (a product of syngamy). Reproduction takes place by the formation of uninucleate, thick-walled resting spores which are produced within minute fruiting bodies like structures i.e., the sporangia, however, the true fruiting bodies are absent in slime moulds.

32. (B) *Trypanosoma gambiense* is the single celled, parasitic zooflagellate causing trypanosomiasis or sleeping sickness. *Giardia* is a parasitic flagellate unicellular eukaryote occurring in the intestine of man and other animals and causes giardiasis or diarrhoea (*i.e.*, very loose and frequent stool containing large quantity of fat). *Noctiluca* is a single-celled marine, colourless dinoflagellate. It is a voracious predator and has a long, motile tentacle, near the base of which, its single short flagellum emerges. *Monocystis* is a microscopic, unicellular endoparasitic protozoan found in the coelom and seminal vesicles of earthworm. As it is an endoparasite, it does not possess any special structure for locomotion.

33. (D) Auxospores are formed in diatoms and hormocysts are formed in cyanobacteria. Cyanobacteria reproduce asexually through fragmentation, hormogonia, akinetes and endospores. Hormocysts are found in certain cyanobacteria that help in reproduction. Auxospore is a stage of sexual reproduction in the life cycle of diatoms.

34. (A) *Euglena* is considered as the connecting link between plants and animals. It has chlorophyll, thus it carry out photosynthesis in presence of sunlight (autotrophic) like plants. In the absence of sunlight, *Euglena* shows holozoic nutrition and ingests the food from the outside, like animals. It also shows flagellated locomotion like animals.

35. (B) *Trypanosoma* belongs to class zooflagellata which comes under the group mastigophora. The members of this group are either free living or parasitic. They have flagella.

36. (C) Yeast is a unicellular fungus, which lacks filamentous structures called hyphae. However, they form short temporary filamentous structures called pseudomycelium.

37. (C) Saprophytes are the decomposers which helps in the decomposition of dead organic matter, e.g., *Agaricus*. Parasites are the entities which live on the other organisms (either plants or animals) and derive nutrition from them. e.g., tapeworm in humans. Lichens are the symbiotic association of fungi and algae. Mycorrhiza is symbiotic association of fungi and plant roots.

Related Theory

Brood parasitism is a form of kleptoparasitism. Brood parasites manipulate the behaviour of the host so that the host raises the young of the parasite instead of the host's own young. A well-known example of brood parasitism in birds is that of the cuckoo. Cuckoo leaves its eggs in the crow's nest. The egg of cuckoo hatches and matures for some period of time in the crow's nest and then flies away. There are also many species of insect brood parasite. Brood parasitoids are parasites that kill the host's offspring during the course of their own development.

Caution

In the given question, students might get confused in matching lichens and mycorrhiza. Lichens are the symbiotic association of fungi with algae whereas mycorrhiza are symbiotic association of fungi with plant roots.

38. (A) In Basidiomycetes (*Agaricus*), meiospores are produced exogenously after karyogamy and meiosis. In Deuteromycetes (*Alternaria*), sexual reproduction is absent and hence sexual spores are not formed. In Ascomycetes (*Neurospora and Saccharomyces*), endogenous ascospores are produced as meiospores.

39. (D) In fungi, cell wall is composed of chitin, while in plants, cell wall is composed of cellulose and hemicellulose. In bacteria, cell wall is made up of peptidoglycan.

Related Theory

Chitin is a modified polysaccharide, synthesised from N-acetyl-D-glucosamine. These units form covalent β-(1→4)-linkages. Chitin is found in the exoskeletons of insects, the cell walls of fungi, and certain hard structures in invertebrates and fishes. It is second most abundant natural polymer on earth.

40. (B) Chitinous cell wall is a characteristic feature of fungi. Fungi are heterotrophic eukaryotic organisms having filamentous body called mycelium. They are both multicellular (mushrooms) and unicellular (yeast) organisms.

Related Theory

Some fungi, e.g., Phytophthora consists of cellulosic cell wall.

41. (B) Eubacteria are known as true bacteria. Desmids are known as golden algae due to its characteristic golden colour because of the presence of a pigment fucoxanthin and the use of oil droplets which act as food reserves. Phycomycetes are also called algal fungi because they are aquatic in habitat and form thalli body. Cyanobacteria are also called blue green algae because of the presence of blue and green photosynthetic pigments.

Related Theory

Eubacteria are prokaryotic cells with bacterial rRNA and contain diacyl glycerol diester lipids in their membrane. Their cell membrane contains ester linkage between unbranched fatty acid chains and glycerol. Their cell wall is made up of peptidoglycan.

42. (A) Deuteromycetes are called imperfect fungi as they do not show sexual reproduction. Basidiomycetes are known as club fungi because it can bear millions of spores on club-shaped basidia located on the surface of its gills. Ascomycetes are called sac fungi because they form a sac-like structure called ascus which contains the sexual spores (ascospores) produced by the fungi. Phycomycetes are commonly known as algal-fungi because of their aquatic habitat and form of thallus.

Related Theory

Reproduction in deuteromycetes may occur through different forms i.e., spores, or conidia, produced directly on the mycelium or conidiophore. Some of these fungi do not produce spores. Such fungi are able to propagate themselves by fragmenting the hyphae or by producing a mass of hyphae called a sclerotium.

Caution

Students should remember that except deuteromycetes, all fungi shows sexual reproduction.

43. (B) *Alternaria* is a deuteromycetes, which lacks sexual reproduction. *Phytophthora* is a unicellular fungus with non-septate coenocytic mycelium. *Mucor* is a multinucleate, coenocytic, branched fungi with mycelium. They reproduce by conjugation. They both belong to phycomycetes. *Agaricus* is a basidiomycetes, with well-developed filaments, branched and septate mycelium, they are saprophytic fungi.

Caution

According to taxomony of Fungi, "-mycota" is used to designate a phylum while "-mycetes" formally denotes a class.

44. (B) Fungi are eukaryotic, non-vascular, non-motile and heterotrophic organisms. They may be unicellular or filamentous and reproduce by means of spores. They exhibit the phenomenon of alternation of generation and lack chlorophyll and hence cannot perform photosynthesis. They have chitinous cell wall.

Related Theory

The vegetative body of the fungi may be unicellular or composed of microscopic threads called hyphae. Hyphae can grow and form a network called a mycelium. Yeasts are unicellular fungi that do not produce hyphae. The cell membrane of a fungus has a unique sterol and ergosterol.

45. (A) Kingdom Protista includes all unicellular eukaryotic organisms like diatoms, dinoflagellates, slime moulds, sarcodina, *etc*. Fungi represents a group of eukaryotic, chlorophyllous, non-photosynthetic heterotrophic organism of diverse forms, sizes, physiology and mode of reproduction.

46. (A) The causative agent of late blight of potato is a fungus *Phytophthora infestans*.

47. (D) Bird's nest fungi *(Cyathus)*, puffballs *(Lycoperdon)*, Mushrooms *(Agaricus)*, Stink horn – Basidiomycetes

Claviceps, Peziza, Morchella – Ascomycetes

48. (C) Ergot of rye is a plant disease that is caused by the fungus *Claviceps purpurea*. The ergot that replaces the grain of the rye is a dark, purplish sclerotium, from which the sexual stage of the life cycle will form after over wintering.

Related Theory

Corn smut is caused by the fungus Ustilago maydis. Powdery mildew of grapes is caused by fungus Uncinula necator. Root and stem rot is caused by Phytophthora sojae.

49. (C) *Mucor* is a saprophytic fungus. It grows on decaying dung and some food stuffs. It shows the best growth on a piece of bread at about 25°C with relative humidity of about 95% in moist and shady places.

Related Theory

Mucor is a genus of mould. They are formed from thread-like hyphae that spread out from a visible mycelium. It causes mucormycosis. Most people develop this infection by breathing in mould spores. Less often, infection can develop when spores enter the body through a cut or open wound. It was much prevalent during second wave of COVID-19 (as black fungus) in 2021 in India.

50. (A) Lichens are unique, organisms that consist of two unrelated components, an alga and/or cyanobacterium (phycobiont) and a fungus (mycobiont).

51. (D) Lichens have a body called a thallus, an outer, tightly packed fungal layer called a cortex, and an inner, loosely packed fungal layer called a medulla. Lichens use hyphal bundles called rhizines to attach to the substrate. Lichens are the symbiotic relation that consist of two unrelated components, an algae and/or cyanobacterium and a fungus.

52. (A, B) *Aspergillus flavus* grows on stored cereal grains, groundnut and areca nut and produces a carcinogenic toxin called aflatoxin. *Penicillium* produces yellow rice toxins in rice, barley and corns.

53. (A) Sporozoans are endoparasites. All endoparasites lack locomotory structures, like cilia, flagella, pseudopodia, *etc*. Mushrooms are fungi, belonging to class basidiomycetes. In plant cells, cell wall is made up of cellulose and pectin, while in fungi, it is made of chitin. Animal cell lacks cell wall. Mitochondria is known as powerhouse of the cells, as it is involved in the production of ATP. In Monera, mitochondria is absent.

54. (A) Mycoplasma are the free living prokaryotes that lack cell wall. Plasma membrane forms the outer boundary of the cell of mycoplasma.

55. (C) *Anabaena* lacks a true nucleus and other cell organelles. *Anabaena* is a blue-green alga belonging to Monera (Prokaryotic kingdom). Hence, it lacks a well-defined or true nucleus.

56. (D) *Nostoc* is an example of blue-green algae that lacks true nucleus, and thus, nuclear membrane is also absent.

57. (B) Fungi are special type of organisms, which are always heterophytes. While algae, bryophytes and pteridophytes are chlorophyll containing green plants and are autotrophic.

58. (B) Monera is a prokaryotic, unicellular organism that lacks a clearly defined nucleus and cell organelles that are connected to the nuclear membrane.

Related Theory

Animal cells lack cell walls because they do not require them; plant cells do, though. As eukaryotes, protista display a variety of feeding strategies. For example, some protistan creatures are photosynthetic autotrophs, producing their own food with the help of sunlight, while others are heterotrophs (depends on other organisms for food).

➥ *Fungi are eukaryotes, not green plants, and they produce spores. Some of the most potent medicinal characteristics are found in fungi, including those that prevent and treat heart disease and cancer.*

59. (B) Phylum Cnidaria of class Anthozoa includes *Gorgonia* (animal). *Gorgonia* resembles the sea pen, a soft coral, and are sometimes known as sea whips or sea fans. These multicellular sea invertebrates lack cell walls, which is a trait of plant kingdom, contain tissues (organised groupings of cells), and they are all heterotrophic, meaning that they cannot produce their own food and must rely on other species for sustenance.

60. (B) Infective constituent in virus is the genetic material, *i.e.*, DNA and RNA, not protein coats. Viruses are obligate parasites, *i.e.*, they are found everywhere. Prions are misfolded proteins with the ability to transmit their misfolded shape onto normal variants of the same protein. Viroids are small infectious pathogens. They are composed solely of a short strand of circular, single-stranded RNA that lack protein coating.

61. (D) Viroids are free RNA molecules of low molecular weight without any protein coat while viruses can have either RNA or DNA molecules encapsulated in a protein coat. Viroids infect only plants whereas virus infects all types of organisms.

Related Theory

➥ *Prions are misfolded proteins with the ability to transmit their misfolded shape onto normal variants of the same protein. They characterise several fatal and transmissible neurodegenerative diseases in people and many other animals. Prions do not contain genetic materials such as DNA or RNA. The unique traits and genetic information of prions are believed to be encoded within the conformational structure and post translational modifications of the proteins.*

Caution

➥ *Viroids do not contain DNA. They synthesise DNA using host cell machinery, (reverse transcription) and then transcript back to multiply and cause infection.*

62. (C) Viroids are small, circular, single stranded RNA molecules without protein coat. Viroid's RNA has a low molecular weight. Viroids are known to cause different plant diseases.

Related Theory

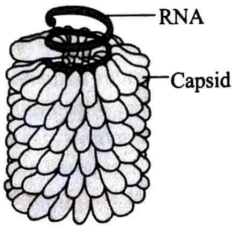
➥ *Difference between Viruses, Viroids and Prions are:*

Viruses	*Viroids*	*Prions*
Obligate intracellular agents.	*Obligate intracellular agents.*	*Abnormal form of a cellular protein.*
Consist of either DNA or RNA, surrounded by a protein coat.	*Consist of only RNA; no protein coat.*	*Consist of only protein; no DNA or RNA.*

➥ *Viroids are subviral particles described as non-self-replicating ssRNAs that require other helper viruses to establish an infection.*

63. (A) Viroids were discovered by T.O. Diener, while D.J. Ivanowski discovered the first virus, Tobacco Mosaic Virus (TMV). *Contagium vivum fluidum* is a Latin term, suggested in 1898 by M.W. Beijerinck to describe a virus as being liquid. Stanley crystallised Tobacco Mosaic Virus and found that it is a rod-shaped aggregate of protein and nucleic acid molecules.

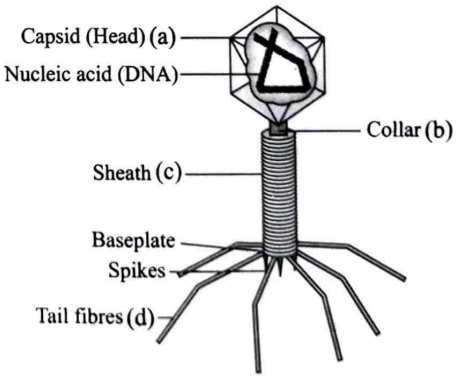
64. (B) In Tobacco Mosaic Virus, genetic material RNA is single stranded, helical, coiled structure covered by capsomeres (basic unit of proteinaceous outer covering, called capsid).



Tobacco Mosaic Virus

65. (B) The nucleocapsid of virus is of two types: rod shaped and spherical shaped. Rod shaped virus have helical symmetry, while spherical viruses have icosahedral symmetry. All virus are either plant or animal pathogens and have ability to synthesise nucleic acids and proteins, showing all phenomenon like replication, transcription, reverse transcription and translation. Antibiotics are chemical compounds that act against the bacteria, not virus.

66. (C) The structure of a Bacteriophage is as follows:



Bacteriophage

Related Theory

➥ *A bacteriophage is composed of nucleic acid surrounded by a protein structure. It attaches itself to the bacterium and infects the host cell. It also utilises the host machinery to multiply and produce viral components. The new bacteriophages produced assemble and burst out of the bacterium through cell lysis.*

67. (A) Theodor Otto Diener discovered infectious RNA particles called viroids, which are the causative agents of the potato spindle tuber disease. They are not a virus, but completely unique agents, which consists solely of a brief strand of single-stranded RNA without protein capsid.

Related Theory

➥ *Viroids are small, circular, naked, single stranded RNA molecules that are the smallest known pathogens. Even, the RNA molecule contains no protein encoding genes and therefore, the viroid is totally dependent on host function for its replication. No viroid diseases of animals are known yet.*

68. (C) Mad cow disease, or Bovine Spongiform Encephalopathy (BSE), is a disease that was first found in cattle and is caused by a prion.

Related Theory

➥ *Prions are the infectious agents responsible for several neurodegenerative diseases in mammals. This happens due to the abnormal folding of the proteins in the brain. It refers to the hypothesis that the infectious agents causing the diseases contain only proteins. It explained why the infectious agents are resistant to ultraviolet radiations. They can break down the nucleic acids, but are receptive to substances that denature proteins.*

69. (C) Bacteriophage is a kind of virus that can infect bacteria and start replicating inside the bacterial cell because the lysis represents the lytic cycle.

Lysogenic cycle allows the host cell to continue to survive and reproduce, the virus is reproduced in all of the cell's offspring.

Any hormone (such as epinephrine, glucagon, and cortisol) that promotes release of free fatty acids from fat tissue is known as lipolytic.

Lysozyme is a naturally occurring enzyme found in bodily secretions such as tears, saliva, and milk and acts as an antimicrobial agent.

Related Theory

➥ *Human lysozyme acts as a physiological barrier in immune system against some bacteria. It is found in abundance in tears, saliva and mucus.*

70. (D) Outside of the host cell, viruses do not use any energy. They only become active when they come into contact with a host cell. Once activated, they use the host cell's energy and tools to make more viruses. Because they do not use their own energy, some scientists do not consider them alive.

71. (C) Viruses consist of 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 require living host cell for multiplication, while they take over the machinery of the host cell. Thus, viruses are obligatory intercellular parasites.

Related Theory

➥ *Viruses can infect all cellular life forms, but each cellular species can be infected by own limited specific range of viruses. Most viruses that harm animals can not harm humans.*

➥ *Capsid is the protein coat made up of small units called capsomeres.*

72. (A) Transduction is the process of transferring the bacterial DNA from one bacteria to another with the help of a bacteriophage. The bacterial DNA can then be incorporated into the genome of the host bacterial cell.

Related Theory

➥ *Transduction, a process of genetic recombination in bacteria in which genes from a host cell (a bacterium) are incorporated into the genome of a bacterial virus (bacteriophage) and then carried to another host cell when the bacteriophage initiates another cycle of infection.*

73. (A) Transduction is the process of transfer of genetic material from one bacterium to another through a virus. Viruses called bacteriophages are able to infect bacterial cells and use them as hosts to make more viruses. After multiplying on the host bacterial cell, bacteriophages assemble and occasionally remove a portion of the host DNA. Later, when one of these bacteriophages infects a new host cell, the piece of bacterial DNA may be incorporated into the genome of the new host.

74. (B) In the process of transduction, genetic material of one bacteria goes to other bacteria by agency of bacteriophages (viruses infecting bacteria). The process does not require physical contact between the donor cell and the receiver cell but however, involves the action of bacteriophages.

Related Theory

➥ *Transduction is the transfer of foreign genes by means of viruses. It was first of all reported by Zinder and Lederberg (1952) in Salmonella typhimurium. Transduction is used for gene mapping and analysis in bacteria and also for strain construction.*

75. (B) Lichens are often used as an indicator of pollution and are very sensitive to SO_2. They prefer to grow in pollution free environment.

76. (C) Algae or cyanobacteria, along with fungi, form lichens in a symbiotic relationship. However, lichens are susceptible to contaminants and often develop in pollution free environment. This has led to their widespread usage as biological SO_2 pollution indicator.

77. (A) The criteria for Five Kingdom Classification are:

(1) **Cell structure complexity:** Prokaryotic and eukaryotic cells.

(2) **The complexity of body structure or structural organisation:** Unicellular/ multicellular/tissue/organ/organ system.

(3) **Mode of nutrition:** Photo-autotrophic (Plantae), absorptive heterotrophic (fungi), and ingestive heterotrophic (Animalia).

(4) **Mode of reproduction.**

(5) **Phylogenetic relationships:** Prokaryotes to eukaryotes, unicellular to multicellular organisms.

Related Theory

➥ ***Limitations of Whittaker's Five Kingdom:*** *It did not differentiate between unicellular and multicellular algae, because Whittaker included the unicellular green algae in the Kingdom Protista but multicellular algae in Kingdom Plantae. However, both the organisms must belong to same group. Viruses are also not included in this classification.*

78. (C) Monerans possess the most extensive metabolic diversity. Some bacteria are autotrophic, while some of them are heterotrophic in their mode of nutrition.

79. (A) *Chlamydomonas* and *Chlorella* has been placed under the Kingdom Protista. These were earlier placed in Algae within Plantae.

80. (C) According to the five kingdom classification of R.H. Whittaker, organisms are divided into five kingdoms including Monera, Protista, Fungi, Plantae, and Animalia. The Kingdom Monera is considered, the most primitive group, which includes all prokaryotes such as mycoplasma, bacteria, actinomycetes and cyanobacteria (BGA).

Mnemonics

➥ *Five Kingdoms can be memorised as:*
Masterji Padha rahe the, Fir Principal Aaye

Masterji	—	***Monera***
Padha rahe the,	—	***Protista***
Fir	—	***Fungi***
Principal	—	***Plantae***
Aaye	—	***Animalia***

81. (B) The main criteria of the five kingdom classification were cell structure, body organisation, mode of nutrition, reproduction, and phylogenetic relationships.

Related Theory

➥ *The animal kingdom is classified on the basis of levels of organisation, body symmetry, germinal layers, nature of coelom, segmentation and presence or absence of notochord.*

82. (B) Cyanobacteria or blue-green algae (BGA) are Gram (+) photosynthetic prokaryotes which perform oxygenic photosynthesis and are placed under Kingdom Monera.

83. (B) An important criterion for modern day classification is anatomical and physiological traits. The basis of modern day classification is the comparison of the similarities and differences of the morphological, anatomical, physiological and some other characteristics of the organism.