

CHAPTER
8

Cell- The Unit of Life

8.1 What is a Cell?

1. A major breakthrough in the studies of cells came with the development of electron microscope. This is because
 - (a) the electron microscope is more powerful than the light microscope as it uses a beam of electrons which has wavelength much longer than that of photons
 - (b) the resolving power of the electron microscope is much higher than that of the light microscope
 - (c) the resolving power of the electron microscope is 200 - 350 nm as compared to 0.1 - 0.2 nm for the light microscope
 - (d) electron beam can pass through thick materials, whereas light microscopy requires thin sections.(2006)
2. A student wishes to study the cell structure under a light microscope having 10X eyepiece and 45X objective. He should illuminate the object by which one of the following colours of light so as to get the best possible resolution?
 - (a) Blue
 - (b) Green
 - (c) Yellow
 - (d) Red(2005)
3. Electron microscope has a high resolution power. This is due to
 - (a) electromagnetic lenses
 - (b) very low wavelength of electron beam
 - (c) low wavelength of light source used
 - (d) high numerical aperture of glass lenses used.(1992, 1990)
4. Magnification of compound microscope is not connected with
 - (a) numerical aperture
 - (b) focal length of objective
 - (c) focal length of eye piece
 - (d) tube length.(1990)

8.2 Cell Theory

5. The concept of "Omnis cellula-e-cellula" regarding cell division was first proposed by

(a) Aristotle (b) Rudolf Virchow
(c) Theodore Schwann (d) Schleiden.

(NEET 2019)

6. Which is correct about cell theory in view of current status of our knowledge about cell structure?
 - (a) It needs modification due to discovery of subcellular structures like chloroplasts and mitochondria.
 - (b) Modified cell theory means that all living beings are composed of cells capable of reproducing.
 - (c) Cell theory does not hold good because all living beings (e.g., viruses) do not have cellular organisation.
 - (d) Cell theory means that all living objects consist of cells whether or not capable of reproducing.(1993)

7. Names of Schleiden and Schwann are associated with
 - (a) protoplasm as the physical basis of life
 - (b) cell theory
 - (c) theory of cell lineage
 - (d) nucleus functions as control centre of cell.(1993)

8.3 An Overview of Cell

8. Angstrom (\AA) is equal to
 - (a) 0.01 mm
 - (b) 0.001 mm
 - (c) 0.0001 mm
 - (d) 0.00001 mm.(1992)
9. Organelles can be separated from cell homogenate through
 - (a) chromatography
 - (b) X-rays diffraction
 - (c) differential centrifugation
 - (d) auto-radiography.(1989)

8.4 Prokaryotic Cells

10. Which of the following statements about inclusion bodies is incorrect?
 - (a) They are not bound by any membrane.
 - (b) These are involved in ingestion of food particles.
 - (c) They lie free in the cytoplasm.
 - (d) These represent reserve material in cytoplasm.(NEET 2020)

11. Select the wrong statement.
 (a) Bacterial cell wall is made up of peptidoglycan.
 (b) Pili and fimbriae are mainly involved in motility of bacterial cells.
 (c) Cyanobacteria lack flagellated cells.
 (d) *Mycoplasma* is a wall-less microorganism.
 (NEET-II 2016)

12. Which of the following structures is not found in a prokaryotic cell?
 (a) Mesosome (b) Plasma membrane
 (c) Nuclear envelope (d) Ribosome (2015)

13. The structures that help some bacteria to attach to rocks and/or host tissues are
 (a) mesosomes (b) holdfast
 (c) rhizoids (d) fimbriae. (2015)

14. Which one of the following is not an inclusion body found in prokaryotes?
 (a) Glycogen granule (b) Polysome
 (c) Phosphate granule (d) Cyanophycean granule (2015 Cancelled)

15. Which structures perform the function of mitochondria in bacteria?
 (a) Nucleoid (b) Ribosomes
 (c) Cell wall (d) Mesosomes (2014)

16. The motile bacteria are able to move by
 (a) fimbriae (b) flagella
 (c) cilia (d) pili. (2014)

17. Why is a capsule advantageous to a bacterium?
 (a) It protects the bacterium from desiccation.
 (b) It provides means of locomotion.
 (c) It allows bacterium to "hide" from host's immune system.
 (d) It allows the bacterium to attach to the surface.
 (Karnataka NEET 2013)

18. The term 'glycocalyx' is used for
 (a) a layer present between cell wall and membrane of bacteria
 (b) cell wall of bacteria
 (c) bacterial cell glyco-engineered to possess N-glycosylated proteins
 (d) a layer surrounding the cell wall of bacteria.
 (Karnataka NEET 2013)

19. Chromosomes in a bacterial cell can be 1 – 3 in number and
 (a) are always circular (b) are always linear
 (c) can be either circular or linear, but never both within the same cell
 (d) can be circular as well as linear within the same cell. (2003)

20. Photosynthetic bacteria have pigments in
 (a) chromatophores (b) chromatophores
 (c) leucoplasts (d) chloroplasts. (1999)

21. The site of respiration in bacteria is
 (a) ribosome (b) microsome
 (c) episome (d) mesosome. (1997)

8.5 Eukaryotic Cells

22. Which is the important site of formation of glycoproteins and glycolipids in eukaryotic cells?
 (a) Endoplasmic reticulum
 (b) Peroxisomes (c) Golgi bodies
 (d) Polysomes (NEET 2020)

23. Which of the following statements is not correct?
 (a) Lysosomes are formed by the process of packaging in the endoplasmic reticulum.
 (b) Lysosomes have numerous hydrolytic enzymes.
 (c) The hydrolytic enzymes of lysosomes are active under acidic pH.
 (d) Lysosomes are membrane-bound structures. (NEET 2019)

24. Which of the following statements regarding mitochondria is incorrect?
 (a) Mitochondrial matrix contains single circular DNA molecule and ribosomes.
 (b) Outer membrane is permeable to monomers of carbohydrates, fats and proteins.
 (c) Enzymes of electron transport are embedded in outer membrane.
 (d) Inner membrane is convoluted with infoldings. (NEET 2019)

25. The shorter and longer arms of a submetacentric chromosome are referred to as
 (a) m-arm and n-arm respectively
 (b) s-arm and l-arm respectively
 (c) p-arm and q-arm respectively
 (d) q-arm and p-arm respectively. (NEET 2019)

26. Which of the following pairs of organelles does not contain DNA?
 (a) Nuclear envelope and Mitochondria
 (b) Mitochondria and Lysosome
 (c) Chloroplast and Vacuoles
 (d) Lysosomes and Vacuoles (NEET 2019)

27. Match the column I with column II.

Column-I	Column-II
A. Golgi apparatus	(i) Synthesis of protein
B. Lysosomes	(ii) Trap waste and excretory products
C. Vacuoles	(iii) Formation of glycoproteins and glycolipids
D. Ribosomes	(iv) Digesting biomolecules

Choose the right match from options given below.

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

28. Which of the following is true for nucleolus?
 (a) Larger nucleoli are present in dividing cells.
 (b) It is a membrane-bound structure.
 (c) It takes part in spindle formation.
 (d) It is a site for active ribosomal RNA synthesis.
 (NEET 2018)

29. The Golgi complex participates in
 (a) fatty acid breakdown
 (b) formation of secretory vesicles
 (c) respiration in bacteria
 (d) activation of amino acid. (NEET 2018)

30. Which of the following events does not occur in rough endoplasmic reticulum?
 (a) Protein folding (b) Protein glycosylation
 (c) Cleavage of signal peptide
 (d) Phospholipid synthesis (NEET 2018)

31. Select the incorrect match.
 (a) Lampbrush – Diplotene bivalents chromosomes
 (b) Allosomes – Sex chromosomes
 (c) Sub-metacentric – L-shaped chromosomes
 (d) Polytene – Oocytes of amphibians (NEET 2018)

32. Which of the following cell organelles is responsible for extracting energy from carbohydrates to form ATP?
 (a) Ribosome (b) Chloroplast
 (c) Mitochondrion (d) Lysosome
 (NEET 2017)

33. Select the mismatch.
 (a) Gas vacuoles – Green bacteria
 (b) Large central vacuoles – Animal cells
 (c) Protists – Eukaryotes
 (d) Methanogens – Prokaryotes (NEET-II 2016)

34. A cell organelle containing hydrolytic enzymes is
 (a) lysosome (b) microsome
 (c) ribosome (d) mesosome.
 (NEET-II 2016)

35. Mitochondria and chloroplast are
 (A) semi-autonomous organelles
 (B) formed by division of pre-existing organelles and they contain DNA but lack protein synthesising machinery.
 Which one of the following options is correct?
 (a) (A) is true but (B) is false.
 (b) Both (A) and (B) are false.
 (c) Both (A) and (B) are correct.
 (d) (B) is true but (A) is false. (NEET-I 2016)

36. Microtubules are the constituents of
 (a) centrioles, spindle fibres and chromatin
 (b) centrosome, nucleosome and centrioles
 (c) cilia, flagella and peroxisomes
 (d) spindle fibres, centrioles and cilia.
 (NEET-I 2016)

37. Which one of the following cell organelles is enclosed by a single membrane?
 (a) Lysosomes (b) Nuclei
 (c) Mitochondria (d) Chloroplasts
 (NEET-I 2016)

38. Water soluble pigments found in plant cell vacuoles are
 (a) carotenoids (b) anthocyanins
 (c) xanthophylls (d) chlorophylls.
 (NEET-I 2016)

39. Match the columns and identify the correct option.

Column I	Column II
A. Thylakoids	(i) Disc-shaped sacs in Golgi apparatus
B. Cristae	(ii) Condensed structure of DNA
C. Cisternae	(iii) Flat membranous sacs in stroma
D. Chromatin	(iv) Infoldings in mitochondria

 (a) A-(iii), B-(i), C-(iv), D-(ii)
 (b) A-(iii), B-(iv), C-(ii), D-(i)
 (c) A-(iv), B-(iii), C-(i), D-(ii)
 (d) A-(iii), B-(iv), C-(i), D-(ii) (2015)

40. Cellular organelles with membranes are
 (a) endoplasmic reticulum, ribosomes and nuclei
 (b) lysosomes, Golgi apparatus and mitochondria
 (c) nuclei, ribosomes and mitochondria
 (d) chromosomes, ribosomes and endoplasmic reticulum. (2015)

41. Which of the following are not membrane bound?
 (a) Lysosomes (b) Mesosomes
 (c) Vacuoles (d) Ribosomes (2015)

42. DNA is not present in
 (a) nucleus (b) mitochondria
 (c) chloroplast (d) ribosomes.
 (2015 Cancelled)

43. Nuclear envelope is a derivative of
 (a) microtubules
 (b) rough endoplasmic reticulum
 (c) smooth endoplasmic reticulum
 (d) membrane of Golgi complex. (2015 Cancelled)

44. The structures that are formed by stacking of organised flattened membranous sacs in the chloroplasts are
 (a) stroma lamellae (b) stroma
 (c) cristae (d) grana.
 (2015 Cancelled)

45. Select the correct matching in the following pairs.
 (a) Rough ER – Synthesis of glycogen
 (b) Rough ER – Oxidation of fatty acids
 (c) Smooth ER – Oxidation of phospholipids
 (d) Smooth ER – Synthesis of lipids
 (2015 Cancelled)

46. The chromosomes in which centromere is situated close to one end are
 (a) telocentric (b) sub-metacentric
 (c) metacentric (d) acrocentric.
 (2015 Cancelled)

47. The solid linear cytoskeletal elements having a diameter of 6 nm and made up of a single type of monomer are known as
 (a) microtubules (b) microfilaments
 (c) intermediate filaments
 (d) lamins. (2014)

48. The osmotic expansion of a cell kept in water is chiefly regulated by
 (a) mitochondria (b) vacuoles
 (c) plastids (d) ribosomes. (2014)

49. Match the following and select the correct answer.
 (A) Centriole (i) Infoldings in mitochondria
 (B) Chlorophyll (ii) Thylakoids
 (C) Cristae (iii) Nucleic acids
 (D) Ribozymes (iv) Basal body of cilia or flagella

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

 (2014)

50. The Golgi complex plays a major role
 (a) as energy transferring organelles
 (b) in post translational modification of proteins and glycosylation of lipids
 (c) in trapping the light and transforming it into chemical energy
 (d) in digesting proteins and carbohydrates.
 (NEET 2013)

51. Which one of the following organelle in the figure correctly matches with its function?
 (a) Golgi apparatus, formation of glycolipids
 (b) Rough endoplasmic reticulum, protein synthesis
 (c) Rough endoplasmic reticulum, formation of glycoproteins
 (d) Golgi apparatus, protein synthesis (NEET 2013)

52. A major site for synthesis of lipids is
 (a) symplast (b) nucleoplasm
 (c) RER (d) SER (NEET 2013)

53. Which of the following types of plastid does not contain stored food material?
 (a) Chromoplasts (b) Elaioplasts
 (c) Aleuroplasts (d) Amyloplasts



54. Select the alternative giving correct identification and function of the organelle 'A' in the diagram.

- Mitochondria - Produce cellular energy in the form of ATP
- Golgi body - Provides packaging material
- Lysosomes - Secrete hydrolytic enzymes
- Endoplasmic reticulum - Synthesis of lipids

(Karnataka NEET 2013)

55. Select the correct statement from the following regarding cell membrane.

- Na^+ and K^+ ions move across cell membrane by passive transport.
- Proteins make up 60 to 70% of the cell membrane.
- Lipids are arranged in a bilayer with polar heads towards the inner part.
- Fluid mosaic model of cell membrane was proposed by Singer and Nicolson. (2012)

56. What is true about ribosomes?

- The prokaryotic ribosomes are 80S, where "S" stands for sedimentation coefficient.
- These are composed of ribonucleic acid and proteins.
- These are found only in eukaryotic cells.
- These are self-splicing introns of some RNAs. (2012)

57. Which one of the following does not differ in *E.coli* and *Chlamydomonas*?

- Ribosomes
- Chromosomal organization
- Cell wall
- Cell membrane (2012)

58. Which one of the following cellular parts is correctly described?

- Thylakoids - flattened membranous sacs forming the grana of chloroplasts
- Centrioles - sites for active RNA synthesis
- Ribosomes - those on chloroplasts are larger (80S) while those in the cytoplasm are smaller (70S)
- Lysosomes - optimally active at a pH of about 8.5 (Mains 2012)

59. Which one of the following structures is an organelle within an organelle?

- Ribosome
- Peroxisome
- ER
- Mesosome

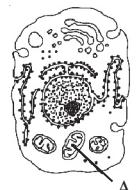
(Mains 2012)

60. Peptide synthesis inside a cell takes place in

- chloroplast
- mitochondria
- chromoplast
- ribosomes. (2011)

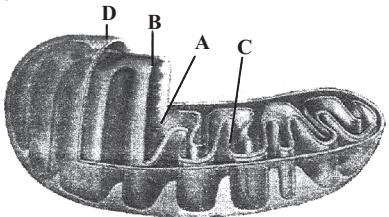
61. Important site for formation of glycoproteins and glycolipids is

- vacuole
- Golgi apparatus
- plastid
- lysosome. (2011)



62. Which one of the following is not considered as a part of the endomembrane system?
 (a) Golgi complex (b) Peroxisome
 (c) Vacuole (d) Lysosome
 (Mains 2011)

63. The figure below shows the structure of a mitochondrion with its four parts labelled A, B, C and D. Select the part correctly matched with its function.



(a) D (outer membrane) – gives rise to inner membrane by splitting
 (b) B (inner membrane) – forms infoldings called cristae
 (c) C (crista) – possesses single circular DNA molecule and ribosomes
 (d) A (matrix) – major site for respiratory chain enzymes
 (Mains 2011)

64. The plasma membrane consists mainly of
 (a) phospholipids embedded in a protein bilayer
 (b) proteins embedded in a phospholipid bilayer
 (c) proteins embedded in a polymer of glucose molecules
 (d) proteins embedded in a carbohydrate bilayer.
 (2010)

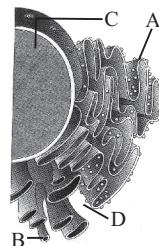
65. The main area of various types of activities of a cell is
 (a) plasma membrane (b) mitochondrion
 (c) cytoplasm (d) nucleus. (2010)

66. Which one of the following has its own DNA?
 (a) Mitochondria (b) Dictyosome
 (c) Lysosome (d) Peroxisome (2010)

67. Which one of the following structures between two adjacent cells is an effective transport pathway?
 (a) Plasmodesmata (b) Plastoquinones
 (c) Endoplasmic reticulum
 (d) Plasmalemma (2010)

68. An elaborate network of filamentous proteinaceous structures present in the cytoplasm which helps in the maintenance of cell shape is called
 (a) thylakoid
 (b) endoplasmic reticulum
 (c) plasmalemma
 (d) cytoskeleton. (Mains 2010)

69. Identify the components labelled A, B, C and D in the diagram below from the list (i) to (viii) given along with



Components :

- (i) Cristae of mitochondria
- (ii) Inner membrane of mitochondria
- (iii) Cytoplasm
- (iv) Smooth endoplasmic reticulum
- (v) Rough endoplasmic reticulum
- (vi) Mitochondrial matrix
- (vii) Cell vacuole
- (viii) Nucleus

The correct components are:

A	B	C	D
(a) (v)	(iv)	(viii)	(iii)
(b) (i)	(iv)	(viii)	(vi)
(c) (vi)	(v)	(iv)	(vii)
(d) (v)	(i)	(iii)	(ii)

(Mains 2010)

70. Middle lamella is composed mainly of
 (a) muramic acid (b) calcium pectate
 (c) phosphoglycerides (d) hemicellulose. (2009)

71. Cytoskeleton is made up of
 (a) callose deposits (b) cellulosic microfibrils
 (c) proteinaceous filaments
 (d) calcium carbonate granules. (2009)

72. Plasmodesmata are
 (a) locomotory structures
 (b) membranes connecting the nucleus with plasmalemma
 (c) connections between adjacent cells
 (d) lignified cemented layers between cells. (2009)

73. In germinating seeds, fatty acids are degraded exclusively in the
 (a) peroxisomes (b) mitochondria
 (c) proplastids (d) glyoxysomes. (2008)

74. Vacuole in a plant cell
 (a) lacks membrane and contains air
 (b) lacks membrane and contains water and excretory substances
 (c) is membrane-bound and contains storage proteins and lipids
 (d) is membrane-bound and contains water and excretory substances. (2008)

75. Keeping in view the 'fluid mosaic model' for the structure of cell membrane, which one of the following statement is correct with respect to the movements of lipids and proteins from one lipid monolayer to the other (described as flip-flop movement)?

(a) While proteins can flip-flop, lipids can not
 (b) Neither lipids, nor proteins can flip-flop
 (c) Both lipids and proteins can flip-flop
 (d) While lipids can rarely flip-flop, proteins cannot. (2008)

76. Which one of the following is not a constituent of cell membrane?
 (a) Glycolipids (b) Proline
 (c) Phospholipids (d) Cholesterol (2007)

77. Select the wrong statement from the following.
 (a) Both chloroplasts and mitochondria have an internal compartment, the thylakoid space bounded by the thylakoid membrane.
 (b) Both chloroplasts and mitochondria contain DNA.
 (c) The chloroplasts are generally much larger than mitochondria.
 (d) Both chloroplasts and mitochondria contain an inner and an outer membrane. (2007)

78. Which of the following statements regarding mitochondrial membrane is not correct ?
 (a) The outer membrane resembles a sieve.
 (b) The outer membrane is permeable to all kinds of molecules.
 (c) The enzymes of the electron transfer chain are embedded in the outer membrane.
 (d) The inner membrane is highly convoluted forming a series of infoldings. (2006)

79. Which of the following statements regarding cilia is not correct ?
 (a) Cilia contain an outer ring of nine doublet microtubules surrounding two singlet microtubules.
 (b) The organised beating of cilia is controlled by fluxes of Ca^{2+} across the membrane.
 (c) Cilia are hair-like cellular appendages.
 (d) Microtubules of cilia are composed of tubulin. (2006)

80. Chlorophyll in chloroplasts is located in
 (a) grana (b) pyrenoid
 (c) stroma
 (d) both grana and stroma. (2005)

81. According to widely accepted "fluid mosaic model" cell membranes are semi-fluid, where lipids and integral proteins can diffuse randomly. In recent years, this model has been modified in several respects. In this regard, which of the following statements is incorrect?
 (a) Proteins in cell membranes can travel within the lipid bilayer.
 (b) Proteins can also undergo flip-flop movements in the lipid bilayer.
 (c) Proteins can remain confined within certain domains of the membrane.

(d) Many proteins remain completely embedded within the lipid bilayer. (2005)

82. Centromere is required for
 (a) movement of chromosomes towards poles
 (b) cytoplasmic cleavage
 (c) crossing over (d) transcription. (2005)

83. The main organelle involved in modification and outing of newly synthesized proteins to their destinations is
 (a) chloroplast (b) mitochondria
 (c) lysosome
 (d) endoplasmic reticulum. (2005)

84. The telomeres of eukaryotic chromosomes consist of short sequences of
 (a) thymine rich repeats (b) cytosine rich repeats
 (c) adenine rich repeats (d) guanine rich repeats. (2004)

85. In chloroplasts, chlorophyll is present in the
 (a) outer membrane (b) inner membrane
 (c) thylakoids (d) stroma. (2004)

86. Ribosomes are produced in
 (a) nucleolus (b) cytoplasm
 (c) mitochondria (d) Golgi body. (2002)

87. In fluid mosaic model of plasma membrane
 (a) upper layer is non-polar and hydrophilic
 (b) upper layer is polar and hydrophobic
 (c) phospholipids form a bimolecular layer in middle part
 (d) proteins form a middle layer. (2002)

88. Element necessary for the middle lamella is
 (a) Ca (b) Zn
 (c) K (d) Cu. (2001)

89. Microtubules are absent in
 (a) mitochondria (b) flagella
 (c) spindle fibres (d) centrioles. (2001)

90. Lysosome contains
 (a) oxidative enzymes (b) hydrolytic enzymes
 (c) reductive enzymes (d) anabolic enzymes. (2000)

91. Which of the following ribosomes are engaged in protein synthesis in animal cell?
 (a) Ribosomes which occur on nuclear membrane and ER
 (b) Ribosomes of only cytosol
 (c) Ribosomes of only nucleolus and cytosol
 (d) Ribosomes of only mitochondria and cytosol (2000)

92. Function of telomeres in nucleus is
 (a) poleward movement
 (b) to initiate the RNA synthesis
 (c) to seal the ends of chromosome
 (d) to recognise the homologous chromosome. (2000)

ANSWER KEY

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

Hints & Explanations

1. (b) : Microscopes are used for studying cellular structures. They are used to magnify small objects. In electron microscopes, a high energy beam of electrons is focused through electromagnetic lenses. It can magnify very small details with high resolving power. The increased resolution results from the shorter wavelength of the electron beam.

2. (a) : Resolution of microscope is inversely proportional to wavelength of light used. Out of four options given, blue light has minimum wavelength and hence maximum resolution.

3. (b) : Microscopes are used for studying cellular structures. They are used to magnify small objects. In electron microscopes, a high energy beam of electrons is focused through electromagnetic lenses. It can magnify very small details with high resolving power. The increased resolution results from the shorter wavelength of the electron beam.

4. (a) : Magnification of compound microscope is not connected with numerical aperture. The magnifying power is represented by the symbol 'X'. The total magnification of a microscope is obtained by multiplying the objective magnification and ocular lens magnification e.g., if the magnifying power of an ocular lens is 10X and of the objective is 40X, then the total magnifying power of a microscope is $10 \times 40 = 400X$.

5. (b) : Rudolf Virchow (1855) observed that new cells develop by division of the pre-existing cells— “Omnis cellula-e-cellula” (theory of cell lineage or common ancestry). The finding gave cell theory its final shape.

6. (c) : Viruses are an exceptions to the cell theory as they are obligate parasites (subcellular in nature).

7. (b) : Names of Schleiden and Schwann were associated with cell theory in 1839. The concept that “All living organisms are composed of cell” is known as cell theory.

8. (c) : An angstrom (symbol Å) is a non-SI unit of length that is internationally recognised, equal to 0.1 nanometer (nm). It can be written in scientific notations as 1×10^{-10} m. It is used in expressing the size of atoms, length of chemical bonds, etc. It is named after Anders Jonas Angstrom.

$$\text{Angstrom} = 0.0001\text{mm}$$

9. (c) : Organelles can be separated from cell homogenate through differential centrifugation. The basic principle involved here is sedimentation of particles in a suspension by centrifugal force. In a centrifuge, the particles sediment at different rates when an accelerating force is subjected. The rate of sedimentation depends upon the size of the particles, its shape and density.

10. (b) : Reserve material in prokaryotic cells are stored in the cytoplasm in the form of inclusion bodies. These are not bound by any membrane system and lie free in the cytoplasm, e.g., phosphate granules, cyanophycean granules and glycogen granules.

11. (b) : Pili and fimbriae are bacterial appendages which are not involved in locomotion. Actually, pili are long, fewer and thick tubular outgrowths which develop in response to F⁺ or fertility factor in Gram negative bacteria. Being long they are helpful in attaching to recipient cell and forming conjugation tube. Fimbriae are small bristle-like fibres sprouting from cell surface in large number. There are 300-400 of them per cell. They are involved in attaching bacteria to solid surfaces.

12. (c) : A prokaryotic cell is characterised by absence of an organised nucleus and membrane bound cell organelles. DNA is naked i.e., without a nuclear envelope and lies variously coiled in the cytoplasm. It is commonly called nucleoid or genophore. Mesosomes, plasma membrane and 70S ribosomes are present in a prokaryotic cell.

13. (d) : Refer to answer 11.

14. (b) : Polysome is not an inclusion body. It is an aggregation of ribosomes formed under conditions of high concentration of magnesium. An inclusion body is any of various particulate structures, usually proteins, formed after viral infections in a prokaryotic or eukaryotic cell.

15. (d) : Mesosome is characteristic circular to villiform specialisation of bacterial cell membrane that develops as an ingrowth. It consists of vesicles, tubules and lamellae. Mesosomes may be septal or lateral. Septal mesosome connects nucleoid with plasma membrane and assists in replication and septum formation during cells division. Lateral mesosome is not connected with nucleoid and contains respiratory enzymes and performs functions similar to eukaryotic mitochondria and hence is also called chondrioid. They also increase the surface area of plasma membrane and enzymatic contact.

16. (b) : Flagellum is the organ of motility in bacteria. Bacterial flagella are unistranded, equivalent to a single microtubular fibre and formed of protein called flagellin. They perform rotatory movements.

17. (a, c, d) : S-type bacteria or virulent bacteria are capsulated. The capsule is made up of polysaccharides and amino acids. It is a tough and thick mucilage covering. It gives protection to bacteria against host's immune system. The capsule is considered a virulence factor because it enhances the ability of bacteria to cause disease. Capsule contains water and mucilage, thus protects bacteria against desiccation. Capsule also helps the bacterium to adhere (attach) to the surface.

18. (d): Glycocalyx is a sticky, gelatinous material that collects outside the cell wall of bacteria to form an additional surface layer. When this layer is firmly attached to the surface of the cell, it is called a capsule. If it is loosely distributed around the cell, the glycocalyx is called a slime layer.

19. (a) : Bacterial cells do not have nucleus, characteristic of eukaryotic cells. 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. This DNA, sometimes attached at one or more points to a mesosome, frequently runs parallel to the axis of the cell. Bacterial DNA is not associated with histone protein and does not coil to form well-defined chromosomes during the multiplication. In addition to circular DNA, a small amount of subsidiary extrachromosomal DNA is also present as plasmids or episomes.

20. (b) : Photosynthetic bacteria have chromatophores which are membrane bound vesicular structures which are extensions of cytoplasmic membrane. They contain photosynthetic pigments along with enzymes and electron carriers for photosynthetic phosphorylation. These pigments are bacteriochlorophyll and bacteriophaeophytin. Leucoplasts, chloroplasts and chromoplasts are different types of plasids which occur in plastids and some protistans.

21. (d): Mesosomes are complex, intracellular, membranous structures within the cytoplasm, that are formed by the infoldings of the cytoplasmic membrane. Surface of mesosomes have many enzymes which take part in respiration, e.g., oxidases and dehydrogenases. Mesosomes are also known to help in the separation of two daughter molecules of DNA during cell division. They are also called mitochondria of bacterial cell.

22. (c) : Golgi apparatus is the important site of formation of glycoproteins and glycolipids. Protein synthesised by the rough endoplasmic reticulum and lipids synthesised by smooth endoplasmic reticulum reach the cisternae of the Golgi apparatus. Here, they combine with carbohydrates to form glycoproteins and glycolipids.

23. (a) : Lysosomes are single membrane bound vesicles which contain hydrolytic enzymes. Lysosomes are believed to be formed by the joint activity of ER and Golgi complex. Precursors of hydrolytic enzymes are synthesised at RER and are transferred to the forming face of Golgi complex. These precursors are then changed to enzymes. Enzymes are then packed in larger vesicles and are pinched off at maturing face. These vesicles combine with endosomes to produce lysosomes. Lysosomal enzymes function in acidic medium or pH 4.5. This pH is lower than that of cytoplasm.

24. (c) : Enzymes of electron transport are embedded in the inner membrane of mitochondria.

25. (c) : The short arm of chromosome is termed as the p(petit) arm and longer arm is referred as q arm.

26. (d) 27. (a)

28. (d): Nucleolus is naked (devoid of membrane), round or slightly irregular structure which is attached to the chromatin at a specific region called nucleolar organiser region (NOR). Nucleolus is a site for rRNA synthesis. Nucleolus disappears when the cell undergoes division and reappears after its completion.

29. (b): Golgi complex is a complex cytoplasmic structure made up of smooth membrane saccules or cisternae, a network of tubules with vesicles and vacuoles, which takes part in membrane transformation, secretion and production of complex biochemicals. One face of Golgi apparatus is convex (forming, *cis*) face while the other is concave (maturing, *trans*) face. *Cis* face receives contents from endoplasmic reticulum which then reaches *trans* face and bud off as secretory vesicles.

30. (d): Smooth endoplasmic reticulum is involved in the production of lipids and sterols. Complexing of lipids and proteins to form lipoproteins occurs in SER. RER is involved in protein folding, glycosylation of protein and cleavage of signal peptide.

31. (d): Polytene chromosomes are giant chromosomes formed by somatic pairing between homologous chromosomes and repeated replication (endomitosis) of their chromonemata. They are quite common in salivary glands of insects and are therefore, popularly known as salivary chromosomes.

32. (c) : Mitochondria are miniature biochemical factories where food stuffs or respiratory substrates are completely oxidised to carbon dioxide and water. The energy liberated in the process is initially stored in the form of reduced coenzymes and reduced prosthetic groups. The latter soon undergo oxidation and form energy rich ATP. ATP comes out of mitochondria and helps perform various energy requiring processes of the cell like muscle contraction, nerve impulse conduction, biosynthesis, membrane transport, cell division, movement, etc. Because of the formation of ATP, the mitochondria are called power houses of the cell.

33. (b): Large central vacuoles are the characteristic of plant cell, not animal cell which may have many small scattered vacuoles.

34. (a) : Lysosomes are small vesicles which are bounded by a single membrane and contain hydrolytic enzymes in the form of minute crystalline or semicrystalline granules of 5-8 nm. About 50 enzymes have been recorded to occur in them. All the enzymes do not occur in the same lysosome but there are different sets of enzymes in different types of lysosomes. The important enzymes are acid phosphatases, sulphatases, proteases, peptidases, nucleases, lipases and carbohydrases. They are also called acid hydrolases because these digestive enzymes usually function in acidic medium or pH of 4-5.

35. (a) : Both mitochondria and chloroplast are semi-autonomous organelles. They have their own DNA which produces its own mRNA, tRNA and rRNA. These organelles also possess their own ribosomes and hence are able to synthesise some of their proteins.

36. (d) : Microtubules are unbranched hollow submicroscopic tubules of protein tubulin which develop on specific nucleating regions. It can undergo quick growth or dissolution at their ends by assembly or disassembly of monomers. They are present in the cytoplasm as well as in specialised structures like centrioles, basal bodies, cilia or flagella, sensory hair, equatorial ring of thrombocytes, spindle apparatus, chromosome fibres, nerve processes, sperm tails, axostyle of parasitic flagellates, fibre system of *Stentor*, cyto-pharyngeal basket of *Nassula*, etc.

37. (a) : Lysosomes are small vesicles bounded by a single membrane and contain hydrolytic enzymes. Nucleus, mitochondria and chloroplasts are double membrane bound cell organelles.

38. (b) : Anthocyanins are water soluble pigments, which commonly occur in membrane enclosed vacuoles. They are responsible for colour of fruits and flower petals.

39. (d)

40. (b)

41. (d)

42. (d) : Ribosome is a small spherical body within a living cell that is the site of protein synthesis. Ribosomes consist of two subunits, one large and one small, each of which comprises some RNA (called ribosomal RNA) and proteins. They do not have any DNA.

43. (b) : Recent developments have shown that nuclear membrane is derived from rough endoplasmic reticulum. During cell division, nuclear membrane is disintegrated. The nuclear envelope transmembrane proteins are absorbed in the RER. Once the division is completed, RER reassembles the nuclear envelope.

44. (d) : A chloroplast is a vesicle, bound by an envelope of two unit membranes and filled with a fluid matrix called stroma. The lamellae, after separation from the inner membrane, usually take the form of closed, flattened, ovoid sacs, the thylakoids, which lie closely packed in piles, the grana.

45. (d) : Smooth endoplasmic reticulum (SER) is a system of smooth membranes (*i.e.*, membranes not having ribosomes) within the cytoplasm of plant and animal cells. It forms a link between the cell and nuclear membranes. It is the site of important metabolic reactions, including phospholipids and fatty acid synthesis. In animal cells, lipid-like steroid hormones are also synthesised.

46. (d) : Centromere is a part of a chromosome that attaches to the spindle during cell division. A chromosome with the centromere close to one end is acrocentric.

47. (b) : Microfilaments are ultramicroscopic long, cylindrical rods that occur in eukaryotic plants and

animals. They are 6-8 nm in thickness. Microtubules are hollow microscopic tubular structures with an external diameter of 24 nm and of variable length. They are composed of tubulin. Intermediate filaments are the numerous microscopic protein fibres of about 10 nm thickness that form part of the cytoskeleton. They are made up of a variety of proteins, *e.g.*, keratin in nails.

48. (b) : Vacuoles are non-cytoplasmic areas present inside cytoplasm and separated from latter by tonoplast. They are believed to be formed by expansion and pinching off from ER. There occurs a large central vacuole and many small vacuoles in plant cells. They play a major role in osmotic expansion of a cell.

49. (a)

50. (b) : Post-translational modification is a step in protein biosynthesis. Proteins are created on ribosomes translating mRNA into polypeptide chains. These polypeptide chains undergo post-translational modification, such as folding, cutting and other processes, before becoming the mature protein product. Proteins synthesised by the rough endoplasmic reticulum and lipids synthesised by smooth endoplasmic reticulum reach the cisternae of the Golgi apparatus. Here, they combine with carbohydrates to form glycoproteins and glycolipids. This process is called glycosylation.

51. (b) : The given figure shows endoplasmic reticulum bearing ribosomes on its surface. It is called rough endoplasmic reticulum or RER. RER is actively involved in protein synthesis and secretion.

52. (d) : Smooth endoplasmic reticulum (SER) is a system of smooth membranes (*i.e.*, membranes not having ribosomes) within the cytoplasm of plant and animal cells. It forms a link between the cell and nuclear membranes. It is the site of important metabolic reactions, including phospholipid and fatty acid synthesis. In animal cells, lipid-like steroid hormones are also synthesised.

53. (a) : Chromoplasts are coloured plastids. They do not contain stored food material. Chromoplasts are formed either from leucoplasts or chloroplasts. Chromoplasts provide colour to many flowers for attracting pollinating insects. They also provide colour to fruits for attracting animals for dispersal.

54. (a) : Mitochondria are miniature biochemical factories where food stuffs or respiratory substrates are completely oxidised to carbon dioxide and water. The energy liberated in the process is initially stored in the form of reduced coenzymes and reduced prosthetic groups. The latter soon undergo oxidation and form energy rich ATP. ATP comes out of mitochondria and helps perform various energy requiring processes of the cell like muscle contraction, nerve impulse conduction, biosynthesis, membrane transport, cell division, movement, etc. Because of the formation of ATP, the mitochondria are called power houses of the cell.

55. (d) : According to the fluid mosaic model of cell membrane structure proposed by Singer and Nicolson (1972). Plasma membrane contains about 50–60% proteins and 50–40% lipids. Lipids form a bilayer with hydrophilic heads pointing outwards. Cell membrane allows transport of some molecules by passive transport, e.g., water, neutral solutes while some are transported actively, e.g., Na^+/K^+ pump.

56. (b) : Ribosome is a small spherical body within a living cell that is the site of protein synthesis. Ribosomes consist of two subunits, one large and one small, each of which comprises some RNA (called ribosomal RNA) and protein. They do not have any DNA.

57. (d) : *E.coli* (bacteria) is prokaryote while *Chlamydomonas* (algae) is eukaryote. Ribosomes of both groups differ being 70S in prokaryotes and 80S in eukaryotes. Prokaryotic chromosomes lack histone protein unlike eukaryotic ones. Cell wall organisation also differs as bacterial cell wall is rich in muramic acid while algal cell wall is cellulosic. It is the cell membrane which has similar organisation in both the groups.

58. (a) : Thylakoids are the flattened sac-like membranous structures that are stacked on top of one another to form the grana of plant chloroplast. Chlorophyll and other photosynthetic pigments are situated in the thylakoid membranes, which are the site for the light-dependent reactions of photosynthesis.

59. (a) : Ribosomes occur in all living cells except mammalian erythrocytes or red blood corpuscles. Depending upon the place of their occurrence, ribosomes are of two types—cytoplasmic ribosomes and organelle ribosomes. The cytoplasmic ribosomes (cytoribosomes) may remain free in the cytoplasmic matrix or attached to the cytosolic surface of endoplasmic reticulum with the help of special ribophorin or SRP protein. The organelle ribosomes are found in plastids (plastiribosomes) and mitochondria (mitoribosomes). Cytoplasmic ribosomes are of 80S type in eukaryotic cell whereas organelle ribosomes are of 70S type.

60. (d) : Peptide synthesis inside a cell takes place in ribosome. Ribosomes are found in all cells and are involved in protein synthesis. The major constituents of ribosomes are RNA and proteins present in approximately equal amounts.

61. (b) : Golgi apparatus principally performs the function of packaging materials. The newly synthesized proteins are handed over to the Golgi apparatus which are catalysed by the addition of carbohydrates, lipid or sulphates moieties to the proteins. Golgi apparatus is the important site of formation of glycoproteins and glycolipids.

62. (b) : While each of the membranous organelles is distinct in terms of its structure and function, many of these are considered together as an endomembrane system because their functions are coordinated. The

endomembrane system includes endoplasmic reticulum (ER), Golgi complex, lysosomes and vacuoles. Since the functions of the mitochondria, chloroplast and peroxisomes are not coordinated with the above components, these are not considered as part of the endomembrane system.

63. (b)

64. (b) : Plasma membrane consists of lipids (20-79%), proteins (20-70%), carbohydrates (1-5%) and water (20%). Lipid molecules possess both hydrophobic and hydrophilic ends and are thus arranged in the form of lipid bilayer. Most common lipid of the bilayer is phospholipid. Protein molecules occur at places both inside (intrinsic proteins) and on the outer side (extrinsic proteins) of the phospholipid bilayer.

65. (c) : Cytoplasm is granular, crystallo-colloidal complex that forms the living protoplasm of a cell excluding its nucleus. It consists of proteins, nucleic acids, fats, carbohydrates, vitamins, minerals, waste metabolites and all the organelles. It is the main area for various types of activities of a cell like respiration, nutrition, storage, etc.

66. (a) : Both mitochondria and chloroplast are semi-autonomous organelles. They have their own DNA which produces its own mRNA, tRNA and rRNA. These organelles also possess their own ribosomes and hence are able to synthesise some of their proteins.

67. (a) : Plasmodesmata are fine cytoplasmic strands that connect the protoplasts of adjacent plant cells by passing through their cell walls. Plasmodesmata are cylindrical in shape (about 20-40 nm in diameter) and are lined by the plasma membrane of the two adjacent cells. They permit the passage of substances including ions, sugars, amino acids and macromolecules between cells.

68. (d)

69. (a) : A – Rough endoplasmic reticulum
B – Smooth endoplasmic reticulum
C – Nucleus
D – Cytoplasm

70. (b) : Middle lamella of cell wall is composed of calcium and magnesium pectate. It joins the adjoining cells together and thus acts as a cementing layer.

71. (c) : The ability of eukaryotic cells to adopt a variety of shapes and to carry out coordinated and directed movements depends on the cytoskeleton. The main proteins that are present in the cytoskeleton are tubulin (in the microtubules), actin, myosin, tropomyosin (in the microfilaments) and keratins, vimentin, desmin, lamin, etc, (in intermediate filaments).

72. (c) : Refer to answer 67.

73. (d) : Glyoxysomes are small, spherical vesicles enclosed by a single unit membrane. Glyoxysomes are

generally found in cells of yeast, *Neurospora* and in germinating fatty seeds where fat is being converted into carbohydrates, *i.e.*, glyoxylate cycle (gluconeogenesis).

74. (d) : In a plant cell, vacuole may be defined as a non-living reservoir, bounded by a differentially or selectively permeable membrane, the tonoplast. It is filled with a highly concentrated solution called vascular sap or cell sap which contains many dissolved solutes such as organic acids, soluble carbohydrates, soluble nitrogenous compounds as nitrates, enzyme, tannins, chlorides, phosphates, amino acids alkaloids and anthocyanin pigments.

75. (d) : According to fluid mosaic model, there is rapid internal motion involving flexing, within each lipid molecule a rapid lateral diffusion of the lipids is possible and a slow 'flip-flop' motion, *i.e.*, a transfer of lipid molecules from one side of the bilayer to the other, is also possible. The lipid molecules might also rotate about their axes. The proteins of the membrane are concerned with the enzymatic activity of the membrane, with transport of molecules, and with a receptor function whereas, the lipid bilayer provides the permeability barrier.

76. (b) : Chemically, a biomembrane consists of lipids (20-70%), proteins (20-70%), carbohydrates (1-5%) and water (20%). The important lipids of the membrane are phospholipids (some hundred types), sterols, (*e.g.* cholesterol), glycolipids, sphingolipid (*e.g.*, sphingomyelin, cerebrosides). Proteins can be fibrous or globular structural carrier, receptor or enzymatic.

77. (a)

78. (c) : The outer membrane of mitochondrion is smooth, freely permeable to most small molecules, contains fewer enzymes and is poor in proteins. It has porin proteins which form channels for the passage of molecules through it. It allows uptake of substrates and release of ATP. The inner membrane is semipermeable and regulates the passage of materials into and out of the mitochondrion. It is rich in enzymes and carrier proteins (permeases). It is usually produced into numerous infolds called cristae (singular crista). It bears minute regularly spaced lollipop-shaped particles known as oxyosomes. The rest of the inner membrane contains the electron carrier molecules of the electron transport chain.

79. (b)

80. (a) : Thylakoids are the flattened sac-like membranous structures that are stacked on top of one another to form the grana of plant chloroplast. Chlorophyll and other photosynthetic pigments are situated in the thylakoid membranes, which are the site for the light-dependent reactions of photosynthesis.

81. (b) : *Refer to answer 75.*

82. (a) : Centromere is the point at which the two chromatids of a chromosome are held together. During

movement of chromosomes, the spindle fibres (on which the chromatids move) are attached to the centromere.

83. (d) : The proteins formed on ribosomes pass into the ER lumen where they are modified. Then the modified proteins move on into the transitional area, where the ER buds off membranous sacs, the transport vesicles, carrying the proteins to the Golgi apparatus.

84. (d) : Telomeres are highly conserved element throughout the eukaryotes both in structure and function. Telomeric DNA consists of simple randomly repeated sequences, characterised by clusters of G residues in one strand and C residues in other strand. A short sequence of (12-16 nucleotides in length) of G rich strand as overhang is another feature of telomere.

85. (c) : *Refer to answer 80.*

86. (a) : Nucleolus synthesises and stores RNA. The ribosomal proteins are synthesized in the cytoplasm and shift to the nucleolus for the formation of ribosomal subunits by complexing with rRNA.

87. (c)

88. (a) : Middle lamella is the first formed layer, present in between the two adjacent cells. It is situated outside the primary cell wall. It is made up of calcium and magnesium pectate.

89. (a)

90. (b) : A lysosome is a tiny sac bounded by a single unit membrane of lipoprotein. It contains a dense, finely granular fluid. The latter consists of glycoprotein hydrolytic (digestive) enzymes called acid hydrolases. These include proteases, lipases, nucleases, glycosidases, sulphatases, acid phosphatases, etc.

91. (a) : Ribosomes present in nuclear membrane and endoplasmic reticulum take part in protein synthesis. Two or more ribosomes simultaneously engaged in protein synthesis on the same mRNA strand forming polyribosomes. The ribosome functions as a template, bringing together different components required for protein synthesis.

92. (c)

93. (c) : Glycosylation of protein means linking of sugars to proteins which starts in rough endoplasmic reticulum and completes in Golgi complex.

94. (b) : The spherosomes are spherical bodies, about 0.5-1 μm wide and enclosed by a single unit membrane. They contain granular contents rich in lipids but also have some proteins.

95. (c) : The ribosomes provide space for the synthesis of proteins in the cell. Hence, they are known as the "protein factories" of the cell. The ribosomes bound to the membranes generally synthesise proteins for export as secretions by exocytosis or for incorporation into membranes or for inclusion into lysosomes. The free ribosomes generally produce enzymic proteins for use in the cell itself.

96. (b) : Refer to answer 90.

97. (b) : In desmosomes, circular patches of cell membranes are held together by interaction of proteins that extend through each membrane into the space between cells. The cell membrane has on the inner side a dense plate of protein for mechanical support and bears fine filaments, the tonofibrils, radiating into the cell. The desmosomes act as "spot welds" and keep the cells firmly together.

98. (d) : Refer to answer 90.

99. (d) : Respiratory chain is located in the inner membrane (cristae) of mitochondria. It consists of a series of proteins containing oxidation-reduction groups. Chemical treatment of the mitochondrial membrane results in the isolation of five complexes which have been designated as complexes I, II, III, IV and V.

100. (c)

101. (d)

102. (c)

103. (a) : The two poles of a Golgi apparatus are called *cis* face and *trans* face, which act respectively as the receiving and shipping departments.

The vesicles lie near the ends and concave surface of the Golgi complex. They are pinched off from the tubules of the cisternae.

The Golgi complex gives rise to primary lysosomes by budding from the *trans* face of cisternae.

104. (b) : Passive transport takes place along the concentration gradient whereas active transport takes place against the concentration gradient and require energy.

105. (b) : Balbiani rings (puffs) are sites of RNA and protein synthesis. These chromosomes show distinct dark and light bands. Euchromatin is present in dark bands and heterochromatin is present in light bands. These bands help in mapping of chromosomes in cytogenetic studies. These chromosomes form puffs or loops (in region of dark bands) which are called Balbiani puffs or Balbiani rings where synthesis of mRNA occurs.

106. (a) : In plant cells, peroxisomes are associated with photorespiration. Peroxisomes are found only in C₃ plants where a wasteful phenomenon of photorespiration occurs. The other organelles associated with this process are chloroplast and mitochondria. Peroxisomes are also reported in animal cells, *i.e.*, liver and kidney cells. The peroxisome contains several enzymes such as amino transferase, glycolate oxidase, glyoxylate reductase, peroxidase and catalase, etc.

107. (c) : Refer to answer 90.

108. (c) : Golgi apparatus is absent in bacteria and blue green algae. Golgi bodies are absent in prokaryotic cells and present in eukaryotic cells except in male gametes of bryophytes and pteridophytes, mammalian RBCs, sieve tubes of plants, etc.

109. (d) : Cell recognition and adhesion occur due to biochemicals of cell membranes named glycoproteins and

glycolipids. These are formed due to small carbohydrate molecules present on lipids and extrinsic proteins.

110. (d) : In salivary gland chromosomes/polytene chromosomes, pairing is formed between homologous chromosomes. A characteristic feature of these chromosomes is that somatic pairing occurs in them and hence their number appears half of normal somatic cells.

111. (d) : All the plastids have a common origin and one type of plastid can change into another. Plastids are of 2 main types : leucoplasts and chromoplasts. The leucoplasts are colourless and occur in the cells not exposed to sunlight. The chromoplasts are coloured occur in the cells exposed to sunlight.

112. (b) : *Acetabularia* used in Hammerling's nucleocytoplasmic experiment is unicellular uninucleate green algae. Hammerling's experiment on *Acetabularia* involved exchanging rhizoid and stalk. Presence of hereditary information in the nucleus was proved by the work of Hammerling on single celled alga *Acetabularia*.

113. (a) : *Apparato reticolare* is Golgi apparatus. The Golgi apparatus was named after Camillo Golgi (1906) who discovered this cell structure in nerve cells (1898) and assigned it the role of a cell organelle. Inspired by its appearance, Golgi named this cell structure the inner reticular apparatus (*apparato reticolare interno*).

114. (a) : An outer covering membrane is absent over nucleolus. Nucleolus is a dense, spherical, colloidal body which remains attached with nucleolar organizing chromosomes. It was discovered by Fontana (1781) and termed as nucleolus by Bowman (1840). The main function of nucleolus is the synthesis of ribosomal RNA and it is called store house of RNA. It plays an important role in cell division also.

115. (b) : Refer to answer 111.

116. (c) : Oxsomes or F₀ - F₁ particles occurs on inner mitochondrial membrane. Each particle is made up of base, stalk and head and is about 10 nm in length. The number of oxsomes per mitochondrion varies from 10⁴ - 10⁵. Chemically, these are made up of phospholipid core and protein cortex. Oxsomes have ATP as enzyme molecules and therefore, responsible for ATP synthesis. These elementary particles are also called F₀ - F₁ particles by some workers. The base of these is called F₀ subunit and head is called F₁ subunit.

117. (c) : Refer to answer 95.

118. (b) : RNA occurs in the nucleus as well as in the cytoplasm of the eukaryotic cells and in prokaryotic cell, it is found in the cytoplasm. DNA is found in the nucleus, mitochondria and chloroplast. Chloroplast and sphaerosomes are found only in cytoplasm.

119. (c) : Addition of new cell wall particles amongst the existing one is intussusception. Growth of cell wall occurs by two methods - by intussusception and by apposition. By intussusception, the primary wall is stretched and materials

of secondary wall are deposited. By apposition, materials of secondary wall are deposited in the form of thin layers.

120. (a) : Cell wall shows complete permeability because it helps in the transport of substances into and out of the cell. The main function of cell wall is to provide mechanical support.

121. (d) : In plant cells ribosomes were first of all observed by Robinson and Brown (1953) in bean roots. In animal cells, these were discovered by Palade (1955), hence are called Palade particles.

122. (b)

123. (c) : *Acetabularia* used in Hammerling's nucleocytoplasmic experiment is unicellular uninucleate green algae. Hammerling's experiment on *Acetabularia* involved exchanging rhizoid and stalk. Presence of hereditary information in the nucleus was proved by the work of Hammerling on single celled alga *Acetabularia*.

124. (c)

125. (d) : Nucleoproteins are compounds present in cells of living organisms that consist of nucleic acids with proteins. Nucleoproteins are synthesized in cytoplasm. These are conjugated proteins. They are of two types -deoxyribonucleoproteins and ribonucleoproteins.

126. (d) : Polyribosomes are aggregates of several ribosomes held together by string of mRNA. Polyribosomes consists of 4 - 8 ribosomes which are attached to a single strand of messenger RNA or mRNA. This mechanism helps in synthesis of several copies of the same protein.

127. (c): Refer to answer 64.

128. (c) : *Acetabularia* used in Hammerling's nucleocytoplasmic experiment is unicellular uninucleate green algae.

129. (d) : Refer to answer 64.

