

Chapter

8

Cell - The Unit of Life

- 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)
- Select the mismatch.
(a) Gas vacuoles – Green bacteria
(b) Large central vacuoles – Animal cells
(c) Protists – Eukaryotes
(d) Methanogens – Prokaryotes
(NEET-II 2016)
- 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)
- A cell organelle containing hydrolytic enzymes is
(a) lysosome (b) microsomes
(c) ribosome (d) mesosome.
(NEET-II 2016)
- 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)
- 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)
- Which one of the following cell organelles is enclosed by a single membrane?
(a) Lysosomes (b) Nuclei
(c) Mitochondria (d) Chloroplasts
(NEET-I 2016)
- 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)
- Which of the following structures is not found in a prokaryotic cell?
(a) Mesosome (b) Plasma membrane
(c) Nuclear envelope (d) Ribosome
(2015)
- 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)
- Which of the following are not membrane-bound?
(a) Lysosomes (b) Mesosomes
(c) Vacuoles (d) Ribosomes
(2015)

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

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

14. 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)

15. 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)

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

17. 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)

18. 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)

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

20. 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) |

21. 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)

22. 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)

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

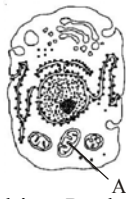
24. The term 'glycocalyx' is used for
 (a) a layer present between cell wall and membrane of bacteria
 (b) cell wall of bacteria
 (c) bacterial cell glyco-engineered to possess N-glycosylated proteins
 (d) a layer surrounding the cell wall of bacteria.
 (Karnataka NEET 2013)

25. Which of the following types of plastid does not contain stored food material?
 (a) Chromoplasts (b) Elaioplasts
 (c) Aleuroplasts (d) Amyloplasts
 (Karnataka NEET 2013)

26. Which of the following best illustrates “feedback” in development?
- Tissue X secretes RNA which changes the development of tissue Y.
 - As tissue X develops, it secretes enzymes that inhibit the development of tissue Y.
 - As tissue X develops, it secretes something that induces tissue Y to develop.
 - As tissue X develops, it secretes something that slows down the growth of tissue Y.

(Karnataka NEET 2013)

27. 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)

28. 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)

29. 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)

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

- Ribosomes
- Chromosomal organization
- Cell wall
- Cell membrane

(2012)

31. 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)

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

- Ribosome
- Peroxisome
- ER
- Mesosome

(Mains 2012)

33. Peptide synthesis inside a cell takes place in

- chloroplast
- mitochondria
- chromoplast
- ribosomes.

(2011)

34. Important site for formation of glycoproteins and glycolipids is

- vacuole
- Golgi apparatus
- plastid
- lysosome.

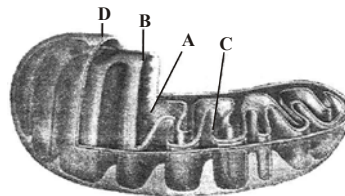
(2011)

35. Which one of the following is not considered as a part of the endomembrane system?

- Golgi complex
- Peroxisome
- Vacuole
- Lysosome

(Mains 2011)

36. 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.

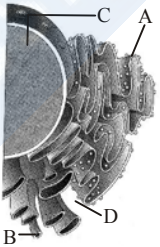


- D (outer membrane) – gives rise to inner membrane by splitting
- B (inner membrane) – forms infoldings called cristae
- C (crista) – possesses single circular DNA molecule and ribosomes
- A (matrix) – major site for respiratory chain enzymes

(Mains 2011)

37. The plasma membrane consists mainly of

- phospholipids embedded in a protein bilayer
- proteins embedded in a phospholipid bilayer

- (c) proteins embedded in a polymer of glucose molecules
(d) proteins embedded in a carbohydrate bilayer. (2010)
38. The main area of various types of activities of a cell is
(a) plasma membrane
(b) mitochondrion
(c) cytoplasm
(d) nucleus. (2010)
39. Which one of the following has its own DNA?
(a) Mitochondria (b) Dictyosome
(c) Lysosome (d) Peroxisome (2010)
40. 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)
41. 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)
42. 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 B
(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)
43. Middle lamella is composed mainly of
(a) muramic acid
(b) calcium pectate
(c) phosphoglycerides
(d) hemicellulose. (2009)
44. Cytoskeleton is made up of
(a) callose deposits
(b) cellulosic microfibrils
(c) proteinaceous filaments
(d) calcium carbonate granules. (2009)
45. Plasmodesmata are
(a) locomotory structures
(b) membranes connecting the nucleus with plasmalemma
(c) connections between adjacent cells
(d) lignified cemented layers between cells. (2009)
46. In germinating seeds fatty acids are degraded exclusively in the
(a) peroxisomes (b) mitochondria
(c) proplastids (d) glyoxysomes. (2008)
47. 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)
48. The two sub-units of ribosome remain united at a critical ion level of
(a) magnesium (b) calcium
(c) copper (d) manganese. (2008)
49. 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 flipflop 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)
50. Which one of the following is not a constituent of cell membrane?
(a) Glycolipids (b) Proline
(c) Phospholipids (d) Cholesterol (2007)

51. Select the wrong statement from the following.
- Both chloroplasts and mitochondria have an internal compartment, the thylakoid space bounded by the thylakoid membrane.
 - Both chloroplasts and mitochondria contain DNA.
 - The chloroplasts are generally much larger than mitochondria.
 - Both chloroplasts and mitochondria contain an inner and an outer membrane. (2007)
52. Biological organisation starts with
- cellular level
 - organismic level
 - atomic level
 - submicroscopic molecular level. (2007)
53. Which of the following statements regarding mitochondrial membrane is not correct ?
- The outer membrane resembles a sieve.
 - The outer membrane is permeable to all kinds of molecules.
 - The enzymes of the electron transfer chain are embedded in the outer membrane.
 - The inner membrane is highly convoluted forming a series of infoldings. (2006)
54. Which of the following statements regarding cilia is not correct ?
- Cilia contain an outer ring of nine doublet microtubules surrounding two singlet microtubules.
 - The organized beating of cilia is controlled by fluxes of Ca^{2+} across the membrane.
 - Cilia are hair-like cellular appendages.
 - Microtubules of cilia are composed of tubulin. (2006)
55. A major breakthrough in the studies of cells came with the development of electron microscope. This is because
- 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
 - the resolving power of the electron microscope is much higher than that of the light microscope
 - the resolving power of the electron microscope is 200 - 350 nm as compared to 0.1 - 0.2 nm for the light microscope
 - electron beam can pass through thick materials, whereas light microscopy requires thin sections. (2006)
56. Chlorophyll in chloroplasts is located in
- grana
 - pyrenoid
 - stroma
 - both grana and stroma. (2005)
57. 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?
- Blue
 - Green
 - Yellow
 - Red (2005)
58. 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?
- Proteins in cell membranes can travel within the lipid bilayer.
 - Proteins can also undergo flip-flop movements in the lipid bilayer.
 - Proteins can remain confined within certain domains of the membrane.
 - Many proteins remain completely embedded within the lipid bilayer. (2005)
59. Centromere is required for
- movement of chromosomes towards poles
 - cytoplasmic cleavage
 - crossing over
 - transcription. (2005)
60. Chemiosmotic theory of ATP synthesis in the chloroplasts and mitochondria is based on
- membrane potential
 - accumulation of Na ions
 - accumulation of K ions
 - proton gradient. (2005)
61. The main organelle involved in modification and outing of newly synthesized proteins to their destinations is
- chloroplast
 - mitochondria
 - lysosome
 - endoplasmic reticulum. (2005)
62. The telomeres of eukaryotic chromosomes consist of short sequences of
- thymine rich repeats
 - cytosine rich repeats
 - adenine rich repeats
 - guanine rich repeats. (2004)

63. In chloroplasts, chlorophyll is present in the
(a) outer membrane (b) inner membrane
(c) thylakoids (d) stroma. (2004)
64. Cellular totipotency is demonstrated by
(a) only gymnosperm cells
(b) all plant cells
(c) all eukaryotic cells
(d) only bacterial cells. (2003)
65. Ribosomes are produced in
(a) nucleolus (b) cytoplasm
(c) mitochondria (d) golgi body. (2002)
66. 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)
67. Element necessary for the middle lamella is
(a) Ca (b) Zn
(c) K (d) Cu. (2001)
68. Microtubules are absent in
(a) mitochondria (b) flagella
(c) spindle fibres (d) centrioles. (2001)
69. Proteinaceous pigment which controls the activities concerned with light is
(a) phytochrome (b) chlorophyll
(c) anthocyanin (d) carotenoids. (2001)
70. Lysosome contains
(a) oxidative enzymes
(b) hydrolytic enzymes
(c) reductive enzymes
(d) anabolic enzymes. (2000)
71. 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)
72. 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)
73. Which cell organelle is concerned with glycosylation of protein?
(a) Ribosome
(b) Peroxisome
(c) Endoplasmic reticulum
(d) Mitochondria (2000)
74. Which of the following organelles has single membrane?
(a) Mitochondria (b) Spherosomes
(c) Nucleus (d) Cell wall (1999)
75. The proteins are synthesized at
(a) centrosomes (b) Golgi bodies
(c) ribosomes (d) mitochondria. (1999)
76. Which of the following structures will not be common to mitotic cell of a higher plant?
(a) Centriole (b) Spindle fibre
(c) Cell plate (d) Centromere (1997)
77. The mechanism of ATP formation both in chloroplast and mitochondria is explained by
(a) chemiosmotic theory
(b) Munch's hypothesis (mass flow model)
(c) relay pump theory of Godlewski
(d) Cholodny-Wont's model. (1997)
78. Protein synthesis in an animal cell, takes place
(a) in the cytoplasm as well as endoplasmic reticulum
(b) only on ribose attached to nucleon
(c) only in the cytoplasm
(d) in the nucleolus as well as in the cytoplasm. (1997)
79. Lysosomes are rich in
(a) nucleic acids
(b) hydrolytic enzymes
(c) carbohydrates
(d) hormones. (1996)
80. Colchicine is an inhibitory chemical, which
(a) stops the functioning of centriole
(b) prevents attaching of centromeres with rays
(c) prevents the spindle formation in mitosis
(d) prevents the formation of equatorial plane. (1996)
81. The prokaryotic flagella possess
(a) helically arranged protein molecule
(b) "9 + 2" membrane enclosed structure
(c) unit membrane enclosed fibre
(d) protein membrane enclosed fibre. (1995)

82. The desmosomes are concerned with
 (a) cell division (b) cell adherence
 (c) cytolysis (d) cellular excretion.
 (1995)
83. Which of the following organelles contain enzymes that have digestive action?
 (a) Ribosomes (b) Polysomes
 (c) Plastids (d) Lysosomes
 (1994)
84. In mitochondria, cristae act as sites for
 (a) protein synthesis
 (b) phosphorylation of flavoproteins
 (c) breakdown of macromolecules
 (d) oxidation-reduction reaction. (1994)
85. Centromere is required for
 (a) replication of DNA
 (b) chromosome segregation
 (c) poleward movement of chromosomes
 (d) cytoplasmic cleavage. (1994)
86. Which one of the following organelles is located near the nucleus and contains a collection of flattened membrane bound cisternae?
 (a) Nucleolus (b) Mitochondrion
 (c) Centriole (d) Golgi apparatus
 (1994)
87. The inner membrane of the mitochondria is, usually, highly convoluted forming a series of infoldings known as
 (a) thylakoids (b) lamellae
 (c) cristae (d) grana. (1994)
88. Besides giving out secretory vesicles, the Golgi apparatus is also concerned with the formation of
 (a) lysosomes
 (b) plastids
 (c) grana of chloroplasts
 (d) cell plates after cell division in plants.
 (1994)
89. Active and passive transports across cell membrane differ in
 (a) passive transport is nonselective
 (b) passive transport is along the concentration gradient while active transport is due to metabolic energy
 (c) active transport is more rapid
 (d) passive transport is confined to anions while active transport is confined to cations.
 (1993)
90. Balbiani rings (puffs) are sites of
 (a) DNA replication
 (b) RNA and protein synthesis
 (c) synthesis of polysaccharides
 (d) synthesis of lipids. (1993)
91. In plant cells, peroxisomes are associated with
 (a) photorespiration (b) phototropism
 (c) photoperiodism (d) photosynthesis.
 (1993)
92. Membranous bag with hydrolytic enzymes which is used for controlling intracellular digestion of macromolecules is
 (a) endoplasmic reticulum
 (b) nucleosome
 (c) lysosome
 (d) phagosome. (1993)
93. Golgi apparatus is absent in
 (a) higher plants
 (b) yeast
 (c) bacteria and blue-green algae
 (d) none. (1993)
94. Cell recognition and adhesion occur due to biochemicals of cell membranes named
 (a) proteins
 (b) lipids
 (c) proteins and lipids
 (d) glycoproteins and glycolipids. (1993)
95. In salivary gland chromosomes/polytene chromosomes, pairing is
 (a) absent
 (b) occasional
 (c) formed between nonhomologous chromosomes
 (d) formed between homologous chromosomes.
 (1993)
96. 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 being 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 consists of cells whether or not capable of reproducing. (1993)

97. 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)
98. Binding of specific protein on regulatory DNA sequency can be studied by means of
(a) ultra centrifugation
(b) electron microscope
(c) light microscope
(d) X-rays crystallography. (1993)
99. All types of plastids possess essentially the same structure because they
(a) perform the same function
(b) store food materials like starch, fat and protein
(c) occur in aerial parts
(d) can transform from one form to another. (1992)
100. Experiments on *Acetabularia* by Hammerling proved the role of
(a) cytoplasm in controlling differentiation
(b) nucleus in heredity
(c) chromosomes in heredity
(d) nucleocytoplasmic ratio. (1992)
101. Which one is *apparato reticolare*?
(a) Golgi apparatus
(b) Endoplasmic reticulum
(c) Microfilaments
(d) Microtubules (1992)
102. An outer covering membrane is absent over
(a) nucleolus (b) lysosome
(c) mitochondrion (d) plastid. (1992)
103. All plastids have similar structure because they can
(a) store starch, lipids and proteins
(b) get transformed from one type to another
(c) perform same function
(d) be present together. (1992)
104. Oxyosomes or $F_0 - F_1$ particles occur on
(a) thylakoids
(b) mitochondrial surface
(c) inner mitochondrial membrane
(d) chloroplast surface. (1992)
105. Ribosomes are the centre for
(a) respiration
(b) photosynthesis
(c) protein synthesis
(d) fat synthesis. (1992)
106. Angstrom (\AA) is equal to
(a) 0.01 mm (b) 0.001 mm
(c) 0.0001 mm (d) 0.00001 mm. (1992)
107. 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)
108. Addition of new cell wall particles amongst the existing ones is
(a) deposition (b) apposition
(c) intussusception (d) aggregation. (1991)
109. Cell wall shows
(a) complete permeability
(b) semipermeability
(c) differential permeability
(d) impermeability. (1991)
110. Ribosomes were discovered by
(a) Golgi (b) Porter
(c) de Robertis (d) Palade. (1991)
111. Fluid mosaic model of cell membrane was put forward by
(a) Danielli and Davson
(b) Singer and Nicolson
(c) Garner and Allard
(d) Watson and Crick. (1991)
112. Resolution power is the ability to
(a) distinguish two close points
(b) distinguish two close objects
(c) distinguish amongst organelles
(d) magnify image. (1991)
113. Hammerling's experiments of *Acetabularia* involved exchanging
(a) cytoplasm
(b) nucleus
(c) rhizoid and stalk
(d) gametes. (1990)
114. The latest model for plasma membrane is
(a) lamellar model
(b) unit membrane model
(c) fluid mosaic model
(d) molecular lipid model. (1990)

115. 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)
116. A bivalent consists of
 (a) two chromatids and one centromere
 (b) two chromatids and two centromeres
 (c) four chromatids and two centromeres
 (d) four chromatids and four centromeres. (1989)
117. Nucleoproteins are synthesised in
 (a) nucleoplasm (b) nuclear envelope
 (c) nucleolus (d) cytoplasm. (1989)
118. Polyribosomes are aggregates of
 (a) ribosomes and *r*RNA
 (b) only *r*RNA
 (c) peroxisomes
 (d) several ribosomes held together by string of *m*RNA. (1989)
119. Plasma membrane is made of
 (a) proteins and carbohydrates
 (b) proteins and lipids
 (c) proteins, lipids and carbohydrates
 (d) proteins, some nucleic acid and lipids. (1989)
120. Organelles can be separated from cell homogenate through
 (a) chromatography
 (b) X-rays diffraction
 (c) differential centrifugation
 (d) auto-radiography. (1989)
121. *Acetabularia* used in Hammerling's nucleocytoplasmic experiments is
 (a) unicellular fungus
 (b) multicellular fungus
 (c) unicellular uninucleate green algae
 (d) unicellular multinucleate green algae. (1988)
122. According to fluid mosaic model, plasma membrane is composed of
 (a) phospholipids and oligosaccharides
 (b) phospholipids and hemicellulose
 (c) phospholipids and integral proteins
 (d) phospholipids, extrinsic proteins and intrinsic proteins. (1988)

Answer Key

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

- (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.
- (b)** : Large central vacuole is the characteristic of plant cell, not animal cell which may have many small scattered vacuoles.
- (b)** : Pili and fimbriae are bacterial appendages which are not involved in locomotion. Actually, pili are long fewer and thicker 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.
- (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.
- (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.
- (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.
- (a)** : Lysosomes are small vesicles bounded by a single membrane and contain hydrolytic enzymes. Nucleus, mitochondria and chloroplasts are double membrane bound cells organelles.
- (d)**
- (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.
- (b)** : Endoplasmic reticulum, nuclei, lysosomes, Golgi apparatus and mitochondria are membrane bound cell organelles whereas ribosomes are naked ribonucleoprotein protoplasmic particles. Chromosomes are the hereditary particles present in the nucleus.
- (d)** : Refer to answer 10.
- (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 protein. They do not have any DNA.
- (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.
- (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.

- 15. (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 steroidal hormones are also synthesized.
- 16. (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.
- 17. (b) :** Polysome is a 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.
- 18. (b) :** 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.
- 19. (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 cell.
- 20. (a)**
- 21. (b) :** Post translational modification (PTM) is a step in protein biosynthesis. Proteins are created on ribosomes translating *mRNA* into polypeptide chains. These polypeptide chains undergo PTM, such as folding, cutting and other processes, before becoming the mature protein product. Proteins synthesized by the rough endoplasmic reticulum and lipids synthesized 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.
- 22. (b) :** The given figure shows endoplasmic reticulum bearing ribosomes on their surface. It is called rough endoplasmic reticulum or RER. RER is actively involved in protein synthesis and secretion.
- 23. (d) :** Refer to answer 15.
- 24. (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.
- 25. (a) :** Chromoplasts are yellow or reddish in colour because of the presence of carotenoid pigments. 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 provide bright red or orange colour to fruits for attracting animals for dispersal.
- 26. (c) :** As tissue X develops it secretes something that induces tissue Y to develop indicating positive feedback mechanism.
- 27. (a) :** Refer to answer 1.
- 28. (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.
- 29. (b) :** Refer to answer 12.
- 30. (d) :** *E.coli* (bacteria) is a prokaryote while *Chlamydomonas* (algae) is a eukaryote. Ribosomes of both groups differ being 70S in prokaryotes and 80S in eukaryotes. Prokaryotic chromosomes lack histone protein unlike eukaryotic ones. Cell wall organization 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 organization in both the groups.
- 31. (a) :** Thylakoid 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.
- 32. (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.

33. (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.

34. (b) : Eukaryotic cells contain a unique cluster of membrane vesicles known as Golgi apparatus. It principally performs the function of packaging materials. The newly synthesized proteins are handed over to the Golgi apparatus which is 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.

35. (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 include 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.

36. (b) : Each mitochondrion is a double membrane-bound structure with the outer membrane and the inner membrane dividing its lumen distinctly into two aqueous compartments, *i.e.*, the outer compartment and the inner compartment. The inner compartment is called the matrix. The outer membrane forms the continuous limiting boundary of the organelle. The inner membrane forms a number of infoldings called the cristae towards the matrix. The cristae increase the surface area. The two membranes have their own specific enzymes associated with the mitochondrial function.

37. (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.

38. (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.

39. (a) : Refer to answer 5.

40. (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 between cells of substances including ions, sugars, amino acids, and macromolecules.

41. (d)

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

43. (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.

44. (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 and other (in the microfilaments) and keratins, vimentin, desmin, lamin and other (in intermediate filaments).

45. (c) : Refer to answer 40.

46. (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).

47. (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.

- 48. (a) :** Ribosomes are very small organelles having a diameter of 150 Å – 250 Å. Each ribosome is made up of two subunits, a smaller subunit and another larger subunit. These two subunits are associated with the help of Mg^{2+} ions (at 0.001 M concentration). If the Mg^{2+} ions concentration is less in cytoplasm, the two units of ribosome separate but when the Mg^{2+} ions concentration is increased ten times, the two units and form a dimer.
- 49. (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.
- 50. (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). Protein can be fibrous or globular structural carrier, receptor or enzymatic.
- 51. (a) :** Refer to answer 5.
- 52. (d) :** Molecular assemblies are large organised sets of molecular units that make up parts of organelles. For example, one common macromolecular assembly is the microtubule which is important in forming structure in the cell related to maintaining the cell structure or related to cell movement. The cell (plasma) membrane that surrounds many organelles and the cell is a highly organised molecular assembly.
- 53. (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 oxysomes. The rest of the inner membrane contains the electron carrier molecules of the electron transport chain.
- 54. (b) :** Cilia are fine hair like vibratile, cytoplasmic processes borne by certain cell types. Their movement either propel the organism or move the medium past a fixed cell. The cilia are enclosed by a unit membrane which is an extension of the plasma membrane of the cell. Within the membrane, is a fluid matrix having a supporting axial shaft, or axoneme. The microtubules, single as well as double, are composed of the globular units of the protein tubulin. The arms of A microtubules contain a protein dynein. The latter is ATPase enzyme which catalyzes hydrolysis of ATP to ADP, and transfers the free energy released direct to ciliary work.
- 55. (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.
- 56. (a) :** Refer to answer 31.
- 57. (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.
- 58. (b) :** Refer to answer 49.
- 59. (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. Crossing over involves physical exchange of genetic material between non-sister chromatids of homologous chromosomes. Cytoplasmic cleavage is the division of cytoplasm. Transcription is the process in which the genetic information of DNA is transferred to mRNA as the first step in protein synthesis.
- 60. (d) :** Chemiosmotic coupling hypothesis is the most widely accepted explanation for oxidative phosphorylation in mitochondria and photophosphorylation in thylakoid membranes. Mitchell proposed the idea of chemiosmotic coupling. He suggested that a concentration gradient of protons is established across the mitochondrial membrane because there is an accumulation of hydrogen ions on one side of the mitochondrial membrane. The proton accumulation is necessary for energy transfer to the endergonic ADP phosphorylation process.
- 61. (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.

62. (d) : Telomeres are highly conserved element throughout the eukaryotes both in structure and function. Telomeric DNA has been shown to consist 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 3' overhang is another feature of telomere.

63. (c) : Refer to answer 31.

64. (b) : Totipotency is the ability of a living somatic plant cell to develop into a complete plant. It was first demonstrated by Steward et. al (1964) using phloem cells of carrot. This technique is now used for multiplying rare and endangered plants through micro-propagations. This technique is widely used for multiplying plants e.g., *Chrysanthemum*, *Dioscorea floribunda*, *Coleus*, *Crotons*, carnation plants etc.

65. (a) : Nucleolus synthesizes 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.

66. (c)

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

68. (a)

69. (a) : Phytochrome is a plant pigment that can detect the presence or absence of light and is involved in regulating many processes that are linked to day length (photoperiod), such as seed germination and initiation of flowering. It consists of a light-detecting portion, called a chromophore, linked to a small protein and exists in two interconvertible forms with different physical properties, particularly in the ability to bind to membranes.

70. (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.

71. (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.

72. (c)

73. (c) : Glycolysation of protein means linking of sugars to proteins which starts in rough endoplasmic reticulum and completed in golgi complex.

74. (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. They occur in most plant cells but are abundant in the endosperm cells of oil seeds. Spherosomes, arise from the endoplasmic reticulum.

75. (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 synthesize 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.

76. (a) : The centrioles occur in nearly all animal cells and in motile plant cells, such as zoospores of algae, sperm cells of ferns, and motile algae. They are absent in amoebae, prokaryotic cells, higher gymnosperms and all angiosperms. An interphase (undividing) cell has a pair of centrioles (diplosome) usually near the nucleus. They lie in a small mass of specialized, distinctly staining cytoplasm that lacks other cell organelles. The centrioles and the centrosphere are together referred to as centrosome. Before cell division, the centrioles duplicate so that a dividing cell has a pair of centrioles at each pole of the spindle. Spindle fibre, cell plate and centromere are present in all plant cells.

77. (a) : Refer to answer 60.

78. (d) : Protein synthesis in an animal cell, takes place in the nucleolus as well as in the cytoplasm. Main part of protein synthesis (transcription and translation) occurs in nucleolus. Chain elongation occurs in cytoplasm.

79. (b) : Refer to answer 70.

80. (c) : Colchicine is an alkaloid derived from the autumn crocus, *Colchicum autumnale*. It inhibits spindle formation in cells during mitosis so that

chromosomes cannot separate during anaphase, thus inducing multiple sets of chromosomes. Colchicine is used in genetics, cytology, and plant breeding research and also in cancer therapy to inhibit cell division.

81. (a) : Prokaryotic flagellum is not surrounded by any membrane. It consists of a single thread. The thread is made of numerous identical spherical protein sub-units called, flagellin. Each subunit is about 40 Å in diameter. The flagellin sub-units are arranged in helical spirals and form a hollow cylinder. Each flagellum is about 120-150 Å thick.

82. (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.

83. (d) : Refer to answer 70.

84. (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.

85. (c) : Refer to answer 59.

86. (d) : Golgi apparatus is a stack of parallel, flattened, intercommunicating sacs or cisternae and many peripheral tubules and vesicles. The cisternae vary in number from 3 to 7 in most animal cells and from 10 to 20 in plant cells. They are usually equally spaced in the pile, separated from each other by thin layers of intercisternal cytoplasm. The latter may contain a layer of parallel fibres, called intercisternal elements, that support the cisternae. The cisternae are free of ribosomes and have swollen ends. They look like the smooth endoplasmic reticulum.

87. (c) : Refer to answer 53.

88. (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. They are of two types : smooth or secretory vesicles, which have a smooth surface

and contain secretions of the cell; and coated vesicles, that have rough surface and elaborate membrane proteins. They carry materials to or from the cisternae. The Golgi complex gives rise to primary lysosomes by budding from the trans face of cisternae.

89. (b) : Active and passive transports across cell membrane differ in passive transport is due to metabolic energy. There is always expenditure of energy in active transport.

90. (b) : Balbiani rings (puffs) are site 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 helps 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.

91. (a) : In plant cells, peroxisomes are associated with photorespiration. Peroxisomes are found only in C_3 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 enzyme such as amino transferase, glycolate oxidase, glyoxylate reductase, peroxidase and catalase etc.

92. (c) : Refer to answer 70.

93. (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 and in cells of fungi.

94. (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.

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

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

Paramecium, *Rhizopus*, *Vaucheria* are some examples which may or may not be exceptions to the theory.

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

98. (d) : X-rays crystallography is a technique which is used to study of binding protein on regulatory DNA sequence. In this technique, X-rays pass through a crystal of a substance and form a diffraction pattern. With the help of this technique, the arrangement of atoms in the molecular structure of enzymes, proteins, DNA, etc. can be studied. Wilkins, Watson and Crick used this technique to determine the molecular configuration of double helix of DNA.

99. (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.

100. (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 nucleous was proved by the work of Hammerling on single celled alga *Acetabularia*.

101. (a) : *Apparato reticolare* are 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*).

102. (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 important role in cell division also.

103. (b) : Refer to answer 99.

104. (c) : Oxysomes or $F_0 - F_1$ 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 oxysomes per mitochondrion varies from $10^4 - 10^5$. Chemically these are made up of phospholipid core and protein cortex. Oxysomes have ATP as enzyme molecules and therefore, responsible for ATP synthesis. These elementary particles are also called $F_0 - F_1$ particles by some workers. The base of these is called F_0 subunit and head is called F_1 subunit.

105. (c) : Refer to answer 33.

106. (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.

Angstrom = 0.0001mm.

107. (b) : Refer to answer 55.

108. (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, material of secondary wall are deposited in the form of thin layers.

109. (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.

110. (d) : Ribosomes are minute cellular, non-membranous particles having an average diameter of 23 nm (230 Å). 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. Ribosomes form a part of fraction microsome, a term given by A. Claude (made of broken ER, ribosomes and Golgi bodies).

111. (b) : Refer to answer 28.

112. (b) : Resolution power is the ability to distinguish two close objects. It is the ability of a system to distinguish two close points as two separate points. Resolving power of microscope depends upon the numerical aperture of the objective lens system and its wavelength.

113. (c) : Refer to answer 100.

114. (c) : Refer to answer 28.

115. (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 $10 \times 40 = 400X$.

116. (c) : A bivalent consist of four chromatids and two centromeres. Bivalent is a pair of homologous chromosome lying together in the zygotene stage of prophase I of first meiotic division.

117. (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.

118. (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 help in synthesis of several copies of the same protein.

119. (c) : Refer to answer 37.

120. (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.

121. (c) : Refer to answer 100.

122. (d) : Refer to answer 37.

