RPSC

IFAS

BIOLOGY

PRACTICE QUESTION BOOK

Useful for
School Lecturer I Grade
College Assistant Professor
(Botany & Zoology)

MPPSC, UPHESC

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Preface

Biology is a fascinating subject that delves into the study of living organisms and their functions. This book, "IFAS Biology", has been written to cater to the needs of students who are preparing for exams related to the field of biology. The book contains over 3000 multiple-choice questions (MCQs) with detailed solutions, covering a broad range of topics. The chapters are organized systematically, starting with Cell Biology and Molecular Biology, then moving on to Biochemistry, Genetics, Plant Taxonomy, Plant Anatomy, Plant Physiology, Plant Embryology, Animal Taxonomy, Animal Physiology, Animal Embryology, Immunology and Signaling, Evolution, Ethology, Ecology, Biotechnology, Bio techniques, and Biostatistics.

This book is specifically designed for students who are preparing for RPSC, MPSC, and UPHESC I grade biology school lecturer exams, as well as College Assistant Professor exams in Botany and Zoology. It includes previous exam questions, as well as most probable questions that can be asked in upcoming exams. The answers are written with the best of the authors' expertise. If you find any error, we would appreciate any feedback or suggestions for improvement.

The book aims to provide a comprehensive and in-depth understanding of various concepts related to the field of biology. It presents the material in a clear and concise manner, making it easy to comprehend and retain. The detailed solutions to each MCQ will help students to better understand the concepts and reinforce their knowledge.

Authors

Acknowledgement

Writing a book is a labor of love, and it requires the contributions and support of many people. We would like to express our gratitude to all those who have helped us in the creation of this book, "IFAS Biology".

Firstly, we would like to thank our families and friends for their unwavering support throughout this journey. Their encouragement and love have been a constant source of motivation for us.

We would like to extend our gratitude to the team at our publishing house, who have provided us with the necessary resources and guidance to bring this book to fruition.

We would like to thank our colleagues, who have provided valuable feedback and helped us refine the content of this book. Their expertise and insights have been invaluable in ensuring the accuracy and comprehensiveness of the material presented in this book.

Finally, we would like to thank the students and teachers who will use this book to prepare for their exams. We hope that this book will prove to be a useful resource for their studies, and we wish them all the best in their academic pursuits.

Authors

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Publications

1 CHAPTER

CELL BIOLOGY

1. Proteins that are to be used outside the cell, are synthesized: **(AP ZOO- 2016)**
   (a) On ribosomes
   (b) In the mitochondria
   (c) On the rough endoplasmic reticulum
   (d) On the smooth endoplasmic reticulum

2. All unicellular organism are capable of
   (a) Independent existence
   (b) Division of labour
   (c) Extracellular digestion
   (d) Photosynthesis

3. Osmosis is a process that
   (a) involves the movement of particles from saturated solutions
   (b) moves water molecules from an area of higher concentration to an area of lower concentration
   (c) involves the active transport of dissolved solids
   (d) continues until the medium on each side of the membrane has become hypertonic

4. All of the following statements regarding lysosome are correct except: **(AP ZOO- 2016)**
   (a) lysosomes contain hydrolytic enzymes
   (b) for the activity of hydrolases the lysosomes maintain a pH of 7.2 in its interior
   (c) the lysosome membrane contains transmembrane proteins
   (d) lysosomes exhibit polymorphism

5. Where is genetic material located in prokaryotes –
   (a) Nucleus
   (b) Enveloped by Nuclear membrane
   (c) Naked in cytoplasm
   (d) None

6. Who was the first one to see a live cell -?
   (a) Robert Hooke
   (b) Anton van Leuwenhoek
   (c) Robert Brown
   (d) None of these

7. Which of the following statements is false? **(G1 - 2018)**
   (a) Cells at the end of prophase do not show golgi bodies and ER.
   (b) Small disc shaped structures at the surface of the centromeres are called kinetochores.
   (c) Metaphase plate is formed at the equator of the spindle.
   (d) Chromosome splitting and separation of chromatids occurs at telophase.

8. In which year Schwann studied different types of animal cell-
   (a) 1839 (b) 1739
   (c) 1639 (d) 1938

9. Who was the one to describe that cells divided and new cells are formed from pre-existing cells-
   (a) Schleiden (b) Schwann
   (c) Virchow (d) All of these

10. Structure made up of sphingolipid is **- (G1 -2019)**
    (a) Myelin sheath (b) Nissl's body
    (c) Neurolemma (d) Dendrone

11. Cell containing membrane bound nucleus is called-
    (a) Eukaryotic (b) Prokaryotic
    (c) Both a and b (d) None of these

12. Where are ribosomes found in prokaryotic cell -
    (a) Cytoplasm (b) Mitochondria
    (c) Chloroplast (d) All of these

13. Which of the following is incorrect –
    (a) Prokaryotic cell – Mycoplasma
    (b) Smallest cell- Bacteria
    (c) Largest cell – Ostrich egg
    (d) Cell without nucleus – Mammalian mature RBC

14. A glycoprotein within a plasma membrane has which of the following characteristics? **(AP ZOO- 2020)**
    (a) Attaches to cytoskeleton proteins.
    (b) Oriented towards the environment
    (c) Peripherally attached to the membrane.
    (d) Found both the membrane leaflets.

15. Which of the following represents prokaryotic cells-
(a) Blue green algae (b) PPLO
(c) Bacteria (d) All of these

16. A loose sheath of Glycocalyx layer is called –
(a) Slime layer (b) Capsule
(c) Cell wall (d) Cell envelope

17. What is the term used to describe the movement of any material from high to low concentration called?
(a) facilitated diffusion (b) osmosis
(c) diffusion (d) active transport

18. Which term is used to describe the carrying of molecules across a membrane that require energy.
(a) osmosis (b) facilitated diffusion
(c) active transport (d) diffusion

19. Where are ribosomes found in eukaryotic cells?
(a) Cytoplasm (b) Mitochondria
(c) Chloroplast (d) All of these

20. The sedimentation coefficient of ribosomes found in bacteria is **(G1 -2011)**
(a) 70s (b) 55 S
(c) 80 S (d) 60 S

21. The latest model of plasma membrane is
(a) Lamellar model (b) Fluid mosaic model
(c) Unit membrane model (d) Molecular lipid model

22. Which of the following organelle is exclusively found in animal cells?
(a) Mitochondria (b) Centriole
(c) Chloroplast (d) Vacuole

23. Which is more abundant in R.E.R. (Rough Endoplasmic Reticulum)? **(AP ZOO- 2020)**
(a) Cisternae (b) Vesicle
(c) Annulate E.R. (d) Both (a) & (b)

24. Plasma membrane is
(a) Semipermeable (b) Selectively permeable
(c) Both a and b (d) None of the above

25. The presence of which organelle distinguishes a plant cell from animal cell
(a) Cell membrane (b) chloroplast
(c) mitochondria (d) nucleus

26. Eukaryotic cells do not have:
(a) A double stranded DNA, enclosed within a nuclear membrane
(b) Nucleoli for production and maturation of ribosomes
(c) Binary fission reproduction
(d) Cell division by mitosis, reproduction by "meiosis".

27. In fluid mosaic model of the plasma membrane
(a) Upper layer is non-polar and hydrophilic
(b) Upper layer is polar and hydrophobic
(c) Phospholipids form a bimolecular layer in the middle part
(d) Proteins form a middle layer.

28. "Cart wheel" structure is exhibited by: **(G1 -2011)**
(a) Ribosome (b) Lysosome
(c) Centriole (d) Nucleolus

29. Which of the following is not the correctly matched pair of structure with functions? **(AP ZOO- 2016)**
(a) Mitochondria: ATP production
(b) Golgi body: Breakdown of complex molecules
(c) Chloroplast: Photosynthesis
(d) Endoplasmic reticulum: Synthesis of proteins

30. In which stage, the colchicine inhibits mitosis? **(G1 -2011)**
(a) Prophase (b) Metaphase
(c) Anaphase (d) Telophase

31. Which of the following processes includes all others?
(a) Osmosis
(b) Diffusion of a solute across a membrane
(c) Facilitated diffusion
(d) Passive transport

32. Which of the following statements is correct about diffusion?
(a) It is very rapid over long distances.
(b) It requires an expenditure of energy by the cell.
(c) It is a passive process in which molecules move from a region of higher concentration to a region of lower concentration.
(d) It is an active process in which molecules move from a region of lower concentration to one of higher concentration

33. Formation of bivalents during meiosis occurs at: **(G1 - 2022)**
(a) Leptotene (b) Diplotene
(c) Pachytene (d) Zygotene

34. If the concentration of solutes in a cell is less than the concentration of solutes in the surrounding fluid, then the extracellular fluid is said to be:
    (a) hypertonic. (b) hypotonic.
    (c) isotonic. (d) stable.

35. Facilitated diffusion:
    (a) requires a transmembrane protein.
    (b) requires ATP.
    (c) can move molecules against a concentration gradient.
    (d) is typically used to transport small nonpolar molecules.

36. What is the voltage across a membrane called?
    (a) Water potential (b) Chemical gradient
    (c) Membrane potential (d) Osmotic potential

37. The sodium-potassium pump is called an electrogenic pump because it
    (a) pumps equal quantities of Na+ and K+ across the membrane.
    (b) pumps hydrogen ions out of the cell.
    (c) contributes to the membrane potential.
    (d) ionizes sodium and potassium atoms.

38. If a membrane protein in an animal cell is involved in the co-transport of glucose and sodium ions into the cell, which of the following is most likely true?
    (a) The sodium ions are moving down their electrochemical gradient while glucose is moving up.
    (b) Glucose is entering the cell along its concentration gradient.
    (c) Sodium ions can move down their electrochemical gradient through the cotransporter whether or not glucose is present outside the cell.
    (d) A substance that blocked sodium ions from binding to the cotransport protein would also block the transport of glucose.

39. Which among the following cell organelles is not surrounded by any membrane? **(G1- 2015)**
    (a) Lysosome (b) Ribosome
    (c) Plastid (d) Endoplasmic reticulum

40. The Chloroplast DNA is (AP ZOO- 2020)
    (a) Like the nuclear DNA
    (b) Single stranded linear
    (c) Double stranded circular
    (d) Single stranded circular

41. Mesosomes are not associated with (G1- 2015)
    (a) cell wall formation (b) DNA replication
    (c) respiration (d) protein synthesis

42. The vesicles which collect and fuse at equatorial plane to form primary cell plate during cytokinesis are derived from which cell organelle? **(AP BOT - 2020)**
    (a) Mitochondria (b) Golgi complexes
    (c) Lysosomes (d) Vacuoles

43. In meiotic prophase I, there are five sub-stages:
    (i) Pachytenc
    (ii) Zygotene
    (iii) Diplotene
    (iv) Diakinesis
    (v) Leptotene
    The correct sequence of these 5 sub-stages is **(G1- 2013)**
    (a) (i), (iii), (ii), (v), (iv) (b) (ii), (iii), (v), (iv), (i)
    (c) (iv), (i), (v), (ii), (iii) (d) (v), (ii), (i), (iii), (iv)

44. pH of lysosome interior is **(AP ZOO- 2020)**
    (a) 10-12 (b) 8-10
    (c) 5-7 (d) 4-5

45. What are the membrane structures that function in active transport?
    (a) peripheral proteins (b) carbohydrates
    (c) cholesterol (d) Integral proteins

46. Which of the following is true of integral membrane proteins?
    (a) They lack tertiary structure.
    (b) They are loosely bound to the surface of the bilayer.
    (c) They are usually transmembrane proteins.
    (d) They are not mobile within the bilayer.

47. What kinds of molecules pass through a cell membrane most easily?
    (a) large and hydrophobic (b) small and hydrophobic
    (c) large polar (d) ionic

48. Who first time explained that cells are formed from pre-existing cells? **(G1- 2015)**
    (a) Robert Brown (b) Robert Hooke
    (c) Theodore Schwann (d) Rudolf Virchow

49. The main organelle involved in modification and routing of newly synthesized secretory proteins to their destinations is

(a) mitochondria (b) endoplasmic reticulum
(c) lysosome (d) chloroplast

50. The cell organelle responsible for cell plate formation at the time of cell division is (**G1- 2013)**
(a) Chloroplast (b) Endoplasmic reticulum
(c) Golgi body (d) Mitochondria

51. Which of the following organelle has a continuous connection with nuclear membrane:
(a) Golgi apparatus (b) Lysosome
(c) RER (d) SER

52. Which of the following statements were true regarding ER:
(a) ER provides structural framework to the cell
(b) ER acts as intra cellular transporting system
(c) SER is involved in the synthesis of lipid
(d) All of the above

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

54. Which of the following organelle is called 'Suicidal Bag'
(a) Mitochondria (b) Endoplasmic reticulum
(c) Lysosome (d) Ribosome

55. Which of the following statements are correct regarding Golgi apparatus:
(a) sorting and packaging of proteins
(b) synthesis of proteins
(c) N-linked glycosylation
(d) None of the above

56. Which of the following organelle control intracellular digestion of macromolecules with the help of hydrolytic enzymes?
(a) Plastid (b) Peroxisome
(c) Lysosome (d) Actin

57. Which of the following is the function of lysosomes:
(a) autophagy (b) autolysis
(c) digestion (d) all of the above

58. White blood cells engulf bacteria through what process?
(a) exocytosis (b) phagocytosis
(c) pinocytosis (d) osmosis

59. Pinching in of fluids by a unicellular organism is the process of:
(a) phagocytosis (b) osmosis
(c) pinocytosis (d) exocytosis

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

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

62. Cellular organelles with membranes are:
(a) Lysosomes, Golgi apparatus and mitochondria
(b) Nuclei, ribosomes and mitochondria
(c) Chromosomes, ribosomes and endoplasmic reticulum
(d) Endoplasmic reticulum, ribosomes and nuclei

63. It is involved in oxidative phosphorylation:
(a) Plastid (b) Mitochondria
(c) ER (d) Golgi

64. 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 large than mitochondria
(d) Both chloroplasts and mitochondria contain an inner and an outer membrane.

65. Which of the following is Plastid responsible for Photosynthesis
(a) Leucoplast (b) Amyloplast
(c) Chromoplast (d) Chloroplast

66. During germination of barley seeds, the enzyme a-amylase is secreted by: **(AP BOT - 2020)**
(a) Seed coat (b) Coleorhiza
(c) Aleurone layer (d) Coleoptile

67. Which type of Ribosome is present in the chloroplast?
(a) 70S (b) 80S
(c) 50S (d) 30S

68. The site for photophosphorylation is:
(a) Mitochondria (b) Cytoplasm
(c) Chloroplast (d) Peroxisome

69. Which of the following is not correct about chloroplast?
(a) Chloroplast is a semi-autonomous organelle
(b) Chloroplast contains single-stranded circular DNA
(c) Chloroplast is double-membrane organelle
(d) Lumen is the site for photolysis of water

70. Stroma is the ground material of which of these:
(a) Ribosomes (b) Lysosomes
(c) Mitochondria (d) Chloroplasts

71. An elaborate network of filamentous, proteinaceous structure present in the cytoplasm is referred to as:
(a) Golgi complex (b) ER
(c) Cytoskeleton (d) Chromosomes

72. Cytoskeleton helps in:
(a) Mechanical support to cell
(b) Providing mobility to cell
(c) Maintenance of shape of cell
(d) All of these

73. Cytoskeleton is made up of:
(a) Cellulosic microfibril
(b) Proteinaceous filaments
(c) Calcium carbonate granules
(d) Callose deposits

74. Which of the following structure- function pair is mis-matched?
(a) Nucleolus- ribosome synthesis
(b) Lysosome – intracellular digestion
(c) Ribosome – protein synthesis
(d) Microtubules – muscle contraction

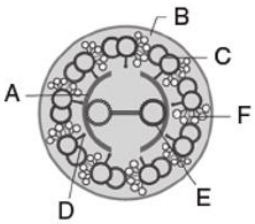
75. In human body most, abundant protein present is:
(a) Collagen (b) Myosin
(c) Actin (d) Albumin

76. Axonema is:
(a) Bundle of actin filaments
(b) Bundle of intermediate filaments
(c) Bundle of microtubules
(d) Bundle of myosin

77. Find out the incorrect statement:
(a) Centrioles forms basal bodies of cilia or flagella.
(b) Centriole gives rise to spindle fibres at the time of cell division in animal cell.
(c) Centrosome is an organelle usually containing two cylindrical structures called centrioles.
(d) Peripheral fibril of centriole is doublet.

78. The central part of the proximal region of the centriole is also proteinaceous and is called:
(a) Spokes (b) Doublet
(c) Hub (d) Linkers

79. Identify A, B, C, D, E and F given in the figure:



(a) A–Interdoublet bridge, B–Peripheral microtubules doublets., C–Central microtubule, D– Plasma membrane, E–Central bridge, F–Radial spoke
(b) A–Central sheath, B–Radial spoke, C–Interdoublet bridge, D–Central microtubule, E–Plasma membrane, F–Peripheral microtubules doublets.
(c) A–Central sheath, B–Plasma membrane, C–Peripheral microtubules doublets., D–Radial spoke, E–Central microtubule, F–Inter-doublet bridge
(d) A–Plasma membrane, B–Radial spoke, C–Peripheral microtubules doublets., D–Central sheath, E–Central microtubule, F–Inter-doublet bridge

80. Select the incorrect statement:
(a) Cilia and flagella are hair-like outgrowths of the cell membrane.
(b) Cilia causes the movement of either the cell or the surrounding medium.
(c) Bacterial flagella are structurally similar to eukaryotic flagella.
(d) Flagella is responsible for cell movement.

81. Nucleus was first discovered by:
(a) Robert Hook (b) Strasburger
(c) Robert Brown (d) None of the above

82. The nucleus contains:
(a) Mitochondria (b) Golgi apparatus
(c) Chromosomes (d) Lysosomes

83. Which of the following cells lack nucleus?
(a) Platelets (b) Lymphocytes
(c) Monocytes (d) Eosinophils

84. Transcriptionally active site is:
(a) Euchromatin (b) Heterochromatin
(c) Nucleolus (d) Nuclear membrane

85. The function of nucleolus is:
(a) RNA synthesis
(b) DNA synthesis
(c) Histone synthesis
(d) Ribosomal subunit synthesis

86. Who discovered cell for the first time? **(G1- 2015)**
(a) Robert Brown (b) Robert Hooke
(c) Antony Van Leeuwenhoek (d) Theodor Schwann

87. Nucleosome is made up of -
(a) Nonhistone protein + RNA
(b) Histone protein and DNA
(c) Non-histone and histone protein
(d) Phospholipid and protein

88. Which one is not a part of nucleus-?
(a) Chromatin (b) Nucleoplasm
(c) Karyosome (d) Centrosome

90. The chromatin material which takes darker stain in interphase is called:
(a) Euchromatin (b) Heterochromatin
(c) Primary constriction (d) Satellite body

91. The size of the nucleolus is large where-
(a) Protein synthesis is active
(b) Protein synthesis is less
(c) No protein synthesis occurs
(d) None of the above

92. In nucleus, nuclear envelope is derived from which of the cell organelles?
(a) SER (b) RER
(c) Mitochondria (d) Golgi apparatus

93. Which of the following cell organelle possesses a single unit membrane **(G1- 2013)**
(a) Chloroplast (b) Lysosome
(c) Mitochondria (d) Nucleus

94. In mitosis, the number of chromosomal and nuclear divisions, respectively, are: **(G1- 2013)**
(a) one and one (b) one and two
(c) two and two (d) two and one

95. Site of protein synthesis in a plant cell is: **(G1- 2013)**
(a) Golgi body (b) Lysosome
(c) Mitochondria (d) Ribosome

96. Endoplasmic reticulum was first observed by: **(G1- 2015)**
(a) Flemming (b) Benda
(c) Porter (d) Claude

97. Which cell organelle is not found in plant cell? **(G1- 2015)**
(a) Chloroplast (b) Centriole
(c) Smooth ER (d) Golgi apparatus

98. Which cell organelle is site of aerobic respiration? **(G1- 2015)**
(a) Chloroplast (b) Ribosome
(c) Mitochondria (d) Endoplasmic reticulum

99. Which pair is not correct? **(G1- 2015)**

(a) Potassium ion (K^+) pump	Passive transport
(b) Fluid mosaic model	Singer and Nicolson
(c) Movement of water across semi-permeable membrane	Osmosis
(d) Plant cell	Plasmodesmata

100. A nucleoside is made up of: **(G1- 2015)**
(a) Phosphate group + Pentose sugar + Nitrogenous base
(b) Pentose sugár + Nitrogenous base
(c) Nitrogenous base + Phosphate group
(d) None of the above

101. In which phase of cell cycle multiplication of mitochondria and chloroplast take place?
(a) G_0 (b) G1
(c) G_2 (d) M

102. During which phase of meiosis does crossing over take place: **(G1- 2015)**
(a) Zygotene (b) Leptotene
(c) Pachytene (d) Diplotene

103. Enzymes present in lysosomes are: **(G1 - 2018)**
(a) Peroxidases (b) Hydrolases
(c) Catalases (d) Dehydrogenases

104. Extra chromosomal DNA of bacteria is called **(G1 - 2018)**
(a) Mesosome (b) Plasmid
(c) Bacteriophage (d) Ribosomes

105. Who discovered that all cells arise from pre-existing cells by cell division? **(G1 - 2018)**
(a) Rudolf Virchow (b) Robert Brown
(c) T. Schwann (d) M. Schleiden.

106. Which of the following is absent in plant cells? **(G1 - 2018)**
(a) Cell wall (b) Plastids
(c) Centrioles (d) Large central vacuole

107. Smooth Endoplasmic reticulum is involved in the synthesis of: **(G1 - 2018)**
(a) Proteins (b) Lipids
(c) Carbohydrates (d) Nucleic acids

108. Total number of mitochondria in a cell remains constant after division because: **(G1 - 2018)**
(a) De-novo synthesis of mitochondria
(b) Fragmentation of Mitochondria new
(c) Number is maintained due to fertilization
(d) Mitochondria also divides by fission into two parts

109. In which cell organelle DNA is not present? **(G1- 2022)**
(a) Mitochondria (b) Nucleus
(c) Golgi apparatus (d) Chloroplast

110. The transport between Golgi cisternae (intra-golgi transport) involves the following steps:
I. Donor cisternae gives rise to a coated bud
II. The bud is uncoated and attaches to acceptor cisternae
III. A complex of three proteins (fusion machine) helps in fusion of bud with acceptor cisternae releases the contents
IV. The bud is detached and is targeted to acceptor cisternae **(AP ZOO- 2016)**
(a) I, IV, II, III (b) III, II, I, IV
(c) I, II, IV, III (d) I, III, IV, II

111. Match List I with List II and select the correct answer by using the codes given below in the List: **(AP ZOO- 2016)**

List I (site of mitochondria)	List II(enzymes)
I. outer membrane	A. cytochrome b-c, complex
II. peri-mitochondrial space	B. fatty acid CoA ligase
III. inner membrane	C. Adenylate kinase
IV. matrix	D. enzyme of TCA cycle

(a) I-A, II-B, III-C, IV-D (b) I-C, II-D, III-A, IV-B
(c) I-A, II-D, III-B, IV-A (d) I-B, II-C, III-A, IV-D

112. In order to enter a cell cycle, a cell must be stimulated from outside. What type of molecule provides this stimulation? **(AP ZOO- 2016)**
(a) Cyclins
(b) Tyrosine Kinases
(c) Cyclin-dependent Kinases
(d) Cytokines and growth factors

113. Mitotic anaphase differs from metaphase in possessing: **(AP ZOO- 2016)**
(a) same number of chromosomes and same number of chromatids
(b) same number of chromosomes and half number of chromatids
(c) half number of chromosomes and half number of chromatids
(d) half number of chromosomes and same number of chromatids

114. "pH" of lysozyme is maintained by: (**AP ZOO- 2016)**
(a) Proton pump (b) Sodium pump
(c) Calcium pump (d) Chloride pump

115. Copper is associated with which of the following mitochondrial enzymes? **(AP ZOO- 2016)**
(a) Cytochrome oxidase
(b) Succinate dehydrogenase
(c) Catalase
(d) Acid phosphatase

116. The 80s ribosomes of eukaryotes break into which of the following sub units? **(AP ZOO- 2016)**
(a) 50s and 30s (b) 60s and 40s
(c) 40s and 40s (d) 60s and 50s

117. The plasma membrane is detected to have caveolae. These structures are: **(AP ZOO- 2020)**
(a) Cholesterol-enriched membrane invaginations.
(b) Components of phospholipids.
(c) Regions with high carbohydrate content.
(d) Regions of protein dominating content.

118. A microtubule is observed quickly after a period of rapid growth. Which of the following most likely occupied to this microtubule to stimulate its break down? **(AP ZOO- 2020)**
(a) Loss of its GTP (b) Loss of ATP
(c) Severing by gelaolin (d) Twisting of cofilin

119. Mitochondrial matrix contains **(AP ZOO- 2020)**
(a) Enzymes (b) DNA & RNA
(c) Ribozyme (d) All of these

120. Cell organelles have content of DNA is/are **(AP ZOO- 2020)**
(a) Nucleolus (b) Plastid
(c) Mitochondria (d) All of these

121. Ki67 is molecular diagnostic target for **(AP ZOO- 2020)**
(a) Hyperthyroidism (b) Cancer
(c) Gastrointestinal problem (d) Headache and nausea

122. Mitotic apparatus consisting of **(AP ZOO- 2020)**
(a) Spindle fibre (b) Astral rays
(c) Centriole (d) All of these

123. Which one of them has absence of DNA content? **(AP ZOO- 2020)**
(a) Mitochondria (b) Tobacco Mosaic Virus
(c) Bacteriophage virus (d) Chloroplast

124. Which one of these phase longest in interphase? **(AP ZOO- 2020)**
(a) Synthetic Phase
(b) G_1 (first gap period)
(c) G_2 (second gap period)
(d) All of these are of same duration.

125. The G_1 phase of the cell cycle is describing that **(AP ZOO- 2020)**
(a) m-RNA synthesis. (b) Cytoplasm division
(c) Maximum growth of cell (d) Cytoplasmic splitting

126. Which one of them substance normally fail to cross cell membrane under circumstances? **(AP ZOO- 2020)**
(a) DNA (b) Water
(c) Fatty acid (d) Ethanol

127. Collagen is rich in **(AP ZOO- 2020)**
(a) Glycine and proline (b) Glycine and glutamate
(c) Glutamine and arginine (d) Glutamine and leucine

128. Which of the following lipid can be used as a marker of inner mitochondrial membrane?
(a) Succinate dehydrogenase (b) ATP synthase
(c) Succinyl Co-A synthase (d) Cardiolipin

129. Function of Golgi complex is/are: **(AP ZOO- 2020)**
(a) Sorting and Packaging (b) Secretion
(c) Biogenesis of lysosome (d) All of these

130. Which of the following is part of mitosis in the cells of seed plants? **(SET 2013)**
(a) Centrioles (b) Asters
(c) Spindles (d) Cleavage furrows

131. Consider the following statements: **(SET 2013)**
(A) In meiosis, the chromosomes are replicated during interphase
(B) The meiotic process by which homologues are paired during Prophase-I is called Chiasma
(C) In Metaphase-I of Meiosis-I, homologous chromosomes line up as pairs on metaphase plate and kinetochore microtubules extend from each centromere in both directions towards the poles
(D) In Metaphase-II of Meiosis-II the chromosomes line up one by one on the metaphase plate and kinetochore microtubules extend from each centromere in both directions towards the poles
Which of the above statements are true?
(a) (C) and (D) (b) (A) and (D)
(c) (A) and (C) (d) (A) and (B)

132. The enzymes involved in viral replication are synthesized: **(SET 2013)**
(a) On the viral ribosomes
(b) On the interior surface of the viral membrane
(c) On the interior surface of the viral coat
(d) By the host cell

133. The function of lysozyme of T_4, bacteriophage, is to digest the bacterial : **(SET 2013)**
(a) Cell Wall (b) Cell membrane
(c) Enzymes (d) Glycogen

134. Proteins that are to be used outside the cell, are synthesized**: (SET 2013)**
(a) In the mitochondria
(b) On the rough endoplasmic reticulum
(c) On the smooth endoplasmic reticulum
(d) On free ribosomes

135. Which of the following is an oxidative organelle and is not a part of the endomembrane system? **(SET 2013)**
(a) Lysosome (b) Peroxisome
(c) Chloroplast (d) Mitochondria

136. Which of the following is not the correctly matched pair of structure with functions? **(SET 2013)**
(a) Golgi complex: breakdown of complex molecules
(b) Mitochondrion: production of ATP
(c) Endoplasmic reticulum: synthesis of proteins
(d) Chloroplast: photosynthesis

137. The special structures that carry materials across the cell membrane are: **(SET 2013)**
(a) Proteins (b) Fatty acids
(c) Phosphates (d) Phospholipids

138. Aquaporins are cell membrane protein channels controlling the selective movement of **(AP BOT - 2020)**
(a) Oxygen (b) Water
(c) ATP (d) Sodium ions

139. In the primary cell wall of all dicot species and in many of the monocot species, the principal cross-linking glycans are: **(AP BOT - 2020)**
(a) Chitin (b) Cellulose
(c) Xyloglycans (d) Peptidoglycan

140. Mitotic cell cycle is divided typically into four phases, G_1, S, G_2 and M. Considering a mitotic cycle time of 18 hours, the general distribution of period of time (in hours) for each of these phases may be: **(AP BOT - 2020)**
(a) G_1-1, S-3, G_2-5, M-9 (b) G_1-9, S-1, G_2-3, M-6
(c) G_1-9, S-5, G_2-3, M-1 (d) G_1-3, S-9, G_2-5, M-1

141. Which of the following proteins bring about controlled degradation of mitotic cyclins? **(AP BOT - 2020)**
(a) Chromatin complexes remodelling
(b) G-protein-coupled receptors
(c) Ubiquitin and Proteasome
(d) Growth factors and Cytokines

142. Danielli and Davson in 1935 proposed a model for **(AP BOT - 2020)**
(a) DNA and histones in Chromatin
(b) RNA and proteins in Ribosomes
(c) Lipids and proteins in cell membrane
(d) Enzyme and co-enzymes in mitochondria

143. Maximum condensation of eukaryotic chromosome takes place during which stage of mitotic division**? (AP BOT - 2020)**
(a) Interphase (b) Metaphase
(c) Anaphase (d) Telophase

144. Select the correct pair**: (AP BOT - 2016)**
(a) Middle - lamella - cellulose
(b) Primary cell wall-cellulose and hemicellulose
(c) Secondary cell wall - Lignin and Cutin
(d) Plasma membrane - Lipids only

145. Which of the following organelle is called 'Suicidal Bag'
(a) Mitochondria (b) Endoplasmic reticulum
(c) Lysosome (d) Ribosome

146. Most abundant blood cells in the human body are
(a) WBCs (b) RBCs
(c) Platelets (d) Plasma Cells

147. In mitosis chromosomes split at centromeres takes place in: (**AP BOT - 2016)**
(a) Prophase (b) Metaphase
(c) Anaphase (d) Telophase

148. Chiasmata (X) are formed in which stage of meiosis I of Prophase I? **(AP BOT - 2016)**
(a) Pachytene (b) Diplotene
(c) Leptotene (d) Diakinesis

149. The shape of the cell is related to their **(SET 2012)**
(a) function (b) situation
(c) medium (d) size

150. The name "Protoplasm" was given by: **(SET 2012)**
(a) Corti (b) Purkinge
(c) Von Mohl (d) Prashad

151. 16S rRNA occurs in which subunit: **(SET 2012)**
(a) 30s (c) 50s
(c) 70s (d) 90s

152. Colchicine inhibits cell division by: **(SET 2012)**
(a) preventing microtubule polymerization
(b) preventing microculture depolymerization
(c) preventing attachment of opindle fibre with kinetochore
(d) stop the functioning of centriole

153. Lysosome along with food contents is called: **(SET 2012)**
(a) Microbody (b) Primary lysosome
(c) Secondary lysosome (d) Residual body

154. Endoplasmic reticulum is not found in: **(SET 2012)**
(a) Animal cells (b) Plants cells
(c) Prokaryotes (d) Protista

155. For which type of ions, the resting potential of a biological membrane is close to the theoretical Nernst potentiab? **(SET-2023)**
(a) Tons which are impermeable.
(b) Ions which are permeable.
(c) Ions which are least abundant.
(d) Ions which are most abundant.

156. N-terminal matrix-targeting sequences are recognized by which of the following during Protein targeting to Mitochondria? **(SET-2023)**
(a) Tim20 and Tim22 proteins
(b) Tim23 and Tim17 proteins
(c) Tom23 and Tom17 proteins
(d) Tom20 and Tom22 proteins

157. Kinetochore microtubule is a mitotic spindle which attaches to chromosome at the specific site called kinetochores. The process by which the spindle fiber gets attached to the chromosome is known as: **(SET-2023)**
(a) Search and capture (b) Alignment
(c) Congression (d) Binding

158. Cyclins drive the events of the cell cycle by partnering with a family of enzymes called the cyclin-dependent kinases (Cdks). Name the cyclin which takes part in M-phase: **(SET-2023)**
(a) Cyclin E (b) Cyclin D
(c) Cyclin B (d) Cyclin A

159. Identify the component which is not a part of lipid bilayer: **(SET-2023)**
(a) Phosphate
(b) Fatty acids
(c) Glycerol
(d) Tryptophan and methionine

160. Hsp70 proteins are central components of the cellular network of molecular chaperones and folding catalysts. Which of the following is not the correct cellular location of Hsp70 protein? **(SET-2023)**
(a) Mitochondria (b) Nucleus
(c) Golgi bodies (d) Chloroplast

161. Name the sequence which allows the resident protein to retain in ER d during protein targeting: **(SET-2023)**
(a) KDEL (b) KKXX
(c) KLDE (d) KXXK

162. The typical length of an integral membrane protein domain (glycophorin fold) is
(a) 20-25 amino acids (b) 10-15 amino acids
(c) 30-40 amino acids (d) 5-10 amino acids

163. Membrane rafts are enriched in:
(a) Cholesterol and sphingolipids
(b) Cholesterol and integral membrane proteins
(c) Glycolipids and phospholipids
(d) Sphingolipids and phospholipids

164. The nature of membrane lipids is
(a) Zwitterion (b) Hydrophobic
(c) Amphipathic (d) Uncharged

165. Asymmetry of biological membranes is regulated by
(a) Phospholipase A (b) Flippase
(c) Phospholipase C (d) N-glycosidase

166. Cystic Fibrosis Transmembrane Regulator (CFTR) Protein is a
(a) Sodium transporter (b) Calcium antiporter
(c) Chloride transporter (d) Potassium transporter

167. Transport of molecules against concentration gradient is called
(a) osmosis (b) active transport
(c) diffusion (d) passive transport

168. Which of the following shows fastest most of transport across plasma membrane?
(a) Simple diffusion
(b) Osmosis
(c) Transport through Ion channel
(d) Primary active transport

169. Which one of the following is the ideal molecular marker of a mature lysosome?
(a) Glucose -6-P receptor
(b) Endo-protease
(c) Mannose-6-P receptor
(d) Endo-glycosidase

170. Signal recognition particle consists of
(a) A single large RNA
(b) Multi-protein complex
(c) A complex of single RNA and multiple proteins
(d) A complex of multiple RNA and multiple proteins

171. Mycoplasmas are bacterial cells that
(a) fail to reproduce in artificial media
(b) have a rigid cell wall
(c) are resistant to penicillin
(d) stain well with Gram's stain

172. Which of the following is NOT true for archea bacteria?
(a) Membrane lipids have branch chain fatty acids
(b) Membrane lipids have ether linked fatty acids
(c) Cell wall is composed of peptidoglycan
(d) They are more similar to eukaryotes and originated from eubacteria

173. Which of the following organelles is surrounded by a single membrane?
(a) Chloroplast (b) Mitochondria
(c) Peroxisomes (d) Nucleus

174. Cells that produce large amounts of secretary proteins are abundant in
(a) mitochondria.
(b) lysosomes.
(c) smooth endoplasmic reticulum.
(d) rough endoplasmic reticulum.

175. Which of the following contain enzymes that detoxify xenobiotics?
(a) rough ER (b) endosomes
(c) lysosomes (d) peroxisomes

176. Which of the following pairs is INCORRECT?
(a) cristae - inner mitochondrial membrane
(b) nucleotide triphosphates - intermembrane space
(c) porin - inner mitochondrial membrane
(d) ATP synthetase - inner mitochondrial membrane

177. The cellular organelle which function(s) as a store for Ca^{2+} ions is
(a) Endoplasmic reticulum (b) Golgi bodies
(c) Endosomes (d) Nucleus

178. Which one of the following structure-function pairs is NOT correct?
(a) Nucleolus - rRNA synthesis
(b) Lysosome – intracellular digestion
(c) Endoplasmic reticulum - glycosylation
(d) Microtubules - muscle contraction

179. Cellular organelles containing hydrolytic enzymes are called
(a) microsomes (b) lysosomes
(c) chloroplasts (d) ribosomes

180. Contractile vacuoles in some protists pump water out of the cell as the surrounding environment is
(a) hypertonic (b) hypotonic
(c) isotonic (d) toxic

181. Which of the following is NOT found inside the eukaryotic nucleus?
(a) Nucleolus (b) Chromatin
(c) Solenoid (d) Centriole

182. Which of the following statements about Ran is CORRECT?
(a) Ran can bind to GTP but not to GDP.
(b) Ran can convert GDP to GTP by phosphorylation of GDP.
(c) Ran can bind to the nuclear export signal on a protein.
(d) Ran can diffuse across the nuclear pore.

183. Which of the following properties is common to all cytoskeletal motor proteins like kinesins, dyneins and myosins?
(a) GTPase activity (b) ATPase activity
(c) Actin binding domain (d) DNA binding domain

184. All of the following are properties of actin filaments EXCEPT:
(a) Actin filaments are flexible and have polarity
(b) Actin filaments act as tracts for different motors
(c) Actin filaments can be bundled together
(d) Actin filaments display dynamic instability

185. Which of the cell junctions listed below involves adhesion to laminin?
(a) tight junction (b) adherens junction
(c) hemi-desmosome (d) desmosome

186. Which one of the following protein is involved in the nucleation step of microtubules *in vivo*?
(a) α-Actin (b) β-Tubulin
(c) α-Tubulin (d) γ-Tubulin

187. The number of nucleosomes present in a 30 nm solenoid structure of a chromatin is
(a) 2 (b) 4
(c) 6 (d) 8

188. Which of the following does not occur during mitosis?
(a) condensation of the chromosomes
(b) replication of the DNA
(c) separation of sister chromatids
(d) spindle formation

189. A particular cell has half as much DNA as some other cells in a mitotically active tissue. The cell in question is most likely in
(a) G_1. (b) G_2.
(c) prophase. (d) anaphase.

190. Sister chromatids are separated during which stage of meiosis?
(a) Metaphase I (b) Metaphase II
(c) Anaphase I (d) Anaphase II

191. In the cells of some organisms, mitosis occurs without cytokinesis. This will result in
(a) cells with more than one nucleus.
(b) cells that are unusually small.
(c) cells lacking nuclei.
(d) destruction of chromosomes.

192. Starting with a fertilized egg (zygote), a series of five cell divisions would produce an early embryo with how many cells?
(a) 4 (b) 8
(c) 16 (d) 32

193. If there are 20 centromeres in a cell at anaphase, how many chromosomes are there in each daughter cell following cytokinesis?
(a) 10 (b) 20
(c) 30 (d) 40

194. Taxol is an anticancer drug extracted from the Pacific yew tree. It stops mitosis, specifically, Taxol must affect
(a) formation of mitotic spindle.
(b) anaphase.
(d) formation of the centrioles.
(d) chromatid assembly.

195. The CORRECT sequence of phases during mitosis is
(a) prophase, metaphase, anaphase, telophase
(b) prophase, anaphase, metaphase, telophase
(c) anaphase, prophase, metaphase, telophase
(d) anaphase, metaphase, prophase, telophase

196. At what stage a cell has 4 separate chromatid for each chromosome?
(a) prophase (b) anaphase
(c) interphase (d) metaphase

197. A crucial event that occurs during meiosis is genetic recombination due to crossing-over. At what stage of meiosis does this occur?
(a) Metaphase II (b) Prophase II
(c) Prophase I (d) Metaphase I

198. Cells in the G_0 state:
(a) cannot re-enter the cell cycle.
(b) can remain in that state for a lifetime.
(c) have entered from G_1 or G_2 checkpoints.
(d) do not divide even when conditions are favourable.

199. Which of the following four is involved in cell cycle control?
(a) Proteolysis of cyclins
(b) Phosphorylation of cyclins
(c) Proteolysis of cyclin-dependent kinase
(d) Dephosphorylation of cyclins

200. For a cyclin-dependent kinase to be active, which of the following conditions are needed?
(a) Presence of its cyclin partner, dephosphorylation at the activating site and phosphorylation of inhibitory site
(b) Absence of its cyclin partner, phosphorylation at the activating site and dephosphorylation of inhibitory site
(c) Presence of its cyclin partner, phosphorylation at the activating site and dephosphorylation of inhibitory site
(d) Absence of its cyclin partner, dephosphorylation at the activating site and dephosphorylation of inhibitory site

: : EXPLANATION : :

1. Correct Answer: (c)

Explanation: Proteins that are to be used outside the cell are synthesized on the rough endoplasmic reticulum. The rough endoplasmic reticulum have attached ribosomes that are involved in the synthesis of secretory proteins. These proteins are then transported out of the cell through the ER→Golgi apparatus→ secretory vesicles and then outside the cell.

2. Correct Answer: (a)

Explanation: Unicellular organisms are capable of independent existence, as well as performing essential functions of life such as respiration, digestion, and reproduction.

3. Correct Answer: (b)

Explanation: Osmosis is a process that moves water molecules from an area of higher concentration to an area of lower concentration. This happens because water molecules tend to diffuse from an area of higher concentration to an area of lower concentration in order to reach equilibrium.

4. Correct Answer: (b)

Explanation: Lysosomes are membrane-bound organelles that contain hydrolytic enzymes that break down waste materials and cellular debris. All of lysosomal enzymes are acid hydrolases, which are active at acidic pH (about 5) that is maintained within lysosomes.

5. Correct Answer: (c)

Explanation: The genetic material in prokaryotes is naked in the cytoplasm. Prokaryotes do not have a nucleus, so their genetic material is not enveloped by a nuclear membrane.

6. Correct Answer: (b)

Explanation: Anton van Leuwenhoek was the first one to see a live cell. He used his microscope to observe living cells and was able to describe the structures that he saw which includes bacteria, protozoa, and cells from various tissues.

7. Correct Answer: (d)

Explanation: Chromosome splitting and separation of chromatids occurs at anaphase not in anaphase.

8. Correct Answer: (a)

Explanation: Schwann studied different types of animal cell in 1839. He was German physiologist who made important contributions to study of cells and cell theory.

9. Correct Answer: (c)

Explanation: The one who described that cells divided and new cells are formed from pre-existing cells was Rudolf Virchow. He was a German physician who made significant contributions to the fields of anatomy, pathology, and cellular biology.

10. Correct Answer: (a)

Explanation: Structure made up of sphingolipid is myelin sheath. It is a layer that surrounds nerve fibers and helps to insulate them, allowing for efficient transmission of nerve impulses.

11. Correct Answer: (a)

Explanation: Eukaryotic cells are characterized by the presence of a membrane-bound nucleus, which contains the genetic material of the cell. Prokaryotic cells, on the other hand, do not have a nucleus but have a single circular DNA molecule located in the cytoplasm.

12. Correct Answer: (a)

Explanation: Ribosomes are found in the cytoplasm of prokaryotic cells, where they are responsible for protein synthesis. They are also found in the cytoplasm of eukaryotic cells.

13. Correct Answer: (b)

Explanation: Mycoplasma is the smallest known cell, with a size range of 0.2-0.3 micrometers. Bacteria are also small cells, with sizes ranging from 0.5-10 micrometers. The ostrich egg is the largest known cell, with a diameter of about 17 cm.

14. Correct Answer: (b)

Explanation: Glycoproteins are proteins that are attached to a carbohydrate moiety, and they are found in the plasma membrane of cells. These proteins are oriented towards the environment, meaning they are exposed to the extracellular space, and they play important roles in cell-cell interaction and signalling.

15. Correct Answer: (d)

Explanation: Blue-green algae, also known as cyanobacteria, bacteria, and mycoplasmas are all types of prokaryotic cells. These cells are characterized by the lack of a nucleus and other membrane-bound organelles, and they have a simpler cellular structure compared to eukaryotic cells.

16. Correct Answer: (a)

Explanation: The slime layer is a loose sheath of glycocalyx that surrounds some bacteria, and it is composed of polysaccharides, proteins, and other molecules. The capsule is a similar structure, but it is typically more organized and compact than the slime layer.

17. Correct Answer: (c)

Explanation: Diffusion is the movement of any material from an area of high concentration to an area of low concentration, without the involvement of energy or active transport. Osmosis is a specific type of diffusion that involves the movement of water molecules across a selectively permeable membrane.

18. Correct Answer: (c)

Explanation: Active transport refers to the movement of molecules across a membrane that requires energy, often in the form of ATP. This is in contrast to passive diffusion, which is the movement of molecules across a membrane without requiring energy, and is driven by the concentration gradient.

19. Correct Answer: (d)

Explanation: Ribosomes are found in the cytoplasm, mitochondria and chloroplasts of eukaryotic cells. They are composed of RNA and protein and are responsible for synthesizing proteins.

20. Correct Answer: (a)

Explanation: The sedimentation coefficient of ribosomes found in bacteria is 70s, meaning that the ribosomes have a molecular weight of 70S. In eukaryotes, ribosomes have a molecular weight of 80S.

21. Correct Answer: (b)

Explanation: The fluid mosaic model is the latest model of the plasma membrane, which is the outermost layer of a cell. The model describes the plasma membrane as a dynamic structure composed of a mixture of lipids and proteins, with the lipids forming a fluid matrix and the proteins floating within it.

22. Correct Answer: (b)

Explanation: Centrioles are organelles that are exclusively found in animal cells. They are cylindrical structures composed of microtubules and are involved in the formation of cilia and flagella, as well as in cell division.

23. Correct Answer: (a)

Explanation: The rough endoplasmic reticulum (RER) is a network of flattened, sac-like structures that are involved in protein synthesis and modification. The RER is composed of both cisternae, tubules and vesicles. But, cisternae are more abundant.

24. Correct Answer: (c)

Explanation: The plasma membrane is selectively permeable for polar molecules, meaning that it allows only certain molecules to pass through. This is due to the lipid bilayer structure of the membrane and the presence of transport proteins that control the movement of molecules. Plasma membrane is also semi-permeable means will allow movement of non-polar molecules along gradient.

25. Correct Answer: (b)

Explanation: Chloroplasts are organelles that are found only in plant cells. They are the site of photosynthesis, the process by which light energy is converted into chemical energy. This distinguishes plant cells from animal cells, which do not have chloroplasts.

26. Correct Answer: (c)

Explanation: Eukaryotic cells do have a double stranded DNA, enclosed within a nuclear membrane, nucleoli for production and maturation of ribosomes, and cell division by mitosis and reproduction by meiosis. However, they do not have binary fission reproduction, which is a mode of asexual reproduction found in prokaryotes where the cell simply divides into two daughter cells.

27. Correct Answer: (c)

Explanation: In the fluid mosaic model of the plasma membrane, the phospholipids form a bimolecular layer in the middle part, with the hydrophobic tails facing inward and the hydrophilic heads facing outward. This

creates a barrier that separates the interior of the cell from the external environment.

28. Correct Answer: (c)

Explanation: Centrioles are cylindrical structures consisting of microtubules and are found in pairs in animal cells. They play a crucial role in cell division, forming the spindle fibers that separate the chromosomes during cell division. The cartwheel structure refers to the radial arrangement of microtubules within the centriole. Ribosomes are involved in protein synthesis, lysosomes are involved in cellular digestion, and the nucleolus is a structure within the nucleus that produces ribosomes.

29. Correct Answer: (b)

Explanation: The incorrect match of structure with function is (b) Golgi body: Breakdown of complex molecules. The Golgi body is involved in modifying, sorting, and packaging macromolecules for transportation within the cell or for secretion outside the cell. It does not break down complex molecules.

30. Correct Answer: (b)

Explanation: Colchicine inhibits mitosis in Metaphase. Metaphase is the stage of mitosis when the chromosomes align at the equator of the cell before being pulled apart to opposite poles of the cell. Colchicine disrupts microtubule formation, which prevents the separation of chromosomes.

31. Correct Answer: (d)

Explanation: Passive transport includes osmosis, diffusion of a solute across a membrane, and facilitated diffusion. Passive transport does not require an input of energy from the cell.

32. Correct Answer: (c)

Explanation: The correct statement about diffusion that it is a passive process in which molecules move from a region of higher concentration to a region of lower concentration. Diffusion does not require an expenditure of energy by the cell, and it is a passive process that follows the concentration gradient.

33. Correct Answer: (d)

Explanation: During the zygotene stage of meiosis, homologous chromosomes begin to pair up and form bivalents. This pairing process is initiated by the formation of protein structures called synaptonemal complexes, which hold the homologous chromosomes together.

34. Correct Answer: (a)

Explanation: If the concentration of solutes in a cell is less than the concentration of solutes in the surrounding fluid, then the extracellular fluid is said to be hypertonic. Water will move from the cell to extracellular fluid.

35. Correct Answer: (a)

Explanation: Facilitated diffusion requires a transmembrane protein. This protein acts as a channel or carrier that facilitates the movement of molecules across the cell membrane, following the concentration gradient. Facilitated diffusion does not require energy input, and it cannot move molecules against the concentration gradient.

36. Correct Answer: (c)

Explanation: The voltage across a membrane is called membrane potential. The membrane potential is generated by the separation of charged ions across the cell membrane, creating an electrochemical gradient that can drive the movement of charged molecules or ions across the membrane.

37. Correct Answer: (c)

Explanation: The sodium-potassium pump is called an electrogenic pump because it contributes to membrane potential. The sodium-potassium pump actively transports ions against their concentration gradients, using ATP as energy source. This process creates an electrochemical gradient and contributes to the establishment of the membrane potential.

38. Correct Answer: (d)

Explanation: In cotransport, the movement of one substance down its concentration gradient is coupled with the movement of another substance against its concentration gradient. In this case, glucose and sodium ions are both moving into the cell. Therefore, the correct answer is (d) because a substance that blocks sodium ions from binding to the cotransport protein would also prevent glucose from being transported.

39. Correct Answer: (b)

Explanation: Ribosomes are not surrounded by a membrane. They are small, dense structures found in