MCQ FOR ZOOL-H-CC-T-04 Cell Biology

Cell and its Functions

1. Which of the following is the simplest amino acid?

a) Glycine

b) Alanine

c) Aspergine

d) Tyrosine

Answer: a

Explanation: Glycine is the simplest amino acid. It has a single hydrogen atom as its side chain. It is a proteinogenic amino acid.

2. The animal cells are interconnected by _____

a) Cell wall

b) Desmosomes

c) Plasma membrane

d) Plasmodesmata

Answer: b

Explanation: Desmosomes are structure by which adjacent cells are attached, formed from protein plagues in cell membranes linked by filaments.

3. Polythene chromosomes are found due to?

a) Mitosis

b) Endomixes

c) Endomitosis

d) Meiosis

Answer: c

Explanation: Endomitosis is a replication of chromosomes in the absence of cell or nuclear division, resulting in numerous copies within each cell, it occurs in salivary glands of Drosophila.

4. r-RNA is synthesized by _____

a) Cytoplasm

b) Golgi body

c) Nucleolus

d) Nucleus

Answer: c

Explanation: Nucleolus is a small dense spherical structure in the nucleus of the cell. r-RNA is synthesized by Nucleolus.

5. Cristae are associated with?

a) Mitochondria

b) Cytoplasm

c) Vacuole

d) Ribosomes

Answer: a

Explanation: Cristae are associated with Mitochondria. It is a fold in the inner membrane of mitochondrion. It provides a large area for chemical reactions to occur.

6. Glycocalyx is associated with _____

a) Cell wall

b) Plasma membrane

c) Nucleus

d) Ribosomes

Answer: b

Explanation: Glycocalyx is associated with Plasma membrane. It is a glycoprotein and glycolipid covering the membrane. It is also known as peculiar matrix.

7. Histone octamere contains _____

a) 8 types of histones

b) 5 types of histones

c) 6 types of histones

d) 8 histones of four different types

Answer: d

Explanation: Histone octamere is an 8 protein complex found at the centre of a nucleosome core particles. It consists of 2 copies of 4 core histone proteins.

8. Detoxification of lipid drugs and other harmful compounds in ER is carried out by?

a) Cytochrome P450

b) Cytochrome bf

c) Cytochrome D

d) Cytochrome F

Answer: a

Explanation: Cytochrome P450 enzymes function to metabolize potentially toxic compounds. There are 57 human genes coding for various cytochrome450.

9. Sodium and potassium pumps are examples of _____

a) Passive transport

b) Plasmolysis

c) Active transport

d) Osmosis

Answer: c

Explanation: Active transport is the movement of ions or molecules across a cell membrane into a region of higher concentration assisted by enzymes and requiring energy. Sodium and potassium pumps are examples of Active transport.

10. Cell theory is not applicable to _____

a) Virus

b) Micro organisms

c) Fungi

d) Algae

Answer: a

Explanation: Cell theory is not applicable to a virus as a virus is considered living and nonliving.

11. Digestive enzymes are present in _____

a) Liposomes

b) Lysosomes

c) Ribosome

d) Mitochondria

Answer: b

Explanation: Lysosomes is an organelle in cytoplasm containing enzymes enclosed in the membrane. It contains hydrolytic enzymes that can breakdown biomolecules.

12. Which among the following is known as mitoplast?

a) Mitochondria without outer membrane

b) Mitochondria without inner membrane

c) Mitochondria without membranes

d) Another name for mitochondria

Answer: a

Explanation: Mitoplast is a mitochondrion that has been stripped of its outer membrane leaving inner membrane intact.

13. Cell drinking is _____

a) Exocytosis

b) Endocytosis

c) Pinocytosis

d) Phagocytosis

Answer: c

Explanation: Cell drinking is Pinocytosis. It is ingestion of liquid into cell by the budding of small vesicles from the cell membrane.

14. Amyloplasts are articles storing _____

a) Fats

b) Proteins

c) Lipids

d) Starch

Answer: d

Explanation: Amyloplasts are articles storing starch. They are non pigmented organelles. They also convert starch back into sugar to release energy.

15. Centrioles take part in the formation of _____

a) Cell plate

b) Spindle

c) Nucleus

d) To start cell division

Answer: b

Explanation: Centrioles are a cylindrical structure composed of tubulin. Centrioles take part in the formation of Spindle.

Structure of Eukaryotic Cell – 1

1. What is the basic functional and structural unit of organisms?

a) Nucleus

b) DNA

c) Cell

d) Gene

Answer: c

Explanation: Cell is the basic structural and functional unit of life. It is a compartment filled with an aqueous solution along with several organelles which perform the essential function of life and is surrounded by the cell membrane.

2. Viruses are cellular organisms.

a) True

b) False

Answer: b

Explanation: Viruses are only living organisms which do not follow the cell theory. These are noncellular organisms as they lack cell wall or cell-like structure.

3. Name the Scientists who first discovered the cell in the piece of cork?

a) Louis Pasteur

b) Anton van Leeuwenhoek

c) Robert Hooke

d) Rudolf Virchow

Answer: c

Explanation: Robert Hooke was the first scientist who discovered the cells in the piece of cork and also given the term of the cell. He published his work in his famous book, Micrographia.

4. Which of the following is not the part of modern cell theory?

a) All living things are made up of one or more cells

b) The cell is a functional and structural unit of life

c) Energy flow takes place within the cell

d) All cells do not have the same chemical composition

Answer: d

Explanation: According to modern cell theory all cells are basically the same in chemical composition. The modern theory also states that the hereditary information passed from cell to cell.

5. What is the permeability of the plasma membrane?

a) Selectively permeable

b) Impermeable

c) Single phase flow

d) Highly permeable

Answer: a

Explanation: Plasma membrane is selectively permeable as it does not allow every solute to pass through it. Hydrophobic molecules and small molecules can easily traverse the plasma membrane while large molecules and ions cannot cross the membrane without the help of transporters.

6. Which of the following is described by the fluid mosaic model?

a) Nucleus

b) Plasma membrane

c) Endoplasmic reticulum

d) Ribosome

Answer: b

Explanation: Jonathan Singer and Garth Nicolson in 1972, proposed a fluid mosaic model for the structure and composition of the plasma membrane. This model is now accepted worldwide for the plasma membrane study.

7. Mark the component which is not the part of lipid bilayer?

a) Glycerol or Sphingosine

b) Fatty acids

c) Tryptophan and methionine

d) Phosphate

Answer: c

Explanation: Phospholipids are composed of two types of components one is hydrophobic and other is hydrophilic. The fatty acid component is only hydrophobic while rest of the molecules is hydrophilic i.e. glycerol, phosphate, and alcohol attached to phosphate.

8. What is the name of the hollow sphere formed by lipid bilayer?

a) Cholesterol

b) Lipid raft

c) Micelle

d) Liposome

9. Which of the following is ABC transport protein that transport lipid in opposite direction?

a) ATPase

b) Scramblase

c) Floppases

d) Flippase

Answer: c

Explanation: Floppases is ATP dependent ABC transporter protein which transports lipids in an opposite direction while flippase is P-type ATPase which transports glycerophospholipid from outer layer to inner membrane.

10. Out of the following, which is not an ATP dependent transporter of lipid?

a) V-type ATPase

b) Scramblase

c) Flippase

d) Floppases

Answer: b

Explanation: Scramblase does not require ATP but it is activated by calcium. It moves phospholipids along its concentration gradient, non-specifically in either direction and ensures the monolayer to be equally populated with phospholipids.

11. Name the technique which is used to visualize the lateral movement of lipids?

a) FRAP

b) Microscopy

c) Electrophoresis

d) Spectrometry

Answer: a

Explanation: FRAP is a technique of fluorescence microscopy which is used to visualize the rapid lateral movement of lipids in the bilayer. The fluidity of lipid bilayer is dependent upon the amount of lipid content and temperature.

Structure of Eukaryotic Cell – 2

1. Spectrin and ankyrin are the example of _____

a) Polytopic

b) Monotopic

c) Peripheral protein

d) Integral protein

Answer: c

Explanation: Spectrin and ankyrin are the peripheral proteins present in the membrane of RBC. Peripheral proteins are extrinsic proteins bound to membranes by electrostatic and hydrogen bond interactions.

2. Glycophorin is a major multi-pass transmembrane protein of RBC.

a) True

b) False

Answer: b

Explanation: Glycophorin is a single pass transmembrane protein of RBC. It was the first transmembrane protein whose complete amino acid sequence was determined. These are present in abundance on the plasma membrane of RBC.

3. Name the technique which is used to visualize the distribution of the protein in the membrane?

a) Patch clamp technique

b) FRAP

c) Freeze-etching

d) Freeze-fracture technique

Answer: d

Explanation: Freeze-fracture technique is used to visualize the protein distribution in the membrane by quickly frozen the specimen at -196°C and then split with a cold knife to expose the interior of the lipid bilayer and its embedded proteins.

4. Which of the following transport protein allows the transport of single solute from one side of the membrane to other?

a) Active transport

b) Passive transport

c) Uniporters

d) Co-transporter

Answer: c

Explanation: Uniporters are uniport which mediates single noncoupled transport of single solute from one side of the membrane to other. Examples: glucose transporter (GLUT).

5. What is the function of antiporters?

a) Transfer of the second solute in the same direction

b) Transfer of the second solute in the opposite direction

c) Transfer of single solute

d) Transfer of solute through pores

Answer: b

Explanation: Antiporters are the co-transporter protein i.e. coupled transport of two solutes in opposite direction. Example: transport of calcium ion out of cardiac muscle cells.

6. Name the type of antibodies which are present in blood group ‘O’?

a) Anti-A and anti-B

b) Anti-A

c) Anti-B

d) H-antigen

Answer: a

Explanation: Blood group O does not have A or B antigen on the surface of their RBC, so their blood plasma contains both the antibodies anti-A and anti-B.

7. Which of the following transport mechanism does not use metabolic energy?

a) Secondary active transport

b) Primary active transport

c) Active transport

d) Passive transport

Answer: d

Explanation: Passive transport takes place along the concentration gradient without the use of metabolic energy while active transport takes place against the concentration gradient by using metabolic energy.

8. Which of the following glucose transporter works on the liver?

a) GLUT-1

b) GLUT-2

c) GLUT-3

d) GLUT-5

Answer: b

Explanation: GLUT is the glucose transporters; a carrier protein mediates the movement of glucose. GLUT-2 works on liver while GLUT-1 on erythrocyte, GLUT-3 on the brain, and GLUT-5 on the small intestine.

9. Name the family of transport protein which allows the water to cross the membrane?
a) Facilitated diffusion
b) Ion channels
c) Aquaporins
d) Active transport
Answer: c
Explanation: Aquaporins are the water channels in the plasma membrane of the plants and animals which allow water and other small uncharged molecules to cross the membrane.

10. Which of the following ATPases are used to maintain the acidic pH of lysosomes and other vesicles?
a) P-ATPases
b) V-ATPases
c) F-ATPases
d) ABC transporters
Answer: b
Explanation: V-ATPase is found in vacuolar membranes and is used to transport proton against a concentration gradient. These pumps maintain low pH by pumping protons from cytosolic face to exoplasmic face of the membrane.

11. Which of the following process is also known as cell drinking?
a) Pinocytosis
b) Phagocytosis
c) Clathrin-mediated endocytosis
d) Caveolae-mediated endocytosis
Answer: a

Explanation: All of the above options are the types of endocytosis, which is a process of engulfing macromolecules in the plasma membrane. Pinocytosis is fluid-phase endocytosis which is also known as cell drinking, ingestion of fluid and solutes in the form of small vesicles.

Cell Division-1

1. Synthesis of RNA and proteins take place in _____

a) M phase

b) S phase

c) G1 Phase

d) G2 phase

Answer: c

Explanation: G1 Phase is the first phase of the cell cycle. It is a part of Interphase. Synthesis of RNA and proteins take place in G1 Phase.

2. When does synapsis occur during meiosis?

a) Zygotene

b) Leptotene

c) Diplotene

d) Pachytene

Answer: a

Explanation: Zygotene is the 2nd stage of the prophase of meiosis. Formation of synaptonemal complexes is seen to form bivalents.

3. Spindle fibers are made up of _____

a) Spindles

b) Tubulin

c) Flagella

d) Humulin

Answer: b

Explanation: Tubulin is a protein of globular protein. It forms microtubules. It helps in cell division.

4. Chromosomes are separated during?

a) Prophase

b) Anaphase

c) Metaphase

d) Telophase

Answer: b

Explanation: Anaphase is the 3rd stage of cell division. During this stage chromosomes move away from one another to opposite poles of the spindle.

5. Crossing over occurs between _____

a) Two daughter nuclei

b) Two different bivalents

c) Non sister chromatids of bivalents

d) Sister chromatids of bivalents

Answer: c

Explanation: Crossing over occurs between Non sisters chromatids of bivalents. Chromosomal crossing over is exchange of genetic material between homologous chromosomes that r4esults in recombinant chromosomes.

6. Replication of centriole occurs in _____

a) Interphase

b) Prophase

c) Metaphase

d) Anaphase

Answer: a

Explanation: Interphase is a phase of cell cycle in which typical cell sends most of its life. During this phase cell copies its DNA in preparation for mitosis.

7. Colchicine arrests which of the following stages of cell division?

a) Anaphase

b) Telophase

c) Interphase

d) Metaphase

Answer: d

Explanation: Colchicine is an alkaloid. It is used to treat acute attacks of gout. Colchicine arrests Metaphase stage of cell division.

8. Cell plate is laid during _____

a) Cytokinesis

b) Karyokinesis

c) Interphase

d) Metaphase

Answer: a

Explanation: Cytokinesis is a process of cell division which divides cytoplasm of a parental cell into two daughter cells. It occurs with mitosis and meiosis.

9. DNA replicates during _____

a) G1 phase

b) G2 phase

c) S phase

d) Prophase

View Answer

Answer: c

Explanation: S phase is a part of the cell cycle in which DNA is replicated. Accurate DNA replication is necessary to prevent genetic abnormalities.

10. Crossing over occurs during _____

a) Diplotene

b) Pachytene

c) Leptotene

d) Zygotene

Answer: b

Explanation: Crossing over occurs during Pachytene. Pachytene is a 3rd stage of the prophase of meiosis.

11. Polyploidy can be artificially induced by _____

a) Self pollination

b) Line breeding

c) Inbreeding

d) Colchicine

Answer: d

Explanation: Polyploidy s condition in which normally diploid cell acquires one or more additional sets of chromosomes. Polyploidy can be artificially induced by Colchicine.

12. Chromosomes are arranged along equator during _____

a) Prophase

b) Metaphase

c) Anaphase

d) Telophase

Answer: b

Explanation: Metaphase is the 2nd stage of cell division. During metaphase chromosome arrange themselves in the middle of the cell.

13. Which phase comes between G1 and G2 phase?

a) Go

b) M

c) S

d) I

Answer: c

Explanation: S phase comes between G1 and G2 phase. It is an important phase.DNA replicates in S Phase.

14. Chiasmata formation takes place during _____

a) Prophase I

b) Metaphase I

c) Anaphase I

d) Telophase I

Answer: a

Explanation: Chiasmata formation takes place during Prophase I. During this stage chromosomes are duplicated. Chiasmata is a point where paired chromosomes remain in contact during the first metaphase of meiosis.

15. Amitosis is shown by _____

a) Euglena

b) Syllis

c) Hydra

d) Bacteria

Answer: d

Explanation: Amitosis is shown by Bacteria. Amitosis is a simple method of cell division which occurs without the formation of spindles and appearance of chromosomes.

Cell Division-2

1. Name the type of cell division in which daughter cells receive an exact copy of chromosomes from parent cell?

a) Mitosis

b) Cleavage

c) Interphase

d) Meiosis

Answer: a

Explanation: Basically eukaryotes have two types of cell division, mitosis, and meiosis. Meiosis is reductional division while mitosis is equational division and the number of chromosomes in parent and daughter cells remain same.

2. Who coined the term mitosis?

a) Robert Hook

b) Walther Flemming

c) Farmer and Moore

d) F. Twort

Answer: b

Explanation: Walther Flemming in 1882 introduced the term mitosis. It is the process where one round of DNA replication is trailed by a single round of chromosomal segregation. It generates two genetically identical cells.

3. Which of the following is a microtubule organizing center?

a) Centrosome

b) Kinetochore

c) G2 phase

d) Centrioles

Answer: a

Explanation: Microtubule organizing center (MTOC) is centrosome, present outside the nuclear membrane. It regulates the cycle of cell division as well as microtubule formation.

4. Among the following, which one is not the substage of mitosis?

a) Prophase

b) Metaphase

c) Anaphase

d) Nucleation

Answer: d

Explanation: Mitosis starts with the nuclear division called karyokinesis followed by cytokinesis. This phase is further divided into four substages: prophase, metaphase, anaphase, and telophase.

5. Name the protein which holds two sister chromatids?

a) Securin

b) Separase

c) Cohesin

d) APC

Answer: c

Explanation: SMC (Structural Maintenance of Chromosome) protein cohesin hold together the sister chromatids at centromere while separase is ubiquitous cysteine protease which degrades cohesin during anaphase.

6. Which of the following microtubule pulls the chromosomes towards pole?
a) Astral
b) Polar
c) Kinetochore
d) Centrioles
Answer: c
Explanation: Kinetochore microtubule is a mitotic spindle which attaches to chromosome at the specific site called kinetochores. It pulls the two sister chromatids at the opposite pole during anaphase.

7. Plant cells have centrosomes and astral microtubule at their spindle poles.
a) True
b) False
Answer: b
Explanation: Plant cells do not have centrosomes and astral microtubule at their poles. In plant cells, mitotic spindle formed from MTOC originate from nuclear envelop itself.

8. Spindle fiber attached to the chromosome by a process known as_____
a) Congression
b) Binding
c) Alignment
d) Search and capture
Answer: d
Explanation: Search and capture is a process by which plus end of microtubule search the kinetochore site at the chromosome and attach to it. These microtubules radiate from the MTOC of the poles.

9. What is congression?

a) Attachment of microtubule to chromosomes

b) Attachment of two sister chromatids

c) The endpoint of the spindle pole

d) The midpoint of two spindle poles

Answer: d

Explanation: The arrangement of chromosomes at the center of the poles or at the metaphase plate, which is a midpoint and this midpoint is called congression.

10. In which of the following phase, sister chromatids move towards opposite poles?

a) Telophase

b) Anaphase

c) Prophase

d) Metaphase

View Answer

Answer: b

Explanation: The sister chromatids are attached to the kinetochore tubule at the metaphase state and start moving towards the opposite poles at anaphase stage. At anaphase, the sister chromatids split apart and move to opposite poles of the spindle.

11. Which of these proteins is responsible for depolymerization of microtubule?

a) Kin I kinesin

b) CENP-E

c) Dynein

d) Actin

Answer: a

Explanation: CENP-E, Kin I kinesin, and dynein are the motor proteins which contain kinetochores. Out of them only Kin I kinesis is responsible for depolymerization of microtubule from its plus end while dynein generates poleward forces toward its minus end.

12. Name the medication which hinders the shortening of the microtubule.

a) Colchicine

b) Cytochalasin

c) Taxol

d) Vinblastine

Answer: c

Explanation: All of these drugs affect the process of cell division at different stages like colchicine inhibits microtubule formation, cytochalasin inhibits cytokinesis, and taxol prevents the shortening of microtubules.

Cell Cycle

1. Resting phase of the cell, where it undergoes growth and DNA replication is called_____

a) Mitosis phase

b) G1 phase

c) Interphase

d) M phase

Answer: c

Explanation: Interphase is also known as resting phase, time in the cell cycle where a cell is preparing for division by undergoing the cell growth. Interphase is further divided into three stages.

2. Replication of DNA takes place in S phase.

a) True

b) False

Answer: a

Explanation: S phase is synthesis phase, characterized as the period of DNA replication. DNA replication is the process of duplication of cell’s genome.

3. Which of the following is not the part of Interphase in the cell cycle?

a) S phase

b) G1 phase

c) G2 phase

d) M phase

Answer: d

Explanation: Interphase is the period before division while M phase is mitosis phase where actual division takes place. G1, S, and G2 phase are the part of Interphase.

4. Name the state where never dividing cells of neurons and skeletal muscle present?

a) G0

b) G1

c) G2

d) M

Answer: a

Explanation: G0 is the state where cell division never occurs; cells can remain in this state for days, weeks, and even a year. It is terminally differentiated state and most of the cell in our body like neurons and skeletal muscle cells are in G0 state.

5. How many hours does the M phase take to complete a cycle?

a) 8hr

b) 1 hr

c) 4 hr

d) 11 hr

Answer: b

Explanation: A cell cycle of the eukaryotic cell takes 24 hr to divide. In total 24 hrs, the G1 phase takes 11 hr, S phase completed in 8 hrs, G2 about 4 hrs, and M phase about 1 hr.

6. Name the process of nuclear division?

a) Ubiquitylation

b) Polymerization

c) Karyokinesis

d) Cytokinesis

Answer: c

Explanation: Nuclear division is the formation of two daughter nuclei and this process known as karyokinesis. M phase starts with the nuclear division followed by a division of cytoplasm (cytokinesis).

7. Name the regulatory component of the cell cycle?

a) Cyclin

b) CDK

c) DNA

d) APC

Answer: a

Explanation: Cyclin is the regulatory component of the cell cycle as it undergoes synthesis and degradation in each division of the cell cycle. CDK is cyclin-dependent kinases which are catalytic in nature.

8. Cyclin dependent kinases are activated by which of the following?

a) Binding to cyclin

b) Binding to cyclin and CDK activating protein kinases

c) Phosphorylation with CDK activating kinase

d) Phosphorylation with tyrosine kinase

Answer: b

Explanation: The activation of CDK is triggered by the association of cyclin and phosphorylation with associated kinases. Kinases are the enzymes which add a phosphate group to the target substrate.

9. Name the cyclin which takes part in M phase?

a) Cyclin E

b) Cyclin A

c) Cyclin D

d) Cyclin B

Answer: d

Explanation: Different events of the cell cycle are controlled by the association of CDK with different cyclins. Cyclin B is mitotic cyclin which works in M phase while cyclin E is S phase cyclin, and cyclin D is G1 cyclin.

10. Name the enzyme which causes ubiquitylation and destruction of cyclin.
a) Acid hydrolases
b) Hyaluronidase
c) Ubiquitin ligase
d) Phosphatase
Answer: c
Explanation: Destruction of cyline takes place by ubiquitin dependent proteolysis. It is catalyzed by ubiquitin ligase, an enzyme which acts upon either G1-S phase or M phase cyclin.

Endoplasmic Reticulum

1. Which of the following is the largest single membrane-bound intracellular compartment?
a) Ribosome
b) Golgi apparatus
c) Nucleus
d) Endoplasmic reticulum
Answer: d
Explanation: Endoplasmic reticulum is a network of closed and flattened single membrane-bound intracellular structure. ER lumen is the enclosed compartment between ER membranes which are physiologically active.

2. Protein undergoes modifications in ER before reaching their final destination.
a) True
b) False
Answer: a
Explanation: After the synthesis of protein, it undergoes various modifications before reaching their final destination i.e. Glycosylation, protein folding, the formation of disulfide bridges, and specific proteolytic cleavage.

3. What is microsome?

a) Compartment of Golgi

b) Smaller ribosomes

c) Small ER compartments

d) Small vesicles of fragmented ER

Answer: d

Explanation: Microsomes are small vesicles formed by the breakdown of ER membrane into fragments. Microsomes which are derived from RER are known as rough microsomes while microsomes lacking ribosomes are called smooth microsome.

4. Endoplasmic reticulum membrane which is associated with ribosomes is called_____

a) ER lumen

b) Smooth endoplasmic reticulum

c) Rough endoplasmic reticulum

d) Endosome

Answer: c

Explanation: Endoplasmic reticulum membrane has been divided into rough or smooth based on the association of ribosome with their cytoplasmic surface. The region of ER that is bounded with ribosomes is called rough endoplasmic reticulum or RER.

5. Name the antibiotic which inhibits the synthesis of oligosaccharides?

a) Tunicamycin

b) Cephalosporins

c) Penicillins

d) Ofloxacin

Answer: a

Explanation: Tunicamycin is an antibiotic which inhibits the synthesis of oligosaccharides by blocking the first step in glycosylation of proteins.

6. Which of the following is not the function of Glycosylation?

a) Helps in proper folding of the protein

b) Confer stability in proteins

c) Helps in cell-cell adhesion

d) Synthesis of membrane lipid

Answer: d

Explanation: Glycosylation is the process of attachment of sugars molecule to the nitrogen atom in an amino acid residue of the protein. synthesis of membrane lipid is incorrect, SER produces membrane lipids.

7. Name the site where detoxification of xenobiotic compounds takes place?

a) Cytosol

b) RER

c) SER

d) Ribosome

Answer: c

Explanation: SER is smooth endoplasmic reticulum which is a part of endoplasmic reticulum membrane where ribosome is not attached. It is the major site for removal of xenobiotics, and the reaction is catalyzed by cytochrome P-450.

8. Name the sequence which allows the resident protein to retain in ER lumen?

a) KDEL

b) KKXX

c) KLDE

d) KXXK

Answer: a

Explanation: KDEL stands for lys-asp-glu-leu sequences, present at the C-terminus of resident proteins. These sequences act as a sorting signal which is necessary for retention of protein in the ER.

9. Which of the following coated vesicle transport protein from ER to Golgi?

a) Clathrin

b) COP II

c) COP I
d) COP III

10. Name the coated vesicle which is used to transfer protein from plasma membrane to endosome?
a) Clathrin
b) COP I
c) COP II
d) COP III
Answer: a
Explanation: Clathrin along with different adapter proteins (APs) forms coated vesicles which transport protein from plasma membrane to endosome.

Golgi Complex

1. Name the scientist who discovered Golgi apparatus?
a) Robert Remake
b) Rudolf Virchow
c) Camillo Golgi
d) Theodor Schwann
Answer: c
Explanation: Camillo Golgi was an Italian physician who first discovered Golgi complex, which is a single membrane-bound organelle. It consists of five to eight membrane-bound sacs called cisternae.

2. Golgi stack is the stack of Golgi cisternae.
a) True
b) False
Answer: a
Explanation: Golgi stack or dictyosome is the stack of flattened membrane bound sacs called cisternae. The cisternae in stack vary in number, shape, and organization and represented as cis, medial and transform.

3. Which of the following organelle takes part in the secretion?

a) Cytoplasm

b) Ribosomes

c) ER compartments

d) Golgi apparatus

Answer: d

Explanation: Golgi apparatus is prominent in cells that are specialized for secretion like goblet cell of intestinal epithelium secrete a large amount of mucus. Cell secretion takes place from trans-Golgi through exocytosis.

4. The chemical products of the cell are shipped and distributed by_____

a) ER lumen

b) Golgi apparatus

c) Lysosome

d) Endosome

Answer: b

Explanation: Golgi apparatus modifies and transport proteins and lipids that have been built in the endoplasmic reticulum to the outside of the cell or to other locations in the cell.

5. Which type of glycosylation takes place in the g=Golgi apparatus?

a) T-linked glycosylation

b) N-linked glycosylation

c) O-linked glycosylation

d) G-glycosylation

Answer: c

Explanation: O-linked glycosylation occurs by the linking of O-linked oligosaccharides to the hydroxyl group of amino acid via N-acetylglucosamine. Proteins undergo O-linked glycosylation in the cisternae of Golgi.

6. Which of the following is not the function of the Golgi apparatus?

a) Processing and shorting of glycoprotein

b) Lipid metabolism

c) Carbohydrate metabolism

d) Amino acid metabolism

Answer: d

Explanation: Golgi apparatus involves the metabolism of carbohydrates, and lipids, but not of amino acid, so, amino acid metabolism is incorrect. Synthesis of glycolipids and sorting of glycoprotein also takes place in Golgi apparatus.

7. Name the complex polysaccharide which does not synthesize in the Golgi apparatus?

a) Starch

b) Hemicellulose

c) Glycosaminoglycans

d) Pectins

Answer: a

Explanation: Complex polysaccharides are also synthesized in the Golgi apparatus such as hemicellulose and pectin in the cell wall of plant and glycosaminoglycans in the extracellular matrix of animals.

8. Which of the following hypothesis explain vesicle fusion?

a) Lipid raft hypothesis

b) SNARE hypothesis

c) Cell adhesion hypothesis

d) Cell kill hypothesis

Answer: b

Explanation: Snare hypothesis explains the vesicle fusion with target mediated by the interaction of specific proteins called SNAREs (Snape receptors). V-SNARE is present on vesicle while t-SNARE is present on the target.

9. Name the GTPase which control the recognition of interactions between v-SNARE and t-SNARE?

a) Rac protein

b) Ras protein

c) Rab protein

d) Rho protein

Answer: c

Explanation: Rab protein attached with the surface of the vesicle; when vesicle encounter with target membrane, the binding of v-SNARE and t-SNARE causes vesicle to bound the membrane and allow the Rab protein to hydrolyze its bound GTP.

10. Which of the following ATPase dissociate SNARE apart?

a) V-ATPase

b) F-ATPase

c) P-ATPase

d) NSF

Answer: d

Explanation: Once the vesicle fusion to target membrane is done, the complex dissociates with the help of NSF (NEM sensitive factor), which is a soluble ATPase that hydrolyses ATP and separate SNAREs.

Lysosome

1. Which of the following organelle control intracellular digestion of macromolecules with the help of hydrolytic enzymes?

a) Plastid

b) Peroxisome

c) Lysosome

d) Actin

Answer: c

Explanation: Lysosomes are membrane-bound compartment filled with hydrolytic enzymes which control intracellular digestion in the macromolecules. It contains about 40 types of different hydrolytic enzymes.

2. pH of the lysosome is acidic in nature.

a) True

b) False

Answer: a

Explanation: The acidic nature of lysosome is maintained by a hydrogen pump in the lysosomal membrane which pumps hydrogen ion into lysosome and maintains pH of about 5.0 in its interior.

3. Which of these are not the hydrolytic enzymes of lysosome?

a) Lipases

b) Sulfatases

c) Phosphatases

d) Aldolase

Answer: d

Explanation: Lysosomes contain 40 types of hydrolytic enzymes which include lipases, sulphatases, phosphatases, glycosidases etc. These enzymes work optimally in the acidic environment and the lysosome provides an acidic environment for these enzymes.

4. Digestion of cell's own component is known as_____

a) Autophagy

b) Heterophagy

c) Phagocytosis

d) Pinocytosis

Answer: a

Explanation: Autophagy is the process of self-digestion, autophagic vacuoles contain cells own components, known as autophagosome which further fuse to the lysosome where digestion of components takes place.

5. What is amphisome?

a) Early endosome

b) Fusion of endosome and autophagosome

c) Vacuole

d) The bigger size of lysosome

Answer: b

Explanation: Amphisome is formed when autophagosome fused with the endosomes. This amphisome further fused with lysosome for digestion. It will result in the release of macromolecules into the cytosol.

6. The release of melanosomes from melanocytes is mediated by which of the following process?

a) Autophagy

b) Endocytosis

c) Exocytosis

d) Pinocytosis

Answer: c

Explanation: In the condition of stress, cell releases undigested content by exocytosis of lysosomes. It is a minor pathway. Melanocyte in skin stores its pigment in lysosomes which releases it into the extracellular space of the epidermis.

7. Name the single membrane which surrounded the vacuoles?

a) Contractile vacuole

b) Meninges

c) Tonoplast

d) Sarcolemma

Answer: c

Explanation: Vacuoles are large, fluid-filled vesicles, present in most of the plants and fungal cells. These are surrounded by a single-membrane called tonoplast.

8. Which of the following organelle works as a lysosome in the plants?

a) Contractile vacuole

b) Peroxisome

c) Plastid

d) Vacuole

Answer: d

Explanation: Like a lysosome in animal cells, vacuoles are present in plants and fungi contain a variety of hydrolytic enzymes. The pH of vacuole is also acidic and is maintained by transport protein in the vacuolar membrane.

9. Which of the following pumps excess water out of the cell?

a) Contractile vacuole

b) Lysosome

c) Peroxisome

d) Vacuoles

Answer: a

Explanation: Contractile vacuole is different from vacuoles as it helps in osmoregulation. It is mainly found in protists and is used to pump excess water out of the cell.

Mitochondria

1. The site of aerobic respiration in eukaryotic cells is_____

a) Peroxisome

b) Plastid

c) Mitochondria

d) Cilia

Explanation: In general, mitochondria are present nearly all eukaryotic cells and known as the power house of the cell. It acts as the site of aerobic respiration and produces cellular energy in the form of ATP.

2. The inner membrane of mitochondria is fairly smooth.

a) True

b) False

Answer: b

Explanation: The inner membrane of mitochondria is highly convoluted while its outer membrane is fairly smooth. These convoluted folds are also called cristae which make the membrane impermeable to many solutes and increase its surface area.

3. How do the small molecules pass through the outer membrane of mitochondria?

a) ATP pump

b) Carrier protein

c) Channels

d) Porins

Answer: d

Explanation: Mitochondrial porins are voltage-dependent anion-selective channels (VDAC). Being present on the outer membrane of mitochondria it allows small molecules to pass.

4. Which of the following division technique is similar in mitochondria and bacteria?

a) Binary fission

b) Budding

c) Binary fusion

d) Meiosis

Answer: a

Explanation: Mitochondria are semi-self-ruling organelle and separation by binary fission simply like bacteria. This similarity between bacteria and mitochondria suggest that it evolved from bacteria and is proved by endosymbiotic theory.

5. Which of the following is INCORRECT evidence to support the endosymbiotic theory?

a) Mitochondria are self-repeating bodies like microscopic organisms

b) Mitochondria have their own particular DNA

c) Mitochondrial ribosomes, and enzymes are similar to the bacteria

d) Mitochondria and bacteria differ in size

Answer: d

Explanation: Endosymbiotic theory had supported the fact that mitochondria have evolved in eukaryotes by the symbiotic association of bacteria. Mitochondria and bacteria differ in size is incorrect as the size of mitochondria and bacteria is approximately same.

6. Name the organelle which is used for aerobic respiration and ATP synthesis in *Entamoeba histolytica*.

a) Hydrogenosome
b) Mitochondria
c) Mitosome
d) Peroxisome
Answer: c
Explanation: Mitosomes are originated from mitochondria and is present only in aerobic organisms that do not have mitochondria. These are double-membrane bound organelle which is mainly found in unicellular organisms.

7. Which of these are not from plastid family?
a) Chloroplast
b) Tonoplast
c) Chromoplast
d) Leucoplast
Answer: b
Explanation: Tonoplast is an outer membrane of vacuoles while chloroplast, chromoplast, and leucoplast belong to plastid family. The chloroplast is considered a most important member of the family as it helps in photosynthesis.

8. Which of the following is responsible for pigment synthesis and storage?
a) Leucoplast
b) Chloroplast
c) Chromoplast
d) Etioplast
Answer: c
Explanation: Chromoplast is well-off in carotenoids which are accountable for orange, yellow, or red color in many fruits and flowers.

9. Which class of leucoplast is responsible for fat storage?
a) Amyloplast
b) Proteinoplasts

c) Aleuroplasts

d) Elaioplasts

Answer: d

Explanation: Leucoplast is colourless or non-pigmented in nature and is used to for storage. Amyloplast store starch, proteinoplast, and Aleuroplast store and modify proteins.

10. Name the plant organelle which acts as a major site for an oxidative reaction?

a) Peroxisomes

b) Mitochondria

c) Chloroplast

d) Thylakoid

Answer: a

Explanation: Major oxidative reaction site in mammals and plants is peroxisomes, where beta-oxidation takes place. However, beta-oxidation in mammals can occur in mitochondria also while in plants, this is exclusively found in peroxisomes.

Cytoskeleton

1. Cell shape and cellular motility is determined by the _____

a) Centrioles

b) Intermediate filament

c) Microtubule

d) Microfilaments

Answer: c

Explanation: Microtubules are a cylindrical, hollow structure which plays a crucial role in determining the shape of the cell. Microtubule is resulted by the combination of 13 protofilaments into a tube-like structure.

2. Singlet microtubule can form a long shaft of cilia and flagella.

a) True

b) False

Answer: b

Explanation: Motile cell appendages like cilia and flagella are formed by the doublet microtubule. Another 10 or 11 protofilaments combined to form second microtubule, this second microtubule fused with 13 protofilaments of first microtubule and forms doublet microtubules.

3. What is treadmilling?

a) Depolymerization of microtubule

b) The breaking of heterodimer chain

c) Arrangement of microtubules

d) Addition of tubulin heterodimer

Answer: d

Explanation: Treadmilling is the process of adding tubulin heterodimer at one end and dissociating another heterodimer from other ends. This will keep the polymer length same or unchanged.

4. Which of the following feature is the same in cilia and flagella?

a) Help in locomotion

b) Wave-like motion

c) Occurring all over the surface of the cell

d) Very small in size

Answer: a

Explanation: Cilia and flagella differ from each other as cilia are smaller in size and many in numbers while flagella are larger in size and very less in numbers. Only the function of them is same as they both help in locomotion.

5. Name the drug which depolymerizes microtubule to tubulin subunit.

a) Cytochalasin D

b) Nocodazole

c) Latrunculin

d) Phalloidin

Answer: b

Explanation: Nocodazole causes depolymerization of microtubule into tubulin subunits while all the other drugs affect actin filaments.

6. What is the role of vinblastine and vincristine?

a) Causes depolymerization

b) Prevent depolymerization

c) Prevent polymerization

d) Prevent nucleation

Answer: c

Explanation: Vinblastine and vincristine are also known for their role in cancer, these drugs act by interfering with the polymerization and stop the growth of microtubule.

7. What is the name of the cell membrane of muscle cells?

a) Sarcoplasm

b) Perimysium

c) Endomysium

d) Sarcolemma

Answer: d

Explanation: Sarcolemma is the cell membrane of muscle cells while sarcoplasm is the cytoplasm of muscle fiber. Sarcoplasm also contains a modified endoplasmic reticulum which is known as sarcoplasmic reticulum.

8. What is the basic functional unit of myofibril?

a) Sarcomere

b) Tropomyosin

c) Troponin

d) Nebulin

Answer: a

Explanation: Myofibril consists of thick and thin filaments i.e. myosin and actin which are arranged into a linear chain of an ordered structure known as a sarcomere.

9. Which of the following take part in relaxation of muscles?

a) Nebulin

b) Titin

c) Tropomodulin

d) Myomesin

Answer: b

Explanation: Titin is the considered as largest protein in the body, and plays a role in the relaxation of muscles. It is present opposite to the Z disc and thick filament.

10. Which of the following is occluding junction?

a) Adherence junction

b) Desmosomes

c) Tight junction

d) Gap junction

Answer: c

Explanation: Occluding junction seal cells together so, tight junction is the type of occluding junction where there is the closest contact between adjacent cells which prevent the free passage of molecules across cells

Nucleus

1. Name the control center of the eukaryotic cell?

a) Nucleus

b) Ribosome

c) Cytoplasm

d) Golgi complex

Answer: a

Explanation: Nucleus contains most of the genetic material of the cell and is called the control center of the eukaryotic cell. Eukaryotic cell may have a single nucleus (uninucleate) or have many nuclei (multinucleate).

2. Red blood cells are multinucleate in nature.

a) True

b) False

Answer: b

Explanation: Mature red blood cells do not have a nucleus, so, these cells are neither multinucleate nor uninucleate.

3. Which of the following microorganism have two nuclei?

a) Slime molds

b) Cyanobacteria

c) Amoeba

d) Paramecium

Answer: d

Explanation: Paramecium is unicellular ciliate protozoa which have two nuclei, one is macronucleus and other is micronucleus. Genes for everyday function of the cell is stored in macronucleus and sexual reproduction is controlled by micronucleus.

4. Which of the following is not a component of the nucleus?

a) Chromosome

b) Nucleolus

c) Cytoplasm

d) Nuclear envelope

Answer: c

Explanation: Cytoplasm is not the component of the nucleus but the nucleus is found in the cytoplasm. The four components of the nucleus are nucleoplasm, nuclear envelope, nucleolus, and chromosomes.

5. Mark the INCORRECT statement about nuclear lamina.

a) Filaments present in the inner membrane of the nucleus

b) Made up of lamin proteins

c) Provide mechanical support to the nucleus

d) It has bounded with the ribosomes

Answer: d

Explanation: Bounded with the ribosomes is incorrect for nuclear lamina as ribosomes present on the outer membrane of nucleus while nuclear lamina is a network of an intermediate filament which is present on the nuclear side of the inner membrane of the nucleus.

6. Name the structure which is used to transfer macromolecules between the cytoplasm and nucleus.

a) Microtubules

b) Nuclear pores

c) Cilia

d) Centrioles

Answer: c

Explanation: Nuclear pores are present on the nuclear envelope which helps in transport of macromolecules among nucleus and cytoplasm. Nuclear pores are the part of a nuclear pore complex which includes inner and outer membranes of the nucleus.

7. Name the signal which helps protein to move in or out of the nucleus?

a) Notch signal

b) Paracrine signal

c) Nuclear localization signal

d) Chemical signals

Answer: c

Explanation: Nuclear localization signals are also known as a nuclear-export signal which helps protein to import and export in the nucleus through nuclear pores. These signals are specific amino acid sequences present on the proteins.

8. Non-membrane bound body of the nucleus which disappears in the late prophase and reappears in telophase_____

a) Nucleolus

b) Chromosome

c) Nucleoplasm

d) Nuclear pore

Answer: a

Explanation: Nucleolus is the component of the nucleus which is a non-membrane bound body produced by Nucleolar-organizing region of a chromosome. It disappears in the late prophase and then appears again in the telophase stage of cell division.

9. Which of the following is not true for chromatin?

a) Organized structure of DNA and protein

b) These are highly condensed DNA

c) It is found in the nucleus

d) It contains a single dsDNA

Answer: a

Explanation: Organized structure of DNA and protein is incorrect as chromatin is less condensed and extended DNA while highly condensed DNA is of chromosomes.

10. Which region of chromatin is transcriptionally silent?

a) Nucleoid

b) Centromere

c) Euchromatin

d) Heterochromatin

Answer: d

Explanation: Heterochromatin is darkly stained and highly condensed region of chromatin which is generally believed to be transcriptionally silent.

Cell Signaling

1. Which of the following signal molecule is NOT used for extracellular signaling?

a) Autocrine

b) Endocrine

c) Paracrine

d) Cyclic AMP

Answer: d

Explanation: Extracellular signaling in animals is carried out by four categories of signal molecules endocrine, paracrine, autocrine, and juxtacrine signaling. Cyclic AMP is a secondary messenger used for intracellular signaling.

2. In endocrine signaling, the signal molecule act on target cell only in close proximity.
a) True
b) False
Answer: b
Explanation: Endocrine signaling always acts on the distant target cell or that cell which located distantly from their site of synthesis while paracrine signaling is used for the cells which are located in close proximity.

3. Arrange the following sequence of extracellular signaling in the correct order?
1) Transport of signal to a target
2) Start of signal transduction pathways
3) Signaling cell synthesize and release signaling molecules
4) Binding of the signal to the specific receptor
a) 2, 3, 4, 1
b) 3, 1, 4, 2
c) 1, 2, 3, 4
d) 1, 3, 4, 2
Answer: b
Explanation: Specific extracellular signaling molecules are defined for each cell. Extracellular signaling involves the synthesis and release of signal molecules, which bind to the specific receptor and initiate signal transduction pathway.

4. Which of the following signaling pathway is followed by T-lymphocytes in response to antigenic stimulation?
a) Autocrine signaling
b) Juxtacrine signaling
c) Paracrine signaling

d) Endocrine signaling

Answer: a

Explanation: Signaling pathway in which signal molecules affect the same cell that produces it is called autocrine signaling. In response to antigenic stimulation, T-lymphocytes synthesize a growth factor which derives its own proliferation and amplifies the immune response.

5. Name the signaling which requires physical contacts between the cells involved.

a) Paracrine signaling

b) Intracellular signaling

c) Autocrine signaling

d) Juxtacrine signaling

Answer: d

Explanation: Juxtracrine signaling is different from another signaling as it requires physical contact between the cells, these signals neither travel to distant target nor act on the same cell.

6. Mark the signal molecule which does not interact with cell surface receptor.

a) Insulin

b) Glucagon

c) Testosterone

d) Gastrin

Answer: c

Explanation: Testosterone is a steroid hormone which can easily traverse cytosolic membrane and interact with a nuclear receptor or cytosolic receptor.

7. Name the largest family of cell surface receptor?

a) GPCR

b) Ion-channel receptor

c) Enzyme-linked receptor

d) Nuclear receptor

Answer: a

Explanation: GPCR is a G-protein coupled receptor; it requires G-protein for transmission of signals to the intracellular receptor. It is present in all eukaryotes and it includes receptors which are responsible for smell, light, and taste.

8. Which of the following G-protein takes part in the regulation of vision?

a) Gs family

b) Gi family

c) Gq family

d) Golf

Answer: b

Explanation: G-protein which takes part in vision is Gt or transducin. Transducin is GTP-binding protein and is trimeric in nature.

9. Name the family of monomeric G-protein which regulates the growth of the cell?

a) Ras

b) Rab

c) Ran

d) Rho

Answer: a

Explanation: Ras is a monomeric G-protein which controls the growth of the cell through serine-threonine protein kinases. Ras works in a cyclic manner from inactive GDP-bound form to active GTP-bound form.