08

Cell : The Unit of Life

TOPIC 1
The Cell

01 What will be the direction of flow of water when a plant cell is placed in a hypotonic solution?
[NEET (Odisha) 2019]

(a) Water will flow in both directions
(b) Water will flow out of the cell
(c) Water will flow into the cell
(d) No flow of water in any direction

Ans. *(c)*

The behaviour of the plant cells with regard to water movement depends on the surrounding solution. When a plant cell is placed in hypotonic solution then the water will flow into the cell and the cell will swell.

02 Which of the following organic compounds is the main constituent of lecithin?
[NEET (Odisha) 2019]

(a) Arachidonic acid
(b) Phospholipid
(c) Cholesterol
(d) Phosphoprotein

Ans. *(b)*

Phospholipids are main constituents of lecithin. These molecules are composed of choline and inositole. It is found in all living cells as a major component of cell membrane.

03 The concept of '*Omnis cellula-e-cellula*' regarding cell division was first proposed by
[NEET (National) 2019]

(a) Theodor Schwann
(b) Schleiden
(c) Aristotle
(d) Rudolf Virchow

Ans. *(d)*

Rudolf Virchow proposed the concept of *"omnis cellula-e-cellula"*, i.e. all cells are derived from the pre-existing cells.

Schleiden and Theodor Schwann jointly put forward the cell theory in 1839.

04 Which one of the following elements is responsible for maintaining turgor in cells?
[NEET 2018]

(a) Potassium (b) Sodium
(c) Magnesium (d) Calcium

Ans. *(a)*

Among the given elements, potassium (K^+) is responsible for maintaining turgor pressure in cell because it regulates the proton pumps involved in opening and closing of stomata. Magnesium (Mg^{2+}) is a constituent of chlorophyll pigment which helps in photosynthesis in green plants. Calcium (Ca^{2+}) provides selective permeability to the cell membrane. All of these, i.e. K^+, Ca^{2+} and Mg^{2+} are essential elements.

Sodium (Na^+) is involved in membrane permeability. It is a non-essential element.

05 Which among the following is not a prokaryote? **[NEET 2018]**

(a) *Nostoc* (b) *Mycobacterium*
(c) *Saccharomyces* (d) *Oscillatoria*

Ans. *(c)*

Among the given options, *Saccharomyces* is a fungus, *i.e.* it is a eukaryote. They possess a well defined nucleus and other cell organelles. ***Nostoc*** and ***Oscillatioria*** are cyanobacteria while ***Mycobacterium*** is a true bacterium. Cyanobacteria and bacteria both are prokaryotes as they lack a well-defined nucleus and other cell organelles.

06 Which of the following components provides sticky character to the bacterial cell ?
[NEET 2017]

(a) Cell wall
(b) Nuclear membrane
(c) Plasma membrane
(d) Glycocalyx

Ans. *(d)*

Glycocalyx is the outer most mucilage layer of the cell envelope. It gives sticky character to the bacterial cell .

07 Select the wrong statement.
[NEET 2016, Phase II]

(a) Bacterial cell wall is made up of peptidoglycan
(b) Pili and fimbriae are mainly involved in motility of bacterial cells
(c) Cyanobacteria lack flagellated cells
(d) *Mycoplasma* is a wall-less microorganism

Ans. *(b)*

Fimbriae or pili are fine hair like appendages used by bacteria for attachment rather than motility. These are formed of protein called pilin.

Pili are longer than fimbriae and are one or two per cells.

Some special type of pili called sex pili are present in certain strains of bacteria which help the bacterium for forming conjugation canal during sexual reproduction by conjugation method. Fimbriae also help bacterium for cell to cell adhering and colonisation.

08 The structures that help some bacteria to attach to rocks and/or host tissues are **[CBSE AIPMT 2015]**

(a) rhizoids (b) fimbriae
(c) mesosomes (d) holdfast

Ans. *(b)*

Fimbriae are small bristle like fibres sprouting out of the cell. In some bacteria, they are known to help is attachment to rocks in streams and also to the host tissues.

09 Which of the following structure is not found in a prokaryotic cell? **[CBSE AIPMT 2015]**

(a) Nuclear envelope
(b) Ribosome
(c) Mesosome
(d) Plasma membrane

Ans. *(a)*

In a prokaryotic cell, nuclear envelope is not found. It means genetic material (DNA) is not enclosed by any envelope and lies in direct contact with the cytoplasm.

10 A protoplast is a cell **[CBSE AIPMT 2015]**

(a) without plasma membrane
(b) without nucleus
(c) undergoing division
(d) without cell wall

Ans. *(d)*

A protoplast is a cell without cell wall. It is a plant, bacterial or fungal cell that had its cell wall completely or partially removed using either mechanical or enzymatic means.

11 Select the correct statement from the following regarding cell membrane. **[CBSE AIPMT 2012]**

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

Ans. *(d)*

In 1972, Singer and Nicolson proposed fluid mosaic model for internal structure of plasma membrane. This is most widely accepted model for plasma membrane.

According to this model, a membrane consists of a continuous bilayer of phospholipids with their polar hydrophilic ends on the outer surfaces and two non-polar hydrohobic tails of each phospholipid molecule point inwards. The globular alpha proteins do not form continuous layer but are embedded randomly in the lipid bilayer or superficially attached.

12 Which one of the following organisms is not an example of eukaryotic cells? **[CBSE AIPMT 2011]**

(a) *Escherichia coli*
(b) *Euglena viridis*
(c) *Amoeba proteus*
(d) *Paramecium caudatum*

Ans. *(a)*

The bacterium *E. coli* is a prokaryote. It is a Gram-negative, facultatively anaerobic, rod-shaped bacterium. It is the most widely studied prokaryotic model organism.

13 Which one of the following also acts as a catalyst in a bacterial cell? **[CBSE AIPMT 2011]**

(a) *sn* RNA (b) *hn* RNA
(c) 23S *r*RNA (d) 5S *r*RNA

Ans. *(c)*

23S *r*RNA in bacteria is the enzyme ribozyme for the formation of peptide bond. 23S *r*RNA is found in large sub-unit (70S) of ribosome of bacteria.

14 Which one of the following structures between two adjacent cells is an effective transport pathway? **[CBSE AIPMT 2010]**

(a) Plasmodesmata
(b) Plastoquinones
(c) Endoplasmic reticulum
(d) Plasmalemma

Ans. *(a)*

The primary cell wall contains many small openings or pores situated in the primary pit fields. The cytoplasm of adjacent cells communicates by means of cytoplasmic bridges called plasmodesmata. The plasmodesmata permit translocation of fluid and passage of solutes between cells.

15 The plasma membrane consists mainly of **[CBSE AIPMT 2010]**

(a) phospholipids embedded in a protein bilayer
(b) proteins embedded in a phospholipid bilayer
(c) proteins embedded in a polymer of glucose molecules
(d) proteins embedded in a carbohydrate bilayer

Ans. *(b)*

According to fluid mosaic model given by **Singer** and **Nicolson** (1972), plasma membrane consists of a continuous bilayer of phospholipid molecules, in which globular proteins are embedded. This arrangement corresponds to icebergs (proteins) floating in a sea of phospholipids.

Proteins stay in the membrane because they have regions of hydrophobic amino acids which interact with fatty acid tails to exclude water. Rest of the molecule is hydrophilic, which faces into or outward, both of which are aqueous environment.

16 Middle lamella is mainly composed of **[CBSE AIPMT 2009]**

(a) hemicellulose
(b) muramic acid
(c) calcium pectate
(d) phosphoglycerides

Ans. *(c)*

The middle lamella is cementing layer between the cells. It is made up of Ca and Mg pectates. The basic chemical unit of pectin is galacturonic acid which have the capability of salt formation with calcium and magnesium (an acid base reaction).

17 Plasmodesmata are **[CBSE AIPMT 2009]**

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

Ans. *(d)*

The primary cell wall contains many small openings or pores situated in primary pit fields. The cytoplasm of adjacent cells communicates through the pores by means of cytoplasmic bridges called **plasmodesmata**. The plasmodesmata permit circulation of fluid and passage of solutes between cells.

18 Keeping in view the 'fluid mosaic model' for the structure of cell membrane, which one of the following statements is correct with respect to the movement of

lipids and proteins from one lipid monolayer to the other (described as flip-flop movement)?
[CBSE AIPMT 2008]

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

Ans. *(b)*

Mobility of membrane proteins due to the fluid property of lipid bilayer was demonstrated by classical experiment of D Frye and M Edidin (1970). Lipid molecules very rarely migrate from one lipid monolayer to other monolayer of lipid bimolecular layer.

Such a type of movement is called flip-flop or transbilayer movement and occurs once a month for any individual lipid molecule. But protein can never perform flip-flop movement.

19 A major breakthrough in the studies of cells came with the development of electron microscope. This is because
[CBSE AIPMT 2006]

(a) the resolving power of the electron microscope is 200-350 nm as compared to 0.1-0.2 for the light microscope
(b) electron beam can pass through thick materials, whereas light microscopy required thin sections
(c) the electron microscope is more powerful than the light microscope as it uses a beam of electrons which has wavelength much longer than that of photons
(d) the resolution power of the electron microscope is much higher than that of the light microscope

Ans. *(d)*

The resolution power of the electron microscope is much higher than that of the light microscope.

As an average the resolving power of a light microscope is 0.25μm-0.3μm while that of electron microscope is 2–10Å though theoritically, it is 0.25Å. The magnification range of light microscope is 2000–4000 while of electron microscope is 100000–300000.

20 According to widely accepted 'fluid mosaic model', cell membranes are semi-fluid, where lipids and integral proteins can diffuse randomly. In recent years, this model has been modified in several respects. In this regard, which of the following statements is incorrect? **[CBSE AIPMT 2005]**

(a) Proteins in cell membranes can travel within the lipid bilayer
(b) Proteins can also undergo flip-flop movements in the lipid bilayer
(c) Proteins can remain confined within certain domains of the membrane
(d) Many proteins remain completely embedded within the lipid bilayer

Ans. *(b)*

Statement (b) is incorrect because flip-flop or transmembrane movement is due to the migration of lipid molecules from one lipid monolayer to other monolayer of lipid bilayer.

21 A student wishes to study the cell structure under a light microscope having 10X eyepiece and 45X objective. He should illuminate the object by which one of the following colours of light so as to get the best possible resolution?
[CBSE AIPMT 2005]

(a) Blue (b) Green
(c) Yellow (d) Red

Ans. *(a)*

Resolving power or resolution is the ability of the lens to distinguish fine details and structure. Specifically, it refers to the ability of the lenses to distinguish between two points a specified distance apart. Resolving power depends on two factors :

(a) Wavelength of light used for illumination.
(b) Power of objective lenses.

$$\text{Resolving power} = \frac{\textit{Wavelength of light}}{2 \times NA}$$

Since, the limit of resolving power of a microscope is fixed by the structure of light, the shortest wavelength of visible light will give the maximum resolution. Among yellow, green, red and blue light colour. Blue (500 nm) have shortest wavelength so, it will give best resolution.

22 The main difference in Gram (+)ve and Gram (–)ve bacteria resides in their **[CBSE AIPMT 1990, 2001]**

(a) cell wall (b) cell membrane
(c) cytoplasm (d) flagella

Ans. *(a)*

Gram stain is a differential stain that differentiates bacteria into two groups —Gram +ve and Gram –ve. The basis of this differentiation lies in the composition (lipid contents) and thickness of cell wall of these bacteria.

Bacteria are called Gram +ve, if they retain the crystal violet colour even after alcohol washing. Whereas, cell wall of Gram –ve bacteria is thin, rich in lipids and decolourise the crystal violet colour of Gram stain.

23 In 'fluid mosaic model' of plasma membrane, **[CBSE AIPMT 2002]**

(a) upper layer is non-polar and hydrophilic
(b) upper layer is polar and hydrophobic
(c) phospholipids form a bimolecular layer in middle part
(d) proteins form a middle layer

Ans. *(c)*

According to the fluid mosaic model, the cell membrane consists of a highly viscous fluid matrix of two layers of phospholipid molecules. Protein molecules (or their complexes) occur in membrane but not in continuous layer.

24 DNA is mainly found in
[CBSE AIPMT 1999]

(a) nucleus (b) cytoplasm
(c) Both (a) and (b) (d) nucleolus

Ans. *(a)*

Most of the amount of DNA is found in nucleus. Though some amount of DNA is found in chloroplast and mitochondria also .

25 The eukaryotic genome differs from the prokaryotic genome because **[CBSE AIPMT 1999]**

(a) DNA is complexed with histones in prokaryotes
(b) repetitive sequences are present in eukaryotes
(c) genes in the former cases are organised into operons
(d) DNA is circular and single stranded in prokaryotes

Ans. *(b)*

A major component (20–50%) of the eukaryotic genome consists of DNA which does not code for any protein. This portion consists of certain base sequences which are repeated many times (hence, called repetitive DNA). DNA of prokaryotes does not contain histones nor it is single stranded.

26 Which is correct about cell theory in view of current status of our knowledge about cell structure?

[CBSE AIPMT 1993]

(a) It needs modification due to discovery of subcellular structures like chloroplasts and mitochondria
(b) Modified cell theory means that all living beings are composed of cells capable of reproducing
(c) Cell theory does not hold good because all living beings do not have cellular organisation (e.g. viruses)
(d) Cell theory means that all living objects consist of cells whether or not capable of reproducing

Ans. *(c)*

Cell theory proposed by **Schleiden** and **Schwann** states that all living organisms whether animal or plants are made up of cells and have similar organisation. It is the basic unit of structure and function. Exception to cell theory are the viruses, mycoplasma, viroids, bacteria which are acellular organisms, i.e. lacks cellular organisations. Moreover, coenocytic forms like *Paramecium, Rhizopus,* have more than one nuclei and are exception to cell theory.

27 Name of Schleiden and Schwann are associated with

[CBSE AIPMT 1993]

(a) protoplasm as the physical basis of life
(b) cell theory
(c) theory of cell lineage
(d) nucleus functions as control center of cell

Ans. *(b)*

Matthias J Schleiden (a German botanist, 1938). Theodor Schwann (1939), a German zoologist in 1939, jointly proposed the cell theory.

28 Cell recognition and adhesion occur due to biochemicals of cell membranes named

[CBSE AIPMT 1993]

(a) proteins
(b) lipids
(c) Both (a) and (b)
(d) glycoproteins and glycolipids

Ans. *(d)*

In the cell membrane, oligosaccharides do not occur freely but are attached to the external surface of phospholipids and proteins forming glycolipids and glycoproteins respectively. They form cell coat (glycocalyx) which acts as recognition centre, site for attachment and provides antigen specificity to cell membranes, blood grouping and matching of tissues in transplantation of organs.

29 Genophore/bacterial genome or nucleoid is made of

[CBSE AIPMT 1993]

(a) histones and non-histones
(b) RNA and histones
(c) a single double stranded DNA
(d) a single stranded DNA

Ans. *(c)*

Genophore refers to nucleoid or bacterial genome, made of single, double stranded DNA. It is supercoiled with the help of RNA and polyamines forming a circular genetic material complex.

30 Balbiani rings (puffs) are sites of

[CBSE AIPMT 1993]

(a) DNA replication
(b) RNA and protein synthesis
(c) synthesis of polysaccharides
(d) synthesis of lipids

Ans. *(b)*

In polytene chromosomes (salivary gland chromosomes). Large swellings are called puffs or Balbiani rings, named after their discoverer. In such rings, DNA is active, uncoiled for rapid transcription of RNA or protein synthesis.

31 Angstrom (Å) is equal to

[CBSE AIPMT 1992]

(a) 0.01 μm
(b) 0.001 μm
(c) 0.0001 μm
(d) 0.00001 μm

Ans. *(c)*

Angstrom (Å) = 0.0001 μm

1 Å = 10^{-10} M = 10^{-8} cm = 10^{-7} mm = 10^{-4} μ.

32 Addition of new cell wall particles amongst the existing ones is

[CBSE AIPMT 1991]

(a) deposition
(b) apposition
(c) intussusception
(d) aggregation

Ans. *(b)*

Apposition or accretion is defined as the addition of new cell wall particles amongst the existing one, such as deposition of secondary walls in layers from outside over the existing primary wall.

Intussusception can be demonstrated as the internal growth of the primary wall which occurs during the growth period of the cell resulting in the increase in volume of cell wall.

Deposition Molecules settling out of a solution.

Aggregation Direct mutual attraction between particles or Aggregation of soil granules to form soil structure.

33 Resolution power is the ability to

[CBSE AIPMT 1991]

(a) distinguish two trees
(b) distinguish two close objects
(c) distinguish amongst organelles
(d) magnify image

Ans. *(b)*

Resolution power is the ability of a microscope to distinguish between two points that are closely situated, i.e. the smallest distance by which two objects lying closely can be separated. Higher resolution makes image clear.

34 Cell wall shows

[CBSE AIPMT 1991]

(a) complete permeability
(b) semi-permeability
(c) differential permeability
(d) impermeability

Ans. *(a)*

Cell wall is the structural, functional and heritable unit of living organisms. It is non-living, porous, permeable, inert, hydrophilic, inelastic, rigid, semi-transparent protective covering around the plasmalemma.

35 Fluid mosaic model of cell membrane was put forward by **[CBSE AIPMT 1991]**

(a) Danielli and Davson
(b) Singer and Nicolson
(c) Garner and Allard
(d) Watson and Crick

Ans. *(b)*

Fluid mosaic model of plasma membrane was proposed by **SJ Singer** and **GL Nicolson** (1972).

36 Magnification of compound microscope is not connected with **[CBSE AIPMT 1990]**

(a) numerical aperture
(b) focal length of objective
(c) focal length of eye piece
(d) tube length

Ans. *(a)*

Magnification is the power of enlargement. It is the ratio of the size of an object seen under microscope to the actual size observed without microscope. Magnification depends on focal length of lenses and length of body tube.

It does not depend on numerical aperture of objective lens and the nature of light being used for illumination. The total magnification of a microscope is determined by multiplying the magnifying power of the objective lens by that of the eye piece.

37 Electron microscope has a high resolution power. This is due to **[CBSE AIPMT 1990, 92]**

(a) electromagnetic lenses
(b) very low wavelength of electron beam
(c) low wavelength of light source used
(d) high numerical aperture of glass lenses used

Ans. *(b)*

Resolving power is defined as the ability of an optical system or objective lens to distinguish two closely placed points as two distinct separate points. It depends on wavelength of light and numerical aperture, as limit of resolution $(L_m) = \frac{0.61\lambda}{NA}$. In electron microscope, higher resolution is provided by the low wavelength of electrons.

38 Plasma membrane is made up of **[CBSE AIPMT 1989]**

(a) proteins and carbohydrates
(b) proteins and lipids
(c) proteins, lipids and carbohydrates
(d) proteins, some nucleic acid and lipids

Ans. *(c)*

Plasma membrane is living, quasifluid, trilaminar membrane, usually consists of proteins (44-76%), lipids (20-53%), water (20%) and carbohydrates (1-8%).

39 Nucleoproteins are synthesised in **[CBSE AIPMT 1989]**

(a) nucleoplasm
(b) nuclear envelope
(c) nucleolus
(d) cytoplasm

Ans. *(d)*

Nucleoproteins are the conjugated proteins. These include ribonucleoproteins and occur in ribosomes. Deoxyribonucleoproteins occur in chromosomes.

40 According to fluid mosaic model, plasma membrane is composed of **[CBSE AIPMT 1988]**

(a) phospholipids and oligosaccharides
(b) phospholipids and hemicellulose
(c) phospholipids and integral proteins
(d) phospholipids, extrinsic proteins and intrinsic proteins

Ans. *(d)*

In fluid mosaic model lipid bilayer is composed of phospholipids with their polar hydrophilic ends on the outer surfaces and two non-polar hydrophobic tails of each phospholipid molecule point inwards. The globular alpha proteins do not form continuous layer but are embedded irregularly in the lipid bilayer (called integral or intrinsic proteins) or superficially attached (extrinsic or peripheral proteins).

41 Element necessary for the middle lamella **[CBSE AIPMT 2001]**

(a) Ca
(b) Zn
(c) K
(d) Cu

Ans. *(a)*

Presence of cell wall is the characteristic feature of all plant cells. Cell wall consisted of three layers, middle lamella or middle layer, primary layer and secondary layer. The position of middle lamella is between two primary walls of different cells and thus functions as cementing layer between these two cells. Main constituents of middle lamella are calcium and magnesium pectate.

42 In plants, inulin and pectin are **[CBSE AIPMT 2001]**

(a) reserve materials
(b) wastes
(c) excretory material
(d) insect-attracting material

Ans. *(a)*

Inulin a polymer of fructose, is used as a stored food, particularly in roots and tubers of family–Compositae. Pectin is a mucopolysaccharide which is found in cell wall of plants. During the time of fruit ripening, the pectin hydrolyses and gives rise to the constituents of sugar.

TOPIC 2
The Cell Organelles

43 Match the List-I with List-II.

	List-I		List-II
A.	Cristae	1.	Primary constriction in chromosome
B.	Thylakoids	2.	Disc-shaped sacs in Golgi apparatus
C.	Centromere	3.	Infoldings in mitochondria
D.	Cisternae	4.	Flattened membranous sacs in stoma of plastids

Choose the correct answer from the options given below. **[NEET 2021]**

	A	B	C	D
(a)	4	3	2	1
(b)	1	4	3	2
(c)	3	4	1	2
(d)	2	3	4	1

Ans. *(c)*

(A)-(3), (B)-(4), (C)-(1), (D)-(2)

The inner membrane of mitochondria forms a number of infolding of the **cristae**.

These dramatically increases the surface area available for hosting the enzymes responsible for cellular respiration.

The lamellae, in chloroplast after separation from the inner membrane, usually take the form of closed, flattened, ovoid sacs, the **thylakoid**s, which lie closely packed in piles, the grana.

Primary constriction in the chromosome forms the **centromere**.

A **cisternae** are series of flattened, curved membrane saccules of the endoplasmic reticulum and Golgi apparatus.

44 Which of the following is an incorrect statement? **[NEET 2021]**

(a) Mature sieve tube elements possess a conspicuous nucleus and usual cytoplasmic organelles
(b) Microbodies are present both in plant and animal cells
(c) The perinuclear space forms a barrier between the materials present inside the nucleus and that of the cytoplasm
(d) Nuclear pores act as passages for proteins and RNA molecules in both directions between nucleus and cytoplasm

Ans. *(a)*

Mature sieve tube elements contain structural phloem specific proteins (P-proteins), mitochondria, ER, and sieve elements plastids but not conspicuous nucleus.

45 The organelles that are included in the endomembrane system are **[NEET 2021]**

(a) endoplasmic reticulum, mitochondria, ribosomes and lysosomes
(b) endoplasmic reticulum, Golgi complex, lysosomes and vacuoles
(c) Golgi complex, mitochondria, ribosomes and lysosomes
(d) Golgi complex, endoplasmic reticulum, mitochondria and lysosomes

Ans. *(b)*

The endomembrane system is a group of membranes and organelles in eukaryotic cells that works together to modify, package and transport protein and lipids.

The endomembrane system include-

Nuclear envelop
Endoplasmic reticulum
Golgi apparatus
Lysosomes
Vacuoles
Plasma membrane

46 When the centromere is situated in the middle of two equal arms of chromosomes, the chromosome is referred as **[NEET 2021]**

(a) metacentric (b) telocentric
(c) sub-metacentric (d) acrocentric

Ans. *(a)*

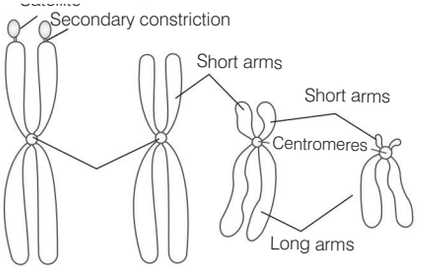
Metacentric chromosomes have the centromere in the center, such that both sections are of equal length, e.g. human chromosome 1 and 3.

Other options can be explained as :

Telocentric chromosomes have the centromere at the very end of the chromosome.

Sub-metacentric chromosomes have the centromere slightly offset from the center leading to a slight asymmetry in the length of the two sections.

Acrocentric chromosomes have centromere which is severely offset from the center leading to one very long and one very short section.



Types of chromosomes

47 Inclusion bodies of blue-green, purple and green photosynthetic bacteria are **[NEET (Oct.) 2020]**

(a) contractile vacuoles
(b) gas vacuoles
(c) centrioles
(d) microtubules

Ans. *(b)*

Gas vacuoles are the inclusion bodies in many aquatic prokaryotes like blue-green, purple and green photosynthetic bacteria. These are generally small, hollow cylindrical structure which facilitates air permeability. Gas vacuoles are membrane bound inclusion bodies that contain an array of substructures referred to as gas vesicles. The membrane of gas vacuoles is rigid, impermeable to water and freely permeable to all gases.

48 The biosynthesis of ribosomal RNA occurs in **[NEET (Oct.) 2020]**

(a) ribosomes (b) Golgi apparatus
(c) microbodies (d) nucleolus

Ans. *(d)*

The biosynthesis of ribosomal RNA occurs in nucleolus of nucleus. It helps the nucleus of the cell to control cell metabolism and other activities. The other two types of RNA, i.e. *m*RNA and *t*RNA are also synthesised here.

49 Match the following columns and select the correct option from the codes given below. **[NEET (Oct.) 2020]**

	Column I		Column II
A.	Smooth Endoplasmic Reticulum	1.	Protein synthesis
B.	Rough endoplasmic reticulum	2.	Lipid synthesis
C.	Golgi complex	3.	Glycosylation
D.	Centriole	4.	Spindle formation

Codes

	A	B	C	D
(a)	2	1	3	4
(b)	3	1	2	4
(c)	4	2	1	3
(d)	1	2	3	4

Ans. *(a)*

The option (a) is the correct match which is as follows

Smooth Endoplasmic reticulum is the major site for synthesis of lipid.

Rough Endoplasmic reticulum is actively involved in protein synthesis and secretion.

Golgi complex is an important site of formation of glycoproteins and glycolipids, i.e. glycosylation.

Centrioles help in spindle formation in the cell.

50 Which of the following elements helps in maintaining the structure of ribosomes? **[NEET (Oct.) 2020]**

(a) Magnesium (b) Zinc
(c) Copper (d) Molybdenum

Ans. *(a)*

Each ribosome consist of two unequal subunits, a larger and a smaller one. Mg^{2+} ions are required for binding the two subunits. Below 0·0001 M Mg^{2+}, the two subunits dissociate while above this strength, the two subunits form the dimer.

51 Which is the important site of formation of glycoproteins and glycolipids in eukaryotic cells? **[NEET (Sep.) 2020]**

(a) Peroxisomes
(b) Golgi bodies
(c) Polysomes
(d) Endoplasmic reticulum

Ans. *(b)*

Golgi bodies are site of formation of glycoproteins and glycolipids in eukaryotic cells. Glycoproteins are simply proteins with a sugar attached to them. The sugars can be attached to a protein in two locations in the cell, the endoplasmic reticulum, which produces N-linked sugars, and the Golgi apparatus, which produces O-linked sugars. Glycolipids are components of cellular membranes comprised of a hydrophobic lipid tail and one or more hydrophilic sugar groups linked by a glycosidic bond. Their role is to maintain the stability of the cell membrane .

52 Match the Column I with Column II. **[NEET (Odisha) 2019]**

	Column I		Column II
1.	Golgi apparatus	(i)	Synthesis of protein
2.	Lysosomes	(ii)	Trap waste and excretory products
3.	Vacuoles	(iii)	Formation of glycoproteins and glycolipids
4.	Ribosomes	(iv)	Digesting biomolecules

Select the correct option from the following

	1	2	3	4
(a)	(iii)	(iv)	(ii)	(i)
(b)	(iv)	(iii)	(i)	(ii)
(c)	(iii)	(ii)	(iv)	(i)
(d)	(i)	(ii)	(iv)	(iii)

Ans. *(a)*

The correct matches are

Golgi apparatus – Formation of glycoproteins and glycolipids

Lysosomes – Digesting biomolecules

Vacuoles – Trap waste and excretory products

Ribosomes – Synthesis of protein

53 Which of the following cell organelles is present in the highest number in secretory cells? **[NEET Odisha) 2019]**

(a) Mitochondria
(b) Golgi complex
(c) Endoplasmic reticulum
(d) Lysosomes

Ans. *(b)*

Golgi complex (Golgi apparatus) is a cell organelle present in highest number in secretory cells. These are the site of modification, packaging and secretions of secretory proteins and glycoproteins outside the cell.

54 Non-membranous nucleoplasmic structures in nucleus are the site for acitive synthesis of **[NEET (Odisha) 2019]**

(a) protein synthesis (b) *m*RNA
(c) *r*RNA (d) *t*RNA

Ans. *(c)*

Non-membranous nucleoplasmic structure in the nucleus of the cell are the site for active synthesis of *r*RNA. These structures are called nucleolus. Larger and more numerous nucleoli are present in the cell actively carrying out protein synthesis.

55 Which of the following pairs of organelles does not contain DNA? **[NEET (National) 2019]**

(a) Chloroplast and Vacuoles
(b) Lysosomes and Vacuoles
(c) Nuclear envelope and Mitochondria
(d) Mitochondria and Lysosomes

Ans. *(b)*

Lysosomes and vacuoles do not contain DNA. Lysosomes are single membrane bound small vesicles which contain hydrolytic enzymes. Vacuoles are a large membranous sac found in the cytoplasm. These contain substances that are not essentially useful for the cell like water, sap, excretory products and other materials. Chloroplast and mitochondria are semi-autonomous organelles because they contain their own DNA and are believed to be prokaryotic symbionts.

56 Which of the following statements is not correct? **[NEET (National) 2019]**

(a) The hydrolytic enzymes of lysosomes are active under acidic pH
(b) Lysosomes are membrane bound structures
(c) Lysosomes are formed by the process of packaging in the endoplasmic reticulum
(d) Lysosomes have numerous hydrolytic enzymes

Ans. *(c)*

The statement "lysosomes are formed by the process of packaging in the endoplasmic reticulum" is incorrect. The correct form of the statement is 'lysosomes are actually formed by the budding off from the *trans*-face of Golgi bodies.

These membrane bound structures contain hydrolytic enzymes whose precursors are synthesised by rough endoplasmic reticulum. Rest statements are correct.

57 The shorter and longer arms of a submetacentric chromosome are referred to as **[NEET (National) 2019]**

(a) p-arm and q-arm, respectively
(b) q-arm and p-arm, respectively
(c) m-arm and n-arm, respectively
(d) s-arm and l-arm, respectively

Ans. *(a)*

The shorter and longer arms of submetacentric chromosome are designated as p and q arm, respectively. Here, 'p' signifies petite or short. In a submetacentric chromosome, centromere is located near the centre due to which the two arms appear unequal in length.

58 Which of the following statements regarding mitochondria is incorrect? **[NEET (National) 2019]**

(a) Enzymes of electron transport are embedded in outer membrane
(b) Inner membrane is convoluted with infoldings
(c) Mitochondrial matrix contains single circular DNA molecule and ribosomes
(d) Outer membrane is permeable to monomers of carbohydrates, fats and proteins

Ans. *(a)*

The statement "enzymes of electron transport are embedded in outer membrane" is incorrect. The correct form of statement is

Enzymes of electron transport are embedded in the inner membrane of mitochondria. An electron transport chain is a series of coenzymes and cytochromes that take part in the passage of electrons from a chemical to its ultimate acceptor. Rest statements are correct.

59 The Golgi complex participates in **[NEET 2018]**

(a) respiration in bacteria
(b) formation of secretory vesicles
(c) fatty acid breakdown
(d) activation of amino acid

Ans. *(b)*

Golgi complex participates in the formation of secretory vesicles. It is a cytoplasmic structure found in eukaryotic cells. It is made up of four parts; cisternae, tubules, vesicles and vacuoles.

The forming face or cisternae receives vesicles from endoplasmic reticulum. Their contents pass through various cisternae with the help of coated vesicles and intercisternal connectives. They ultimately reach the maturing face where they are budded off as, coated secretory or Golgian vesicles or vacuoles.

In **bacteria**, respiration occurs with the help of mesosomes. The **breakdown of fatty acid** occurs in peroxisomes and mitochondria. **Activation of amino acid** is an important step of protein synthesis and it occurs in cytoplasm. In this process, amino acids get attached to *t*RNA molecules.

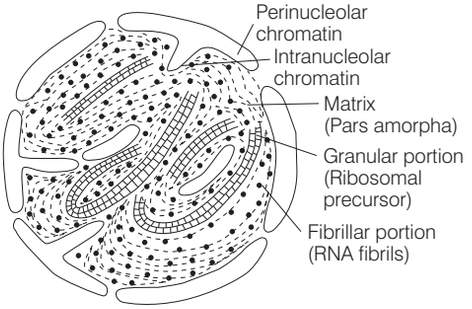
60 Which of the following is true for nucleolus? **[NEET 2018]**

(a) It takes part in spindle formation
(b) It is a membrane-bound structure
(c) Larger nucleoli are present in dividing cells
(d) It is a site for active ribosomal RNA synthesis

Ans. *(d)*

Nucleolus is a naked, round or slightly irregular structure in nucleus. It lacks a membrane and its contents are in direct contact with the nucleoplasm. It is a site for active **ribosomal RNA** (*r*RNA) **synthesis.**

Microtubules take part in the **spindle formation.** Mitochondria, vacuoles and plastids, etc. are **membrane-bound structures**. The **dividing cells** possess a large number of mitochondria.



Structure of nucleolus

61 Nissl bodies are mainly composed of **[NEET 2018]**

(a) nucleic acids and SER
(b) DNA and RNA
(c) proteins and lipids
(d) free ribosomes and RER

Ans. *(d)*

Nissl granules are found in the cell-body of neurons. These granules are composed of Rough Endoplasmic Reticulum (RER) that bears free ribosomes. The latter acts as the site of protein synthesis. These granules were named after its discoverer Franz Nissl.

62 Select the **incorrect** match. **[NEET 2018]**

(a) Submetacentric chromosomes – L-shaped chromosomes
(b) Allosomes – Sex chromosomes
(c) Lampbrush chromosomes – Diplotene bivalents
(d) Polytene chromosomes – Oocytes of amphibians

Ans. *(d)*

Polytene chromosomes are giant chromosomes that are quite common in the salivary glands of insects therefore they are popularly called as salivary chromosomes.

The **Lampbrush chromosomes** are highly elongated special kind of synapsed mid-prophase or diplotene chromosome that are bivalents. **Sex chromosomes** are also called as allosomes. They determine the sex of an organism. **Submetacentric chromosomes** have a submedian centromere. They appear L-shaped during metaphase.

Therefore, except option (d), all are correctly matched.

63 Which one of the following events does **not** occur in rough endoplasmic reticulum? **[NEET 2018]**

(a) Cleavage of signal peptide
(b) Protein glycosylation
(c) Protein folding
(d) Phospholipid synthesis

Ans. *(d)*

Phospholipid synthesis does not occur in RER. It occurs inside Smooth Endoplasmic Reticulum (SER). A **signal peptide** is a short peptide present at the N-terminus of the newly synthesised proteins. It targets them to the ER and is then cleaved off. RER synthesises **proteins.** It bears enzymes for modifying polypeptides synthesised by attached ribosomes, *e.g.* **glycosylation.**

64 Many ribosomes may associate with a single *m*RNA to form multiple copies of a polypeptide simultaneously. Such strings of ribosomes are termed as **[NEET 2018]**

(a) plastidome (b) polyhedral bodies
(c) polysome (d) nucleosome

Ans. *(c)*

Polysome is a string of ribosomes associated with a single *m*RNA. Polysome helps to produce a number of copies of the same polypeptide. **Nucleosome** is the unit of eukaryotic DNA that consists of a DNA segment wrapped around a core of eight histone proteins. Nucleosome chain gives a 'beads on string' appearance under electron microscope. **Plastidome** refer to all the plastids of a cell which work as a functional unit.

65 Which of the following cell organelles is responsible for extracting energy from carbohydrates to form ATP? **[NEET 2017]**

(a) Lysosome (b) Ribosome
(c) Chloroplast (d) Mitochondrion

Ans. *(d)*

Mitochondria is referred as 'power house of the cell'. It contains the enzymes for cellular respiration. It oxidises carbohydrate to produce ATP molecules in the process of aerobic respiration.

Thinking process Mictochondria is a double membrane bound semi-autonomous cell organelles. The number of mitochondria per cell is more in metabolically active cells.

66 Water soluble pigments found in plant cell vacuoles are **[NEET 2016, Phase I]**

(a) chlorophylls (b) carotenoids
(c) anthocyanins (d) xanthophylls

Ans. *(c)*

Anthocyanins are water soluble vacuolar pigments that may appear red, purple or blue depending on pH. It is impermeable to cell membranes of plants and can leak out only when membrane is damaged or dead.

67 Which one of the following cell organelles is enclosed by a single membrane? **[NEET 2016, Phase I]**

(a) Chloroplasts (b) Lysosomes
(c) Nuclei (d) Mitochondria

Ans. *(b)*

Nuclei, mitochondria and chloroplasts are all double membrane bound organelles. Lysosomes are single membrane bound organelle.

68 Mitochondria and chloroplast are

I. semi-autonomous organelles.
II. formed by division of pre-existing organelles and they contain DNA but lack protein synthesising machinery.

Which one of the following options is correct? **[NEET 2016, Phase I]**

(a) II is true, but I is false
(b) I is true, but II is false
(c) Both I and II are false
(d) Both I and II are true

Ans. *(b)*

Mitochondria and chloroplast are semi-autonomous organelles which contains DNA, ribosomes (70S), etc. They are capable of self-replication so called semi-autonomous.

69 Microtubules are the constituents of **[NEET 2016, Phase I]**

(a) spindle fibres, centrioles and cilia
(b) centrioles, spindle fibres and chromatin
(c) centrosome, nucleosome and centrioles
(d) cilia, flagella and peroxisomes

Ans. *(a)*

Microtubules are structures present in cilia, flagella, centrioles and spindle fibres. They are also the part of fibres found in cytoskeleton.

70 A cell organelle containing hydrolytic enzyme is **[NEET 2016, Phase II]**

(a) lysosome
(b) microsome
(c) ribosome
(d) mesosome

Ans. *(a)*

Lysosomes are membrane bound cell organelles. These contain many hydrolytic enzymes which work at high pH. They bring about the intracellular digestion of cell debris and worn and torned cell organelles. These loose their existence while doing so, that is why they are also called as suicidal bags.

71 Select the mismatch. **[NEET 2016, Phase II]**

(a) Gas vacuoles — Green bacteria cells
(b) Large central vacuoles — Animal cells
(c) Protists — Eukaryotes
(d) Methanogens — Prokaryotes

Ans. *(b)*

Animal cells do not have large central vacuole. Instead, these have 2-3 small vacuoles. The presence of such large central vacuoles is the characteristics feature of plant cells.

Concept Enhancer The presence of large vacuole is an indication of irregular growth, i.e. growth in cell membrane is synchronised with growth in protoplasmic content.

72 Match the columns and identify the correct option. **[CBSE AIPMT 2015]**

	Column I		Column II
A.	Thylakoids	1.	Disc-shaped sacs in Golgi apparatus
B.	Cristae	2.	Condensed structure of DNA
C.	Cisternae	3.	Flat membranous sacs in stroma
D.	Chromatin	4.	Infoldings in mitochondria

Codes

	A	B	C	D
(a)	4	3	1	2
(b)	3	4	1	2
(c)	3	1	4	2
(d)	3	4	2	1

Ans. *(b)*

The columns can be matched correctly as follows

	Column I		Column II
A.	Thylakoids	3.	Flat membranous sacs in stroma
B.	Cristae	4.	Infoldings in mitochondria
C.	Cisternae	1.	Disc-shaped sacs in Golgi apparatus
D.	Chromatin	2.	Condensed structure of DNA

73 Balbiani rings are sites of **[CBSE AIPMT 2015]**

(a) lipid synthesis
(b) nucleotide synthesis
(c) polysaccharide synthesis
(d) RNA and protein synthesis

Ans. *(d)*

A Balbiani ring is a large chromosome puff. Balbiani rings are diffused uncoiled regions of the polytene chromosome that are sites of RNA transcription and protein synthesis.

74 Which of the following are not membrane bound? **[CBSE AIPMT 2015]**

(a) Vacuoles
(b) Ribosomes
(c) Lysosomes
(d) Mesosomes

Ans. *(b)*

Ribosomes are non-membranous particles these are simple aggregations of RNA (*r*RNA) and proteins.

75 Cellular organelles with membranes are **[CBSE AIPMT 2015]**

(a) nuclei, ribosomes and mitochondria
(b) chromosomes, ribosomes and endoplasmic reticulum
(c) endoplasmic reticulum, ribosomes and nuclei
(d) lysosomes, Golgi apparatus and mitochondria

Ans. *(d)*

Membrane bound organelles include lysosomes, endoplasmic reticulum, Golgi apparatus, mitochondria, chloroplasts, vacuoles, nucleus.

Non-membrane bound organelles include ribosomes, centrioles, microtubules.

76 The solid linear cytoskeletal elements having a diameter of 6 nm and made up of a single type of monomer are known as **[CBSE AIPMT 2014]**

(a) microtubules
(b) microfilaments
(c) intermediate filaments
(d) lamins

Ans. *(b)*

Microfilaments (actin filament) are the thinnest filaments of the cytoskeleton. They are found in the cytoplasm of the eukaryotic cells.

They constitute the cytoskeleton through which the cells acquire shape their diameter is approximately 6 nm (avg.) These are the polymer of actin sub-units.

77 The osmotic expansion of a cell kept in water is chiefly regulated by **[CBSE AIPMT 2014]**

(a) mitochondria (b) vacuoles
(c) plastids (d) ribosomes

Ans. *(b)*

The osmotic expansion of a cell kept in water is chiefly regulated by vacuole. It is the single and large organelle which constitutes about 20% of plant cells and is small and multiple in animal cells. Vacuole store water and macromolecules including ions, sugar, amino acid, protein and carbohydrates. The membrane that surrounds the vacuole is called tonoplast. The vacuole contains cell sap in it.

The cell sap has high osmotic pressure which regulate turgor pressure in plant cells.

78 Match the following and select the correct answer. **[CBSE AIPMT 2014]**

	Column I		Column II
A.	Centriole	1.	Infoldings in mitochondria
B.	Chlorophyll	2.	Thylakoids
C.	Cristae	3.	Nucleic acids
D.	Ribozymes	4.	Basal body of cilia or flagella

Codes

	A	B	C	D
(a)	4	2	1	3
(b)	1	2	4	3
(c)	1	3	2	4
(d)	4	3	1	2

Ans. *(a)*

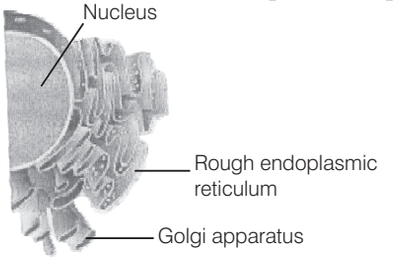
(a) **Centriole** In organism with flagella and cilia, the position of these organelles is determined by the mother centriole which become the basal body.

(b) **Chlorophyll** Chlorophyll molecules are specially arranged in and around photosystem that are embedded in the thylakoid membrane of chloroplast.

(c) **Cristae** These are folds in the inner membrane of mitochondria which provides a large amount of surface area for chemical reaction.

(d) **Ribozymes** (Ribonucleic acid enzyme) is an RNA molecule that is capable of catalysing specific biochemical reactions of nucleic acids

79 Which one of the following organelles in the figure correctly matches with its function? **[NEET 2013]**



(a) Rough endoplasmic reticulum, formation of glycoproteins
(b) Golgi apparatus, protein synthesis
(c) Golgi apparatus, formation of glycolipids
(d) Rough endoplasmic reticulum, protein synthesis

Ans. *(d)*

Rough Endoplasmic Reticulum (RER) – Protein synthesis

Smooth Endoplasmic Reticulum (SER) – Lipid synthesis.

Golgi apparatus – Important site of formation glycoproteins and glycolipids.

80 A major site for synthesis of lipids is **[NEET 2013]**

(a) RER (b) SER
(c) symplast (d) nucleoplasm

Ans. *(b)*

The Smooth Endoplasmic Reticulum (SER) is the major site for synthesis of lipids. RER is actively involved in protein synthesis and secretion. Nucleoplasm is the site for active ribosomal RNA synthesis. Symplast is the system of interconnected protoplast through which water movement occurs.

81 The Golgi complex plays a major role **[NEET 2013]**

(a) in trapping the light and transforming it into chemical energy
(b) in digesting proteins and carbohydrates
(c) as energy transferring organelles
(d) in post translational modification of proteins and glycosidation of lipids

Ans. *(d)*

Golgi complex plays a major role in post translational modification of proteins and glycosidation of lipids. Chloroplasts contain chlorophyll which traps light and transform into chemical energy. Lysosomes are involved in digesting proteins, fats and carbohydrates. Mitochondria are energy transferring organelles.

82 Ribosomal RNA is actively synthesised in **[CBSE AIPMT 2012]**

(a) lysosomes (b) nucleolus
(c) nucleoplasm (d) ribosomes

Ans. *(b)*

In eukaryotes, the site of synthesis of most of the ribosomal RNA (*r*RNA) is nucleolus. The nucleolar organiser contains many copies of ribosomal DNA (repetitive DNA). The RNA cistron of nucleolar DNA forms 45S precursor with the help of RNA polymerase. This 45S RNA undergoes cleavage with the help of nucleases to give 18S, 28S and 5.8S *r*RNA units. Out of different *r*RNAs, the 5S *r*RNA is not synthesised in nucleolus. It is synthesised outside it.

83 What is true about ribosomes? **[CBSE AIPMT 2012]**

(a) The prokaryotic ribosomes are 80S, where S stands for sedimentation coefficient
(b) These are composed of ribonucleic acid and proteins

(c) These are found only in eukaryotic cells
(d) These are self-splicing introns of some RNAs

Ans. *(b)*

Ribosomes are large, non-membranous, RNA protein complexes which are necessary for protein synthesis. In prokaryotes, 70S type of ribosomes are found while 80S type of ribosomes are found in eukaryotes.

84 Important site for formation of glycoproteins and glycolipids is **[CBSE AIPMT 2011]**

(a) Golgi apparatus
(b) plastid
(c) lysosome
(d) vacuole

Ans. *(a)*

The Golgi apparatus principally performs the function of packaging materials. Golgi apparatus is the main site of formation of glycoproteins and glycolipids.

85 Peptide synthesis inside a cell takes place in **[CBSE AIPMT 2011]**

(a) mitochondria (b) chromoplast
(c) ribosomes (d) chloroplast

Ans. *(c)*

The cellular factory responsible for synthesising proteins (peptide synthesis) is the ribosome.

86 Which one of the following has its own DNA? **[CBSE AIPMT 2010]**

(a) Mitochondria
(b) Dictyosome
(c) Lysosome
(d) Peroxisome

Ans. *(a)*

In mitochondria, the inner membrane space is filled with a matrix which contains dense granules along with ribosomes and mitochondrial DNA. The mitochondrial DNA is circular in nature. Their number varies from 2-6. Besides DNA, a mitochondrion has RNA and its ribosomes (70S) also.

Thus, a complete protein synthesising machinery is present in mitochondria, so mitochondria is semi autonomous organelle in nature. Dictyosome, lysosome and peroxisome do not have their own DNA.

87 Cytoskeleton is made up of **[CBSE AIPMT 2009]**

(a) calcium carbonate granules
(b) callose deposits
(c) cellulosic microfibrils
(d) proteinaceous filaments

Ans. *(d)*

The cytoplasm of all eukaryotic cells is criss-crossed by a network of protein fibres that support the shape of the cell and here organelles are anchored at fixed locations. It is a dynamic system which includes three types proteinaceous filaments—actin filaments, microtubule and intermediate filament.

88 The two sub units of ribosome remain united at a critical ion level of **[CBSE AIPMT 2008]**

(a) copper (b) manganese
(c) magnesium (d) calcium

Ans. *(c)*

Magnesium is constituent of chlorophyll, middle lamella, and connected with phosphate transfer in respiration. It is concerned with binding of ribosomes, DNA and RNA synthesis.

Manganese activates enzymes of respiration, photosynthesis and nitrogen metabolism performing oxidation, reduction, decarboxylation, photolysis of water, etc.

Copper is activator of plastocyanin, cytochrome oxidase, RuBP carboxylase and many other enzymes. It functions in electron transfer, maintenance of carbohydrate/nitrogen balance, chlorophyll synthesis, etc.

Calcium is constituent of middle lamella, activator of enzymes connected with chromosome formation and many aspects of metabolism.

89 Vacuole in a plant cell **[CBSE AIPMT 2008]**

(a) is membrane-bound and contains storage proteins and lipids
(b) is membrane-bound and contains water and excretory substances
(c) lacks membrane and contains air
(d) lacks membrane and contains water and excretory substances

Ans. *(b)*

The vacuoles of plant cells are bounded by a single semipermeable membrane known as tonoplast.

These vacuoles contain water, phenol, flavonols, anthocyanins, alkaloids and storage products such as sugars and proteins.

The vacuoles of animal cells are bounded by a lipoproteinaceous membrane and their function is storage, transmission of materials and maintenance of internal pressure of cell.

90 In germinating seeds, fatty acids are degraded exclusively in the **[CBSE AIPMT 2008]**

(a) proplastids
(b) glyoxysomes
(c) peroxisomes
(d) mitochondria

Ans. *(b)*

Glyoxysomes are found to occur in the cells of yeast, *Neurospora* and oil rich seeds of many higher plants. During germination of oily seeds, the stored lipid molecules of glyoxysomes are hydrolysed by the enzyme lipase to glycerol and fatty acids. The long chain fatty acids are then broken down by successive removal of two carbon fragments in the process of β-oxidation.

Peroxisomes are present in all photosynthetic cells of higher plants in etiolated leaf tissue. It is the site of hydrogen peroxide metabolism and glycolate cycle.

Mitochondria is the site of aerobic respiration in eukaryotic cell. It is called power house of the cell.

91 Select the wrong statement from the following **[CBSE AIPMT 2007]**

(a) Both chloroplasts and mitochondria contain an inner and an outer membrane
(b) Both chloroplasts and mitochondria have an internal compartment, the thylakoid space bounded by the thylakoid membrane
(c) Both chloroplasts and mitochondria contain DNA
(d) The chloroplasts are generally much larger than mitochondria

Ans. *(b)*

Thylakoid space which is known as lumen is present only in chloroplasts. The inner membrane of mitochondria is folded to form cristae.

92 Which of the following statements regarding mitochondrial membrane is not correct? **[CBSE AIPMT 2006]**

(a) The enzymes of the electron transfer chain are embedded in the outer membrane
(b) The inner membrane is highly convoluted forming a series of infoldings
(c) The outer membrane resembles a sieve
(d) The outer membrane is permeable to all kinds of molecules

Ans. *(a)*

In mitochondria, the enzymes of electron transport chain are found in the inner membrane while outer membrane contains enzymes involved in mitochondrial lipid synthesis and those enzymes that convert lipid substrates into other forms that are subsequently metabolised in the matrix.

The outer membrane resembles a sieve that is permeable to all molecules of 10,000 daltons mole weight or less, including small proteins.

The inner membrane is impermeable and highly convoluted, forming a series of infoldings, known as cristae, in the matrix space.

93 The main organelle involved in modification and routing of newly synthesised proteins to their destinations is **[CBSE AIPMT 2005]**

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

Ans. *(d)*

Porter coined the name Endoplasmic Reticulum (ER). It is a network of tubules, vesicles and cisternae within an eukaryotic cell (absent in prokaryotic cells). Two types of ER are recognised on the basis of presence/absence of ribosomes on the wall of the ER.

(i) **Smooth ER** It does not have ribosomes. Smooth ER helps in the synthesis of lipid and glycogen.
(ii) **Rough ER** Wall of this ER contains ribosomes. Rough ER is involved in protein synthesis and transfer.

Protein synthesis takes place in ribosomes attached on wall of ER.

Newly formed protein enters within the cavity of rough ER and follows following path :

Protein → Cavity of rough ER → Cavity of smooth ER → Golgi membrane → Lysosomes or transport vesicles or secretory granules.

94 Protein synthesis in an animal cell occurs **[CBSE AIPMT 2005, 2000]**

(a) only on the ribosomes present in cytosol
(b) only on ribosomes attached to the nuclear envelope and endoplasmic reticulum
(c) on ribosomes present in the nucleolus as well as in cytoplasm
(d) on ribosomes present in cytoplasm as well as in mitochondria

Ans. *(d)*

Protein synthesis is taken place on ribosomes. In an eukaryotic cell ribosomes are present in cytoplasm, mitochondria and chloroplasts. So, in these places protein synthesis also takes place.

95 Chlorophyll in chloroplast is located in **[CBSE AIPMT 2005]**

(a) grana
(b) pyrenoid
(c) stroma
(d) Both (a) and (c)

Ans. *(a)*

Chlorophyll is a specialised light absorbing pigment which is found in the inner wall of granum. Each granum is a flat, sac-like structure in which light reaction of photosynthesis takes place.

96 Extra nuclear inheritance is a consequence of presence of genes in **[CBSE AIPMT 2004]**

(a) mitochondria and chloroplasts
(b) endoplasmic reticulum and mitochondria
(c) ribosomes and chloroplast
(d) lysosomes and ribosomes

Ans. *(a)*

Extra nuclear or extra chromosomal or cytoplasmic or organellar inheritance is a consequence of presence of genes in mitochondria and chloroplast. Extra chromosomal units function either independently or in collaboration with nuclear genetic system.

97 In chloroplasts, chlorophyll is present in the **[CBSE AIPMT 2004]**

(a) outer membrane
(b) inner membrane
(c) thylakoids
(d) stroma

Ans. *(c)*

The thylakoids of chloroplast are flattened vesicles arranged as a membranous network within the stroma. 50% of chloroplast proteins and various components involved (namely chlorophyll, carotenoids and plastoquinone) are present in thylakoid membranes that are involved in photosynthesis.

98 Flagella of prokaryotic and eukaryotic cells differ in **[CBSE AIPMT 2004]**

(a) type of movement and placement in cell
(b) location in cell and mode of functioning
(c) microtubular organisation and type of movement
(d) microtubular organisation and function

Ans. *(c)*

Flagella of prokaryotic and eukaryotic species differ in microtubular organisation and type of movement. In eukaryotes the arrangement is (9 + 2) and specialised while in prokaryotes arrangement is (9 + 0) and is simple.

99 Ribosomes are produced in **[CBSE AIPMT 2002]**

(a) nucleolus
(b) cytoplasm
(c) mitochondria
(d) Golgi body

Ans. *(a)*

The proteins required for the formation of ribosome are synthesised within the cytoplasm through the process of translation.

These proteins are later shifted to nucleus and then to nucleolus where the RNA and proteins are assembled into ribosomal sub-units. In prokaryotes (bacteria) ribosomes are synthesised in cytoplasm.

In eukaryotes, the process takes place both in the cell cytoplasm and in the nucleolus which is a region within the cell nucleus.

100 Microtubules are absent in **[CBSE AIPMT 2001]**

(a) mitochondria (b) centriole
(c) flagella (d) spindle fibres

Ans. *(a)*

Microtubules are present only in eukaryotes; and are component of cilia and flagella as well as spindle (during cell division). They are straight, hollow rods measuring about 25 nm in diameter and 200 nm to 25 μm in length. Microtubules give shape and support to the cell.

101 Lysosomes are reservoirs of **[CBSE AIPMT 2000]**

(a) RNA and protein
(b) fats
(c) secretory glycoproteins
(d) hydrolytic enzymes

Ans. *(d)*

Lysosomes were discovered by **Christian de Duve** (1955) from rat liver. **Matile** (1964) discovered lysosomes in plants. Generally, lysosomes are 0.2–0.8 μ in size, irregular membranous vesicles filled with hydrolytic enzymes. They are polymorphic. About 40 enzymes (all hydrolytic) are present in lysosomes. These include proteases, nucleases, glycosidases, lipases, phospholipases, phosphatases and sulphatases.

102 The cell organelle involved in glycosylation of protein is **[CBSE AIPMT 2000]**

(a) ribosome
(b) peroxisome
(c) endoplasmic reticulum
(d) mitochondria

Ans. *(c)*

The proteins synthesised by the ribosomes bound to ER are passed into the lumen of ER where an oligosaccharide is added to them, (i.e. these are glycosylated).

103 Some of the enzymes which are associated in converting fats into carbohydrates, are present in **[CBSE AIPMT 1999]**

(a) liposomes (b) Golgi bodies
(c) microsomes (d) glyoxysomes

Ans. *(d)*

Besides catalase, the glyoxysomes contain enzymes for the glyoxylate cycle through which fats are converted into carbohydrates.

Microsomes are product of homogenisation of ER.

Liposomes are artificially produced lipid bilayers, 25 nm or more in diameter. Golgi body is a dynamic eukaryotic organalle, consisted of cisternae, vesicles and tubules.

104 The proteins are synthesised at **[CBSE AIPMT 1999]**

(a) ribosomes (b) mitochondria
(c) centrosomes (d) Golgi bodies

Ans. *(a)*

During protein synthesis, smaller sub-units of ribosomes attach to *m*RNA. The ribosomes provide space as well as enzyme for the synthesis of proteins. Therefore, these are known as protein factories or workbenches of protein.

105 Which of the following organ has single membrane? **[CBSE AIPMT 1999]**

(a) Nucleus
(b) Cell wall
(c) Mitochondria
(d) Spherosomes

Ans. *(d)*

Cell wall does not have a membrane. The mitochondria and nucleus are surrounded by double membraned envelope.

Spherosomes are single membrane bound, spherical structures in plant cell cytoplasm. These are apparently centres of lipid synthesis and accumulation.

106 Microtubule is involved in the **[CBSE AIPMT 1998]**

(a) cell division
(b) membrane architecture
(c) muscle contraction
(d) DNA recognition

Ans. *(a)*

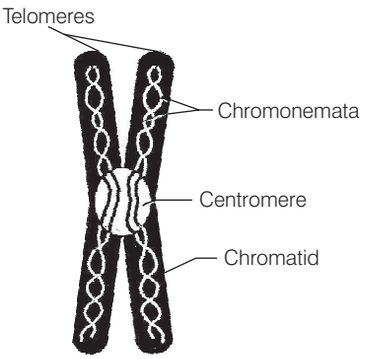
Microtubules are one of the essential protein filaments of the cytoskeletons of probably all eukaryotic cells and their cilia, flagella, basal bodies, centrioles and mitosis and meiosis spindles. Each microtubule is made up of a hollow cylinder of 13 protofilaments of the tubulin protein. The diameter of each microfibril is 25 nm. The function of microtubule is to guide organelle and chromosome movement in the cell, cause cell elongation and help in movements of cilia/flagella.

107 Centromere is a part of **[CBSE AIPMT 1997]**

(a) ribosomes
(b) chromosome
(c) mitochondria
(d) endoplasmic reticulum

Ans. *(b)*

In every chromosome, there is a small region called primary constriction in which there is a centromere where two sister chromatids are held together and spindle fibres get attached during cell dizvision.



Chromosome

108 The mechanism of ATP formation both in chloroplast and mitochondria is explained by **[CBSE AIPMT 1997]**

(a) Relay Pump Theory of Godlewski
(b) Cholodny-Went's Model
(c) Chemiosmotic Theory
(d) Munch's Mass Flow Hypothesis

Ans. *(c)*

As per Peter Mitchell's chemiosmotic-coupling hypothesis, outward pumping of protons across the inner chloroplast or mitochondrial membrane results in accumulation of protons between outer membrane and inner membrane. A proton gradient is thus established. As protons now flow back, passively down the gradient, the proton motive force is utilised to synthesise ATP.

109 Protein synthesis in an animal cell takes place **[CBSE AIPMT 1997]**

(a) only in cytoplasm
(b) in the nucleolus as well as in the cytoplasm
(c) in the cytoplasm as well as in mitochondria
(d) only on ribosomes attached to nucleus

Ans. *(c)*

Protein synthesis is a complex process, it essentially involves DNA for the synthesis of *m*RNA (transcription) which contains information for the synthesis of proteins (translation).

The process of translation takes place on ribosomes which are found in cytoplasm (in attached form on ER) and in mitochondria (in the free form).

110 Genes located on mitochondrial DNA **[CBSE AIPMT 1997]**

(a) generally show maternal inheritance
(b) are always inherited from the male parent
(c) show biparental inheritance like the nuclear genes
(d) are not inherited

Ans. *(a)*

Mitochondria are found only in eukaryotic cells, they contain a single circular double stranded DNA molecule (*mt*DNA). Available evidences show that mitochondria of female parent are transferred to progeny during fertilisation. Recent studies have shown that factors responsible for cytoplasmic male sterility are located in mitochondrial DNA.

111 Lysosomes have a high content of **[CBSE AIPMT 1996]**

(a) hydrolytic enzymes
(b) lipoproteins
(c) polyribosomes
(d) DNA ligases

Ans. *(a)*

Lysosomes or suicidal bags are filled with about 40 types of acid hydrolases (digestive enzymes) like acid proteases, acid nucleases, acid phosphatases, acid sulphatases, acid lipases, acid glycosidases working at an optimum pH ≤ 5 for controlling intracellular digestion of macromolecules.

112 The function of rough endoplasmic reticulum is **[CBSE AIPMT 1995]**

(a) fat synthesis (b) lipid synthesis
(c) protein synthesis
(d) steroid synthesis

Ans. *(c)*

Rough Endoplasmic Reticulum (RER) provides surface for ribosomes for synthesis of secretory (serum proteins), lysosomal and membrane proteins, glycoproteins and helps in packaging of polypeptide chains into enzymes/proteins. It also provides membrane to Golgi bodies for forming vesicles and lysosomes.

113 The prokaryotic flagella possess **[CBSE AIPMT 1995]**

(a) unit membrane enclosed fibre
(b) protein membrane enclosed fibre
(c) '9+2' membrane enclosed structure
(d) helically arranged protein molecule

Ans. *(d)*

Prokaryotic (bacterial) flagellum is made up of flagellin protein arranged helically. It do not show 9+2 organisation and ATPase activity. These flagella do not beat but rotate like a propellar that brings about backward pushing of water. Gram +ve bacteria having two rings in the basal body. Gram –ve bacteria have four rings. The L, P, M and S rings.

114 The desmosomes are concerned with **[CBSE AIPMT 1995]**

(a) cytolysis (b) cell division
(c) cell adherence (d) cellular excretion

Ans. *(c)*

Desmosomes (macula adherens) consists of intercellular thickening materials, disc-shaped intracellular thickening adjacent to each membrane with tonofibrils. These act as intercellular cementing material, adhere cells together at places like spot welding.

115 Inner membrane convolutions of a mitochondrion are known as **[CBSE AIPMT 1994]**

(a) lamellae (b) thylakoids
(c) grana (d) cristae

Ans. *(d)*

Mitochondrial inner membrane is convoluted several times to form cristae.

116 Mitochondrial cristae are sites of **[CBSE AIPMT 1994]**

(a) breakdown of macromolecules
(b) protein synthesis
(c) phosphorylation of flavoproteins
(d) oxidation-reduction reactions

Ans. *(d)*

Mitochondrial cristae bear the functional unit, i.e. oxysomes, Fernandes and Moran particles (F_0 –F_1) particles or electron transport particle. Since, inner membrane is impermeable to ATP, thus ATP is synthesised on oxysomes having ATPase in F_1 (stalk) and proton channels on F_0 (base). ATPase helps in oxidative phosphorylation, synthesise ATP through electron transport system by undergoing oxidation reduction reactions.

117 Organelle having flattened membrane bound cisternae and lying near the nucleus is **[CBSE AIPMT 1994]**

(a) Golgi apparatus
(b) mitochondrion
(c) centriole
(d) nucleolus

Ans. *(a)*

Golgi body or dictyosome has a stack of single membrane bound cisternae with swollen ends, network of tubules and vesicles. Cisternae are parallel membrane lined narrow sacs which are interconnected.

Golgi body has two faces- concave or distal or maturing (M) face or *trans* face towards cell membrane and *cis* or convex or proximal or forming (F) face towards rough ER and nuclear membrane. New cisternae are formed from SER and added from F-face.

118 Cell organelles having hydrolases/digestive enzymes are **[CBSE AIPMT 1994]**

(a) peroxisomes
(b) lysosomes
(c) ribosomes
(d) mesosomes

Ans. *(b)*

Lysosomes (or suicidal bags or cellular house keepers or scavenger of cell) are single membrane bound, spherical microbodies, filled with different types of acid hydrolases (digestive enzymes) working at pH ≤ 5 and can digest almost every type of organic matter except cellulose.

Primary lysosome (storage granules) unites with food vacuole (phagosome) forming secondary lysosomes (heterophagosomes or digestive vacuoles) which cause intracellular digestion (heterophagy).

119 Organelle/organoid involved in genetic engineering is **[CBSE AIPMT 1994]**

(a) plasmid
(b) mitochondrion
(c) Golgi apparatus
(d) lomasome

Ans. *(a)*

Plasmids are small, self-replicating extra chromosomal, non-essential genetic/DNA elements. Plasmid consists of a ring of circular, supercoiled double stranded naked DNA carrying genes for replication and for one or more cellular non-essential functions.

They are ideal vectors for genetic engineering, gene cloning since, they are self-replicating, carry non-essential genes and has a restriction site for one or more restriction endonucleases.

120 In plant cells, peroxisomes are associated with **[CBSE AIPMT 1993]**

(a) photorespiration
(b) phototropism
(c) photoperiodism
(d) photosynthesis

Ans. *(a)*

Peroxisomes are microbodies arising from ER and containing enzymes for peroxide formation. In plants, they occur in green mesophyll cells of leaves of C_3 plants and are involved in photorespiration through interacting with chloroplast and mitochondria. In animals, they are involved in lipid synthesis, purine catabolism, gluconeogenesis, etc.

121 Membranous bag with hydrolytic enzymes which is used for controlling intracellular digestion of macromolecules is **[CBSE AIPMT 1993]**

(a) endoplasmic reticulum
(b) nucleosome
(c) lysosome
(d) phagosome

Ans. *(c)*

The intracellular digestion, i.e. the breakdown of substances within the cytoplasm of a cell is controlled by lysosomes.

Intracellular digestion occurs in animals that lack a digestive track. e.g. in Pycnogonida, Mollusca, Cnidaria and Porifera.

122 Golgi apparatus is absent in **[CBSE AIPMT 1993]**

(a) higher plants
(b) yeast
(c) bacteria and blue-green algae
(d) None of the above

Ans. *(c)*

Golgi bodies are absent in prokaryotic cells, (i.e. bacteria, cyanobacteria, mycoplasma), in mature RBC, mature sperms, mature eggs, sperms of bryophytes, pteridophytes and mature sieve tubes. In contrast, active eukaryotic cells are rich in Golgi bodies. Maximum number (25000) of Golgi bodies are found in rhizoidal cells of *Chara.*

123 All plastids have similar structure because they can **[CBSE AIPMT 1992]**

(a) store starch, lipids and proteins
(b) get transformed from one type to another
(c) perform same function
(d) be present together

Ans. *(b)*

All plastids are similar in structure because these are interconvertible and get transformed from one type to another. Leucoplasts are formed from proplastids and leucoplasts; chloroplasts can arise from pre-existing chloroplasts, proplastids and leucoplasts and chromoplasts can develop from proplastids, leucoplasts and chloroplasts.

124 Oxysomes or $F_0 - F_1$ particles occur on **[CBSE AIPMT 1992]**

(a) thylakoids
(b) mitochondrial surface
(c) inner mitochondrial membrane
(d) chloroplast surface

Ans. *(c)*

Oxysomes are the elementary particles or $F_0 - F_1$ or Fernandes-Moran particle present on the inner membrane of mitochondria. They are about $10^4 - 10^5$ in number and has a base of F_0 sub-unit toward C-face (11×1.5 *nm*), a stalk *(0.5 – 3.5 nm)* and a head or F_1 sub-unit (8.5–10 nm diameter) towards matrix or M-face.

125 An outer covering membrane is absent over **[CBSE AIPMT 1992]**

(a) nucleolus (b) lysosome
(c) mitochondrion (d) plastids

Ans. *(a)*

Nucleolus was discovered by Fontana (1781) and named by Bowman (1840) is a naked roughly rounded darkly stained structure. It is attached to chromatin at specific spot called nucleolar organiser region or NOR. Nucleolus constitute 35% mass of nucleus and is the largest part of nucleus.

126 Ribosomes are the centre for **[CBSE AIPMT 1992]**

(a) respiration
(b) photosynthesis
(c) protein synthesis
(d) fat synthesis

Ans. *(c)*

Ribosomes are smallest, membraneless sub- microscopic organelles, called as protein factories. They act as a template, bringing together different components involved in the protein synthesis.

127 Which one is *apparato reticolare interno*? **[CBSE AIPMT 1992]**

(a) Golgi apparatus
(b) Endoplasmic reticulum
(c) Microfilaments
(d) Microtubules

Ans. *(a)*

Golgi body (dictyosomes, lipochondria) is a stack of flattened membrane bound sac-like body. They form internal reticulare apparatus (apparato reticolare interno).

128 Experiments on *Acetabularia* by Hammerling proved the role of **[CBSE AIPMT 1992]**

(a) cytoplasm in controlling differentiation
(b) nucleus in heredity
(c) chromosomes in heredity
(d) nucleocytoplasmic ratio

Ans. *(b)*

J Hammerling (1953) carried the grafting experiments involving exchange of nucleus (located at the base) in *Acetabularia.* He proved the role of nucleus in heredity, growth, etc.

129 Ribosomes were discovered by **[CBSE AIPMT 1991]**

(a) Golgi
(b) Porter
(c) de Robertis
(d) Palade

Ans. ***(d)***

Ribosomes were first observed by **Claude** (1941), he called them as microsomes. **Robinson** and **Brown** (1950) noticed them in plant cells of bean roots and **Palade** (1955) detected them in animal cells and called these structures as ribosomes.

130 Polyribosomes are aggregates of **[CBSE AIPMT 1989]**

(a) ribosomes and *r*RNA
(b) only *r*RNA
(c) peroxisomes
(d) several ribosomes held together by string of *m*RNA

Ans. ***(d)***

Polyribosomes or ergasomes are formed by the combination of 6-8 ribosomes attached on a single-strand of *m*RNA. *m*RNA brings about polymerisation of a specific protein molecule, with the help of ribosomes, from amino acid molecules found in the cytosol.

131 Organelles can be separated from cell homogenate through **[CBSE AIPMT 1989]**

(a) chromatography
(b) X-rays diffraction
(c) differential centrifugation
(d) auto-radiography

Ans. ***(c)***

Differential centrifugation is the mechanical separation of individual sub-cellular components from homogenate in centrifuge at low speed.

Depending upon the size, specific gravity, mass, density, different organelles are separated and settled at the bottom of the centrifuge tube at different centrifugal speeds.

Ultracentrifuges have 50,000-1,00,000 rpm and are used for the separation of minute cell organelles and constitutents on the basis of different densities.