Biology

TOPIC : CELL : THE UNIT OF LIFE

Date: 

Marks: 120 mks | Time: ½ hr

1. Match column-I with column-II and select the correct option from the codes given below.
   
<table>
<thead>
<tr>
<th>Column-I</th>
<th>Column-II</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Leeuwenhoek</td>
<td>i) First saw and described a living cell</td>
</tr>
<tr>
<td>B. Robert Brown</td>
<td>ii) Presence of cell wall is unique to plant cells</td>
</tr>
<tr>
<td>C. Schleiden</td>
<td>iii) Discovered the nucleus</td>
</tr>
<tr>
<td>D. Schwann</td>
<td>iv) All plants are composed of different kind of cells</td>
</tr>
</tbody>
</table>
   
   (a) A-(i), B-(iii), C-(iv), D-(ii) 
   (b) A-(i), B-(iii), C-(ii), D-(iv) 
   (c) A-(iii), B-(i), C-(iv), D-(ii) 
   (d) A-(i), (B)-(iv), C-(ii), D-(iii) 

2. Arrange the following steps in a correct sequence as per Gram’s staining technique:
   Treatment with 0.5% iodine solution (1), washing with water (2), treatment with absolute alcohol/acetone (3), staining with weak alkaline solution of crystal violet (4).
   
   (a) 4 → 1 → 2 → 3 
   (b) 3 → 2 → 1 → 4 
   (c) 3 → 1 → 2 → 4 
   (d) 4 → 2 → 3 → 1 

3. Correct sequence of layers of bacterial cell envelope from outward to inward is 
   (a) Cell wall → Glycocalyx → Cell membrane 
   (b) Cell membrane → Glycocalyx → Cell wall 
   (c) Glycocalyx → Cell wall → Cell membrane 
   (d) Glycocalyx → Cell membrane → Cell wall 

4. If you remove the fimbriae from the bacterial cell, which of the following would you expect to happen? 
   (a) The bacteria could no longer swim 
   (b) The bacteria would not adhere to the host tissue 
   (c) Transportation of molecules across the membrane would stop 
   (d) The shape of bacteria would change. 

5. Polyribosomes are aggregation of 
   (a) ribosomes and rRNA 
   (b) peroxisomes 
   (c) several ribosomes held together by a strong of mRNA 
   (d) rRNA

6. Match Column-I with Column-II and select the correct option from the codes given below.
   
<table>
<thead>
<tr>
<th>Column-I</th>
<th>Column-II</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Dictyosomes</td>
<td>i) Storage</td>
</tr>
<tr>
<td>B. Mitochondria</td>
<td>ii) Photosynthesis</td>
</tr>
<tr>
<td>C. Vacuoles</td>
<td>iii) Transport</td>
</tr>
<tr>
<td>D. Grana</td>
<td>iv) Secretion</td>
</tr>
<tr>
<td></td>
<td>v) Respiration</td>
</tr>
</tbody>
</table>
A phospholipid molecule is amphipathic and produces two layers coming in contact with H2O. The head of phospholipid molecule is 
(a) at an angle of 40°
(b) at the outer surface
(c) on the inner side
(d) embedded in protein molecules.

8. Match the cell organelles given in Column-I with cellular processes in Column-II and select the correct option from the codes given below.

<table>
<thead>
<tr>
<th>Column-I</th>
<th>Column-II</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Lysosomes</td>
<td>i) Protein synthesis</td>
</tr>
<tr>
<td>B. Ribosomes</td>
<td>ii) Hydrolytic activity</td>
</tr>
<tr>
<td>C. Smooth endoplasmic reticulum</td>
<td>iii) Steroid synthesis</td>
</tr>
<tr>
<td>D. Centriole</td>
<td>iv) Formation of spindle</td>
</tr>
</tbody>
</table>

9. Match the Column-I with Column-II and select the correct option from the codes given below.

<table>
<thead>
<tr>
<th>Column-I</th>
<th>Column-II</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. RER</td>
<td>i) Intracellular and extracellular</td>
</tr>
<tr>
<td>B. SER</td>
<td>ii) Lipid synthesis</td>
</tr>
<tr>
<td>C. Golgi complex</td>
<td>iii) Protein synthesis and secretion</td>
</tr>
<tr>
<td>D. Lysosomes</td>
<td>iv) Move materials out of the cells</td>
</tr>
</tbody>
</table>

10. Read the given statements and select the correct option.

Statement 1: Chloroplast and mitochondria are semi-autonomous bodies.

Statement 2: Chloroplast and mitochondria have their own DNA and protein synthesizing machinery.

(a) Both statements 1 and 2 are correct and statement 2 is the correct explanation of statement 1.
(b) Both statements 1 and 2 are correct but statement 2 is not the correct explanation of statement 1.
(c) Statement 1 is correct and statement 2 is incorrect.
(d) Both statements 1 and 2 are incorrect.

11. Bright colour of petals is due to the presence of
(a) chloroplast          (b) anthocyanin
(c) chromoplast          (d) leucoplast

12. The function of glyoxysome is
(a) protein metabolism   (b) carbohydrate reticulum
(c) fat metabolism       (d) protein synthesis.
13. Identify A and B in the given figure and select the correct option.

![Figure with labels A and B]

- A: Grana thylakoid
- B: Stroma thylakoid

14. The chromosome in which centromere lies slightly away from the middle of the chromosome resulting into one shorter arm and one longer arm, is called as

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

15. Read the given statements.
(i) Centromere is present in the middle of the chromosome and forms two equal arms.
(ii) Chromosome has a terminal centromere.
(iii) Centromere lies close to the end of the chromosome forming one extremely short and one very long arm.
(iv) Centromere lies slightly away from the middle of the chromosome resulting into one shorter arm and one longer arm.

Select the correct option as per the codes given below.

<table>
<thead>
<tr>
<th>Metacentric</th>
<th>Submetacentric</th>
<th>Acrocentric</th>
<th>Telocentric</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i)</td>
<td>(i)</td>
<td>(ii)</td>
<td>(iii)</td>
</tr>
<tr>
<td>(ii)</td>
<td>(ii)</td>
<td>(iii)</td>
<td>(iv)</td>
</tr>
<tr>
<td>(iii)</td>
<td>(iii)</td>
<td>(ii)</td>
<td>(i)</td>
</tr>
<tr>
<td>(iv)</td>
<td>(iv)</td>
<td>(i)</td>
<td>(iii)</td>
</tr>
</tbody>
</table>

16. Select the incorrect statement regarding the plasma membrane.

- (a) Ratio of proteins and lipids varies considerably in different cell types.
- (b) 52% proteins and 40% lipids constitute the membrane of human RBC.
- (c) Arrangement of proteins (P) and Lipids (L) is L-P-P-L.
- (d) Head of lipid is hydrophilic.

17. All plastids have essentially the same structure because

- (a) they have to perform the same function.
- (b) they are localised in the aerial parts of plants
- (c) one type of plastids can differentiate into another type of plastids depending upon the cell requirements.
- (d) all plastids have to store starch, lipids and proteins.

18. In chloroplasts, chlorophyll is present in the

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

19. These are the densely stained reticular structures present near the nucleus, consisting of many flat, disc shaped cisternae of 0.5 – 1.0 m diameter. These are

- (a) chloroplasts
- (b) endoplasmic reticulum
- (c) mitochondrion
- (d) Golgi apparatus.

20. The cell organelle involved in the glycosylation of proteins is

- (a) ribosome
- (b) peroxisome
- (c) mitochondrion
- (d) endoplasmic reticulum
21. Cells which are secretory in function have abundant
   (a) lysosomes  (b) endoplasmic reticulum 
   (c) dictyosomes  (d) osteosomes

22. Ribosomes of the cytoplasm, chloroplast and mitochondrion are respectively
   (a) 805, 805 and 705  (b) 805, 705 and 705
   (c) 705 in all  (d) 805 in all.

23. The molecules in the membrane that limit its permeability are the
   (a) carbohydrates  (b) phospholipids
   (c) proteins  (d) water

24. Which of the following represents the features of lysosomes ?
   (a) A lower pH than the cytoplasm
   (b) Reduced hydrolase activity
   (c) Double membrane envelope
   (d) All of these

25. Integral cell membrane proteins
   (a) are partially embedded in lipid layers
   (b) are completely embedded in lipid layers
   (c) show lateral but not vertical movements within bilayer of lipid
   (d) All of these

26. According to the modern concept, cell membrane is
   (a) solid  (b) quasifluid
   (c) fluid  (d) solidified sheath

27. A cell, which is very active in the synthesis and secretion of proteins, would be expected to have
   (a) equal amount of RER and SER
   (b) more SER than RER
   (c) more RER than SER
   (d) more Golgi bodies and no ER.

28. Choose the incorrect statement regarding cell membrane.
   (a) Generally smaller molecules pass easily and readily than large molecules.
   (b) Water soluble substance pass through it less readily than lipid soluble substance.
   (c) Membranes are selectively permeable.
   (d) None of these

29. Smooth endoplasmic reticulum is well developed in the cells which synthesize.
   (a) steroids  (b) proteins
   (c) carbohydrates  (d) all of these

30. Mechanical support, enzyme circulation/protein synthesis and detoxification of drugs are function of
   (a) dictyosomes  (b) chloroplast
   (c) ribosomes  (d) ER.
1. Solutions

2. (a) The grouping of bacteria is based upon reaction of bacteria to Gram’s stain (Christian Gram, 1884). Bacteria are first stained with weakly alkaline solution of crystal violet and then treated with 0.5% iodine solution. This is followed by washing with water and then with alcohol or acetone. Bacteria which retain blue or purple colour are known as Gram (+) bacteria (e.g., Bacillus subtills). Bacteria which do not retain any stain and become colourless are called Gram (-) bacteria (e.g., Escherichia coli). Washing of the stain in Gram (+)ve bacteria is due to high lipid content of their cell wall which gets dissolved in organic solvents like acetone.

3. (c) Glycocalyx is the outermost of the cell envelope. Cell wall lies between membrane and glycocalyx.

4. (b) Fimbriae are hair like structures present in large number in bacteria. They help in attaching bacteria to solid surfaces or host tissues.

5. (c) Ribosomes may occur singly as monosomes or in rosettes and helical groups called polyribosomes. The different ribosomes are connected with a 10 – 20A thick stand of mRNA. They are formed during periods of active protein synthesis when a number of copies of the same polypeptide are required.

6. (a)

7. (b) The lipid molecules are amphipathic, i.e., they possess both polar hydrophilic (water loving) and nonpolar hydrophobic (water repelling) ends. The hydrophilic region is in the form of a head occurring at outer surface while the hydrophobic part contains two tails of fatty acids. Hydrophobic tails usually occur towards the centre of the membrane. It results in the formation of a lipid bilayer. Most common lipid in the bilayer is phospholipid.

8. (a)

9. (a)

10. (a)

11. (b) Anthocyanins are one of the groups of flavonoid pigments. They occur in the cell vacuoles of various plant organs and are responsible for many of the blue, red and purple colours in plants (particularly in flowers).

12. (a) Glycosomes are microbodies which contain enzymes for oxidation of fatty acids and glyoxylate pathway. They are considered to be special peroxisomes. They occur abundantly in germinating endosperm cells of oil seeds.

13. (b)

14. (b) In submetacentric type of chromosome, the centromere lies at some distance away from the midpoint, dividing the chromosome into two unequal arms.

15. (a)

16. (c) According to Robertson’s concept of until membrane, the cell membrane is trilaminar. It has a thickness of about 75A with a central lipid layer of 35A thick and two peripheral protein layers of 20A each.

17. (c) Plastids are double membranous, semi-autonomous organelles which store and synthesise various types of organic compounds. They develop from colourless precursors proplastids. Proplastids have the ability to divide and differentiate into various types of plastids.

18. (c) The thylakoid membrane contains photosynthetic pigments, namely, chlorophyll, carotenoids (carotene, xanthophylls) and plastoquinone.

19. (d) Camillo Golgi discovered the Golgi apparatus as reticular structure. Typically it is 0.5 – 1.0 um in diameter but its shape and size depend upon the physiological state of the cell.

20. (d) In many cells proteins released from the endoplasmic reticulum are combined with carbohydrate to produce complexes like glycoproteins. This occurs in both Golgi complex and rough endoplasmic reticulum as they contain enzymes called glycosytransferases.

21. (c) Dictysosome is a cup-shaped structure of flattened membranous vesicles found in plant cell. They modify proteins from the ER, and may also polymerise sugars to polysaccharides. They then package these materials for delivery to destinations within the cell, for secretion, or for storage.

22. (b)

23. (b) The lipid bilayer comprising mostly of phospholipid limits the permeability of the membrane.

24. (a) Lysosomes store the hydrolyzing enzymes of the cell. About 40 enzymes have been recorded to occur in them. All the enzymes do not occur in the same lysosome but there are different sets of enzymes in different types of lysosomes. The important enzymes are acid phosphatases, sulphatases, proteases, peptidases, nuclease, lipases and glycosidases. They are also called acid hydrolases because these digestive enzymes usually function in acidic medium or pH of 4.5. This pH is lower than that of cytoplasm. Acidic conditions are maintained inside the lysosomes by pumping of H+ or protons into them.

25. (d)

26. (b) Fluid mosaic, model is the most recent and widely accepted model of a biomembrane which was proposed by Singer and Nicolson in 1972. Fluid mosaic model describes cell membrane as quasifluid, i.e., ‘protein icebergs in a sea of lipids’. According to
this model, there is a bilayer of lipid molecules (phospholipid) with globular protein molecules (2 types – integral and peripheral) and sterols which are arranged in different manner in different regions of the plasma membrane.

27. (c) The RER offers extensive surface on which protein synthesis can be conveniently carried on by ribosomes. The proteins formed on ribosomes pass into the ER lumen where they are modified. Then the modified proteins move into the transitional area, where the ER buds off membranous sacs, the transport vesicles, carrying the proteins to the Golgi apparatus. Here, they are further processed and packaged into secretory vesicles for export by exocytosis at the plasma membrane.

28. (d)

29. (a) The SER provides surface for the synthesis of lipids, including phospholipids, cholesterol, steroid hormones (sex hormones, adrenal corticoid hormones), ascorbic acid and visual pigments.

30. (d) ER functions as cytoskeleton or skeletal framework by providing mechanical support to colloidal cytoplasmic matrix. It conducts information from cell to cell. RER helps in protein synthesis SER takes part in detoxification of toxic chemicals in liver.