Class XI Session 2024-25
Subject - Biology
Sample Question Paper - 3

Time Allowed: 3 hours **Maximum Marks: 70**

General Instructions:

1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. Section–A has 16 questions of 1 mark each; Section–B has 5 questions of 2 marks each; Section– C has 7 questions of 3 marks each; Section– D has 2 case-based questions of 4 marks each; and Section–E has 3 questions of 5 marks each.
4. There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

Section A

1. Why are biological names written in Italics? **[1]**

   a) To show Italian origin
   b) To show British origin
   c) To show French origin
   d) To show Latin origin

2. Dev consumes a large amount of alcohol and the result is polyuria and dehydration due to: **[1]**

   a) Increase in the level of vasopressin
   b) Decrease in the level of aldosterone
   c) Decrease in the level of ANF
   d) Decrease in the level of vasopressin

3. ATP is_____. **[1]**

   a) Nuleosome
   b) Nucleotide
   c) Purine base
   d) Nucleoside

4. Tyloses are balloon-like ingrowths in vessels developing from: **[1]**

   a) Fibres through the general surface of the vessel wall
   b) Fibre through pits on vessels wall
   c) Parenchyma through the general surface of the vessel wall
   d) Parenchyma through the pits of vessels wall

5. The solubility of carbon dioxide is: **[1]**

   a) 20 - 25 times lower than that of oxygen
   b) 10 - 15 times lower than that of oxygen
   c) 20 - 25 times higher than that of oxygen
   d) 10 - 15 times higher than that of oxygen

6. Which of the following stages of Calvin cycle are in the correct order? **[1]**

a) Carboxylation, regeneration, reduction
b) Regeneration, reduction, carboxylation
c) Regeneration, carboxylation, reduction
d) Carboxylation, reduction, regeneration

7. If in glomerular capillaries, pressure of blood is 75 mm Hg, osmotic pressure of plasma proteins is 30 mm Hg, and hydrostatic pressure of fluid in renal tubule is 25 mm Hg then net force or the filtration pressure will be calculated as : **[1]**

a) 75 + [30 – 20] mm Hg
b) 75 – [30 + 20] mm Hg
c) 75 – [30 – 20] mm Hg
d) 75 + [30+20] mm Hg

8. In water, frogs breathe through the skin. What is the name for such kind of respiration? **[1]**

a) Osmosis
b) Perfusion
c) Percutaneous respiration
d) Cutaneous respiration

9. Which hormone is responsible for seed dormancy? **[1]**

a) Auxin
b) ABA
c) Cytokinin
d) Gibberellin

10. Spirulina is used in medicines, from which type of plants it is derived? **[1]**

a) Algae
b) Pteridophytes
c) Fungi
d) Bryophytes

11. Which of the following symptoms will be shown in a person suffering from diabetes? **[1]**

a) Paruresis
b) Anuria
c) Haematuria
d) Glycosuria

12. The specialized centre which can reduce the inspiratory duration upon stimulation is_____. **[1]**

a) Pneumotaxic centre
b) Chemosensitivecentre
c) Apneusticcentre
d) Medullary inspiratory centre

13. **Assertion (A):** Paroxysms are regular and daily in Quotidian malaria. **[1]**
Reason (R): Recurrence of fever is after 48 hours, if the infection is caused by Plasmodium malariae.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) Both A and R are false.

14. **Assertion (A):** Inspiration occurs due to muscular relaxation. **[1]**
Reason (R): During inspiration, the diaphragm and external intercostal muscle contract simultaneously.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

15. **Assertion (A):** Amylase enzyme stops its activity in stomach. **[1]**
Reason (R): In stomach, pH is acidic due to presence of HCl.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

16. **Assertion (A):** Special vascularised structures called gills are used by most of the aquatic arthropods and molluscs. **[1]**

Reason (R): Vascularised bags called lungs are used by the terrestrial forms for the exchange of gases.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

Section B

17. Differentiate between vascular tissues of gymnosperms and angiosperms. **[2]**
18. Differentiate between eyes of cockroach and eyes of frog. **[2]**
19. What are secondary sexual characters? **[2]**
20. Write any three advantages of scientific names. **[2]**
21. Name the end products of light reaction of photosynthesis. Mention the fate of each of them. **[2]**

OR

What is the advantage of using radioactive isotope with a long half-life in biological experiments?

Section C

22. Enlist the demerits of an artificial system of classification of plants. **[3]**
23. Write an account on skeleton of sponges. **[3]**
24. What are nucleotides? Describe their structure. **[3]**
25. How are gibberellins useful in agriculture to improve productivity. Give any three points in support of your answer. **[3]**
26. Differentiate between a ball and socket joint and a pivot joint. **[3]**
27. Draw a standard ECG and explain the different segments in it. **[3]**

OR

Give the cause for the Heart sounds.

28. Distinguish between **[3]**

i. Grey matter and White matter

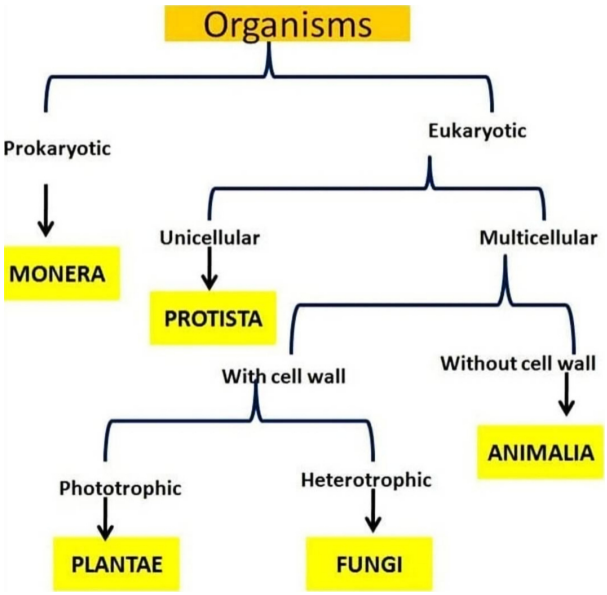
ii. A stimulus and An Impulse

Section D

29. **Read the following text carefully and answer the questions that follow:** **[4]**

R.H. Whittaker proposed a Five Kingdom Classification. The kingdoms defined by him were named Monera, Protista, Fungi, Plantae, and Animalia. The main criteria for classification used by him include cell structure, body organisation, mode of nutrition, reproduction and phylogenetic relationships. The three-domain system has also been proposed that divides the Kingdom Monera into two domains, leaving the remaining eukaryotic kingdoms in the third domain and there by a six kingdom classification. Earlier classification systems included bacteria, blue-green algae, fungi, mosses, ferns, gymnosperms and the angiosperms under 'Plants'. The character that unified this whole kingdom was that all the organisms included had a cell wall in their cells.

Robert H. Whittaker (1969)



i. Observe Robert H. Whittaker (1969) flow chart of classification and mention what type of organisms were included in Kingdom Animalia? (1)

ii. Mention two differences between prokaryotic and eukaryotic cells. (1)

iii. Linnaeus used which kingdom of classification? State two drawbacks of Linnaeus two kingdom classification. (2)

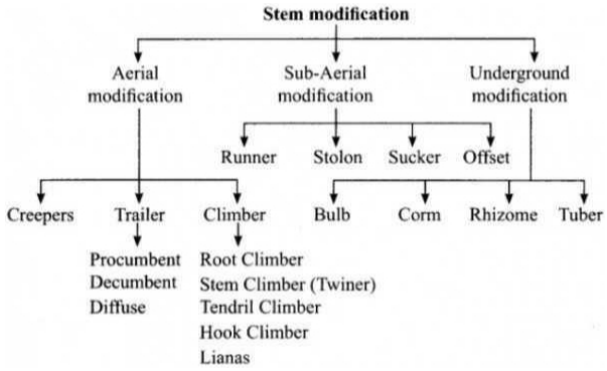
OR

Is Fungi- Autotrophic (Photosynthetic) and Heterotrophic the correct match? Also, Mention the difference between the walls of fungi and green plants. (2)

30. **Read the following text carefully and answer the questions that follow:** **[4]**

Various parts of the plant such as stems leaves, and even fruits are modified into underground parts to perform various functions such as stems, leaves, and even fruits.

The stems in ginger and banana are underground and swollen due to storage of food. They are called rhizome. Rhizome of ginger is a modification of stem because it bears nodes, internodes, terminal buds, scaly leaves and buds, which give rise to aerial shoots. It is not a root because root does not have nodes and internodes. Also, rhizome does not perform the function of roots i.e. anchorage and absorption, rather it serve as reservoir for storage of food. Similarly, corm is an underground stem in Colocasia (jimikand) The tips of the underground stem in potato become swollen due to accumulation of food and forms tuber.



i. Observe the given flow chart and mention what are the four types of Underground stem modification also mention one example of each. (1)

ii. Ginger is an underground stem but why it is distinguished from a root? (1)

iii. Why do the tips of modified stems in potatoes become swollen? (2)

OR

Are all underground parts of a plant roots? (2)

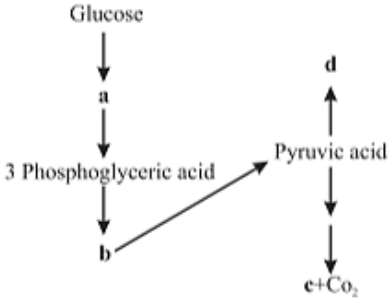
Section E

31. Briefly describe the significance of cell division. **[5]**

OR

What are homologous chromosomes? What happens to homologous chromosomes during meiosis?

32. In the following flow chart, replace the symbols a,b,c and d with appropriate terms. Briefly explain the process and give any two application of it. **[5]**



OR

Where is the electron transport system operative in mitochondria? Explain the system highlighting the role of oxygen.

33. Describe in brief the structure of the cell of the brain. **[5]**

OR

Does a group of smaller cells have a higher metabolic rate than a single large cell of the same volume? Explain.

Solution

Section A

1. **(d)** To show Latin origin
   Explanation: At the time when biologist Carl Linnaeus (1707-1778) published the books that are now accepted as the starting point of binomial nomenclature, Latin was used in Western Europe as the common language of science, and scientific names were in Latin.

2. **(d)** Decrease in the level of vasopressin
   Explanation: Polyuria is usually the result of drinking excessive amounts of fluids (polydipsia), particularly water and fluids that contain caffeine or alcohol. A person suffering from polyuria may develop excessive production of urea and suffer from dehydration due to a decrease in the level of antidiuretic hormone or vasopressin.

3. **(b)** Nucleotide
   Explanation: Adenosine triphosphate (ATP) is a nucleotide. A nucleotide is formed by pentose sugar, nitrogenous base and phosphates. Many nucleotides join together to form polynucleotide.

4. **(d)** Parenchyma through the pits of vessels wall
   Explanation: Tyloses are balloon-like ingrowths in vessels developing from parenchyma cells through the pits of the vessel wall of the xylem of secondary heartwood.

5. **(c)** 20 - 25 times higher than that of oxygen
   Explanation: The solubility of carbon dioxide is 20-25 times higher than that of oxygen, the amount of carbon dioxide that can diffuse through the diffusion membrane per unit difference in partial pressure is much higher compared to that of oxygen.

6. **(d)** Carboxylation, reduction, regeneration
   Explanation: The Calvin cycle can be described under three stages: carboxylation, reduction, and regeneration. Pathway operated in a cyclic manner.

7. **(b)** 75 – [30 + 20] mm Hg
   Explanation: Net force of filtration pressure is equal to the blood pressure of glomerular capillaries minus sum of the osmotic pressure of plasma and hydrostatic pressure of fluid in renal tubule. So, filtration pressure = 75 – [30 + 20] mm Hg.

8. **(d)** Cutaneous respiration
   Explanation: In Cutaneous respiration, the exchange of gases occurs through the skin. Animals undergoing cutaneous respiration usually have moist skin.

9. **(b)** ABA
   Explanation: Abscisic acid encourages fruit to drop and leaves to fall. When the plant is low on water abscisic acid closes the stomata, pores in the leaves. It encourages both seeds and plants to go dormant. The hormone induces seeds to produce proteins to store when the seeds are dormant.

10. **(a)** Algae
    Explanation: Spirulina is a blue-green alga and It is one of the most potent nutrient sources of vitamins B-1(thiamine), B-2 (riboflavin), B-3(nicotinamide), B-6 (pyridoxine), B-9 (folic acid, vitamin C, vitamin D, vitamin A, and vitamin E. It is also a source of potassium, calcium, chromium, copper, iron, magnesium, manganese, phosphorus, selenium, sodium and zinc.

11. **(d)** Glycosuria
Explanation: Glycosuria is a condition characterized by an excess of sugar in the urine, typically associated with diabetes or kidney disease.

12. **(a)** Pneumotaxic centre
Explanation: The pneumotaxic centre can moderate the functions of the respiratory rhythm centre. A neural signal from this centre can reduce the duration of inspiration and thereby alter the respiratory rate.

13. **(d)** Both A and R are false.
Explanation: In Quotidian malaria, paroxysms are irregular and daily (Recurrence of fever is called paroxysms). Plasmodium malariae causes Quartan malaria. Recurrence of fever is about 72 hours.

14. **(a)** Both A and R are true and R is the correct explanation of A.
Explanation: Inspiration is the result of muscular contraction. The diaphragm and external intercostal muscle contract simultaneously. The lateral thoracic wall moves outward and upward.

15. **(a)** Both A and R are true and R is the correct explanation of A.
Explanation: Each enzyme functions at a particular pH. Specificity of pH for enzyme activity is useful in regulating enzymes, e.g., salivary amylase stops its activity in the stomach where hydrochloric acid is secreted. Salivary amylase acts at pH 6.8.

16. **(b)** Both A and R are true but R is not the correct explanation of A.
Explanation: Both A and R are true but R is not the correct explanation of A.

Section B

17.

Vascular Tissues of Gymnosperms	Vascular Tissues of Angiosperms
Xylem is devoid of vessels.	Xylem possesses vessels
Phloem does not contain sieve tubes.	Sieve tubes are present
Phloem does not contain companion cells.	Phloem posses companion cells.

18. Differences between eyes of cockroach and eyes of frog

Eyes of Cockroach	Eyes of Frog
1. Compound eyes made of multiple units	1. Simple eyes made of single units
2. Ommatidia comprise eyes.	2. Lens comprise eyes
3. Project mosaic vision with less resolution.	3. Stereoscopic vision with high resolution.

19. Characters which do not play direct role in sexual reproduction but are basically means of sexual differentiation are called secondary sexual characters. For example, facial hair and deep voice in males and thin voice in females are secondary sexual characters.

20. Advantages of scientific names are:
    i. These are acceptable in every part of the world.
    ii. These are assigned on agreed principles by scientists.
    iii. These are very specific. It means no two organisms can have the same name.

21. ATP, NADPH, and oxygen are the end products of light reaction.
ATP and NADPH are used in the reduction step of the biosynthetic phase of photosynthesis. Oxygen is liberated into the atmosphere.

OR

If an isotope has a shorter half-life (for example ^{11}C that possesses a half-life of 20.5 minutes), it quickly decays and severely restricting its usefulness in biological experiments, which often take hours to complete. So an isotope with a longer half-life is useful.

Section C

22. **Demerits of Artificial System :**
    i. Criteria used, though simple but arbitrary, are based on **random morphological characters/traits.**
    ii. It **lacks the natural relationship** amongst the organisms.

iii. It fails to give an idea about the **origin and evolution of different species.**

iv. Many closely allied individuals were classified in separate groups and those with altogether different characters were placed in the same group.

23. The body of sponges contains a supporting exoskeleton. It is made up of either spicules or spongin fibres or both. Spongin fibres are protein fibres. They are either highly branched or show anastomosis. Spicules are calcareous or siliceous with hard spine-like structures. Depending on the branching the spicules are

i. monoaxons (single axis).

ii. triaxons (three-axis forming six rays of hexactinal spicules).

iii. tetraxons (four rays or tetra actinal).

iv. polyaxons (several rays).

24. **Nucleotides:** They are small, complex molecules made of C, H, O, N, P. Each nucleotide consists of 3 units: a **nitrogenous base,** a **pentose sugar**, and **phosphate groups**. The nitrogenous base is a **purine** (adenine or guanine) or **pyrimidine** (thymine/cytosine/ uracil). The sugar may be ribose in ribonucleotide or deoxyribonucleotide. Combination of a nitrogenous base and a pentose sugar forms a **nucleoside.** Nucleotides are mono or di or triphosphates of nucleosides, e.g., Adenosine monophosphate (AMP), Adenosine diphosphate (ADP) and Adenosine triphosphate (ATP).

25. Gibberellins are useful in agriculture in the following ways:

i. Application of gibberellins increases the length of the stem and increases the yield of sugar in sugarcane.

ii. Gibberellins delay senescence and prevent the premature fruits drop.

iii. It can cause fruits like apple to elongate and improve in shape.

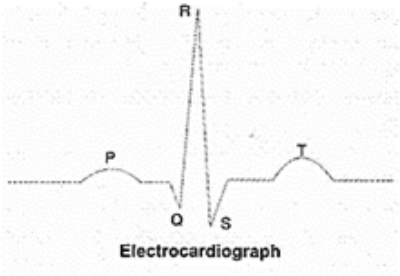
26.

A Ball and Socket Joint	A pivot Joint
One bone forms a cup-like depression or socket in which ball-like structure fits.	It permits movements resembling the rotation of the body around a pivot.
The head or ball can move freely in the socket.	One of the two bones of the joint is always fixed in it.
e.g., Shoulder joint.	e.g., Joint between atlas and axis vertebrae in man.

27. The P-wave represents the electrical excitation (or depolarisation) of the atria, which leads to the contraction of both the atria. The QRS complex represents the depolarisation of the ventricles, which initiates the ventricular contraction. The contraction starts shortly after Q and marks the beginning of the systole.

The T-wave represents the return of the ventricles from excited to the normal state (repolarization). The end of the T-wave marks the end of systole.

Obviously, by counting the number of QRS complexes that occur in a given time period, one can determine the heartbeat rate of an individual. Since the ECGs obtained from different individuals have roughly the same shape for a given lead configuration, any deviation from this shape indicates a possible abnormality or disease. Hence, it is of great clinical significance.



Electrocardiograph

OR

Heart sounds: These are resulted due to sharp closure of heart valves. The first sound ‘lub' occurs at the onset of ventricular systole and; is caused due to sharp closure of AV valve and the ejection of blood from the ventricles.

The second heart sound **‘dub’** occurs at the beginning of ventricular diastole and is caused by sharp closure of the semilunar valves to the aorta and the pulmonary artery.

28. i. **Difference between Grey matter and White matter:**

Grey Matter	White matter
It is composed of cell bodies (cytons) of a nerve cell. It is inside the brain but outside the spinal cord.	It is composed of axons from the nerves cells. It is inside the brain but outside the spinal cord.

ii. **Difference between A stimulus and An impulse:**

A stimulus	An impulse
Any change in the environment of an organism that evokes response or impulse.	It is a self-propagating wave electrochemical in nature; negatively travelling along the axon of a nerve cell.

Section D

29. i. All organisms are multicellular, eukaryotes with heterotrophic mode of nutrition.

ii.

Prokaryotic cell	Eukaryotic cell
Genetic material is not enclosed in a nuclear envelope and is present suspended in the cytoplasm in a region called nucleoid.	Genetic material is enclosed within the nucleus by a nuclear envelope and is not present in direct contact with cytoplasm.
Cell wall is made up of peptidoglycan.	Cell wall is made up of chitin in fungi and cellulose in plants.
Nucleolus is absent.	Nucleolus is present.

iii. Linnaeus used artificial system kingdom of classification.

Drawbacks of Linnaeus two kingdom classification:

- Linnaeus developed a Two Kingdom system of classification with Plantae and Animalia kingdoms.
- This system did not distinguish between eukaryotes and prokaryotes, unicellular and multicellular organisms, photosynthetic (green algae) and non-photosynthetic (fungi) organisms.

  OR

  No, Fungi-Autotrophic (Photosynthetic) and Heterotrophic is not correct match. The walls of the fungi were made of chitin, whereas the green plants had a cellulose cell wall.

30. i.
- Rhizome - Ginger, turmeric.Banana
- Bulb - Tulips, Lilies, Daffodils, Onion, Garlic
- Corm - Colocasia, Yam, Saffron
- Tuber - Potato, Artichokes

ii. It has nodes and internodes. Such nodes and internodes are not found in the roots.

iii. Modified stem in the potato is underground and it becomes swollen because food gets accumulated to form tubers.

OR

No. Many different parts of plants, like the stem, leaves and fruits, get modified to act as underground structures that can perform functions other than those of roots.

Section E

31. Cell division is significant in the following ways

i. **Cell multiplication:** Cell division is a means of cell multiplication or the formation of new cells from pre-existing cells.

ii. **Continuity:** It maintains continuity of living matter generation after generation.

iii. **Multicellular organisms:** The body of a multicellular organism is formed of innumerable cells. They are formed by repeated divisions of a single cell or zygote. As the number of cells increases, many of them begin to differentiate, form tissues and organisms.

iv. **Cell size:** Cell division helps in the maintenance of a particular cell size which is essential for efficiency and control of cell activities.

v. **Genetic similarity:** The common type of cell division or mitosis maintains the genetic similarity of all the cells in an individual despite being different, i.e., structurally and functionally.

OR

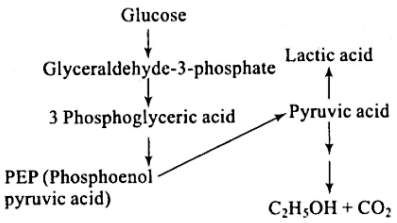
Homologous Chromosomes: These are pairs of similar chromosomes having corresponding genes governing the same set of traits.

During the heterotypic division of **meiosis** in leptotene, chromosomes are thread shaped and coiled. During **zygotene**, the homologous chromosomes start pairing. Here morphologically and genetically chromosomes similar are called homologous chromosomes. In pachytenes, the chromosomes show thickening and shortening. **Diplotene** is marked by the **cessation of attraction force** between two homologous chromosomes. Uncoiling of homologous chromosome tends to separate them from each other but remains attached at chiasmata. During **diakinesis,** the separation of homologous chromosomes is complete. Exchange of parts between chromatids of homologous chromosomes may occur.

During **Anaphase** I, the centromere of homologous compounds of bivalents repel each other. After separation of centromeres, the

homologous chromosomes begin to move apart towards the spindle. In telophase I, the chromosomes reach **poles** and become shortened. The two cells have a reduced number of chromosome and then second meiosis begins.

32.



This figure shows the major pathways of anaerobic respiration or fermentation. Glycolysis is shown on the lefthand side, while further processing of pyruvic acid is shown on the right-hand side.

In animal cells also, like muscles during exercise, when oxygen is inadequate for cellular respiration pyruvic acid is reduced to lactic acid by lactate dehydrogenase. In certain organisms, pyruvic acid is processed to produce ethanol and carbon dioxide. Some amount of energy is released in both cases.

Two applications of anaerobic respiration are as follows:

i. In making fluffy cakes and bread anaerobically reproducing fungi yeast is used.
ii. In making curd lactobacillus is added as inoculum.

OR

Electron Transport System (ETS): The metabolic pathway by which the electrons passes from one carrier to another is known as the **electron transport system.** It is operative in the inner mitochondrial membrane of mitochondria. The electrons from NADH produced in the mitochondrial matrix during the citric acid cycle are oxidised by an **NADH dehydrogenase** (Complex I). Electrons are then transferred to Ubiquinone that receives reducing equivalents via FADH, {generated during oxidation of succinate) by the activity of **Succinic dehydrogenase** (Complex II) in TCA. Reduced ubiquinone is oxidised with the transfer of electrons to cytochrome V via Cytochrome V complex (complex III). Cytochrome V acts carrier for transfer of electrons between complex III and complex IV. Complex IV refers to cytochrome c oxidase complex having cytochromes a and α_3 and two copper centres.

33. The basic structural organisation of a typical cell is as follows

i. Nucleus, the central part and brain of the cell, which is spherical in shape. Its number can be one or more per cell. It is denser than the surrounding cytoplasm.
ii. Cytoplasm, a semi-fluid matrix that occupies the volume of the cell. It is mainly composed of water with free-floating molecules. Inside the cytoplasm, all cellular activities like a gaseous exchange, elimination of wastes, hereditary mechanisms, etc., occur.
iii. The outer membrane, the boundary of the cell, which provides protection to the cell and controls the exchange of ions, molecules and other components in and out of the cell.
The outer membrane of a cell contains cell wall (only in plant cells) and plasma membrane.

OR

Cell Size and Metabolic Rate: Size of the cells vary considerably as we have already seen. But in most of the cells, size ranges between 3 to 30 microns.

The group of smaller cells have a higher metabolic rate than a larger cell because of the following factors:

i. **Nucleocytoplasmic ratio:** We know that that nucleus controls all the metabolic activities of the cell including growth, development, etc. However the nucleus cannot extend its control over an indefinitely large area and without the control of the nucleus, the cell cannot function. If the size increases, the metabolic rate decreases.
ii. **Surface area of the cell:** The substances required for metabolism pass into the cell through the cell membrane, for example, oxygen. If the size of the cell is big, all the areas of the cell may not get the required amount of oxygen. Hence metabolism shall decrease. It is on this account that the group of smaller cells have a higher metabolic rate than the bigger single cell of the same size.