

Solutions

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Date :

1. Robert Hooke 1665
2. a) Robert Hooke - Discovered cells (dead cells in cork)
coined the term cell.
b) Robert Brown - Discovered Nucleus
c) Leeuwenhoek - saw living cells in pond water
d) Purkinje - discovered Protoplasm
e) Schwann, Schleiden + Virchow. - Sch + Sch proposed the cell theory which was added to later by Virchow.
f) Golgi - discovered Golgi body/apparatus

3. Unicellular

All activities of the organism are performed by a single cell.

Multicellular

Activities of the organism are performed by many cells

Division of labour at organelle level

Division of labour seen at cellular level.

Simple but less efficient body design

Complex, efficient body design - Differentiation and organisation

life span is short

Life span is longer

eg. Amoeba, Paramecium, Plasmodium

man, cat, Mango tree

4. Function of the cell determines its shape and size. eg. muscles are ^{made of} long + cylindrical cells which can contract and relax. Sperm has a tail to swim to the ovum.

5. a. Spindle shaped smooth muscle cells can contract and relax to bring about movement.

b. Blood cell - RBC $\rightarrow$  Disc shaped cell, carries oxygen to the tissues, contains Haemoglobin

c. Long Nerve cells (Neurons) transmit nerve impulses.



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- d. Ovum is large and spherical. Contains reserve food for embryo to grow.
 - e. Sperm - Has a tail to swim to Ovum
 - f. Bone cells - have branches - are arranged in a pattern to give strong bone tissue
 - g. fat cell - store fat

6. Cell

- 7. Parts of a cell - the tiny organs of a cell.
eg Nucleus, mitochondria, Chloroplast
- 8. Plasma membrane, Cytoplasm, Nuclear material (Nucleus)
- 9. It regulates the entry and exit of substances from the cell according to the cell's needs and the nature of the substance.
- 10. Plasma membrane is a selectively permeable, lining structure which regulates the entry and exit of substances from/into a cell. It also provides a distinct structure to cell. It is flexible and maintains the internal environment of the cell. It also protects the cell.
- 11. Diffusion
- 12. Diffusion is the movement of particles from their higher concentration to their lower concentration. (across the conc. gradient) It is a physical process that takes place passively (Energy not needed).
Seen in cells for exchange of gases - O_2 & CO_2
- 13. Osmosis is the movement of water (solvent) from its higher concentration to its lower conc. across a semipermeable membrane.
It is a special case of diffusion as it requires a

semipermeable membrane and it is about the movement of solvent.

14. Plant cell in

Hypotonic medium - Endosmosis will take place. Cell will swell up. It does not burst due to the rigid cell wall found in plant cells.

Isotonic medium - No change is seen as rate of Endosmosis is equal to the rate of exosmosis.

Hypertonic medium - The plant cell will show exosmosis. Water will leave the cell causing the cellular contents to shrink away from the cell wall. Such a cell is called 'Plasmolysed' cell.

15. Animal cell in -

a) Isotonic medium - No change. Rate of endosmosis is equal to rate of exosmosis.

b) Hypotonic medium - Endosmosis. Cell bursts as there is no cell wall.

c) Hypertonic medium - Cell loses water and shrinks due to Exosmosis.

16. Plant roots absorb H_2O by Osmosis

Unicellular organisms take up H_2O by Osmosis

17. Exchange of gases

18. Composition of plasma membrane - Proteins & lipids.

Functions - (Ref Austo). → Transport, Structure of cell, Diffusion, Osmosis, Exocytosis, Endocytosis, protection, Maintenance of cell's internal environment.

19. Flexibility of plasma membrane allows the cell to perform exo and endocytosis. It also

facilitates cellular movement. Helps in phagocytosis and pinocytosis.

20. Endocytosis - A cell takes in a substance.
Exocytosis - A cell removes a substance from its body.

Phagocytosis - cell eating. Taking in a solid

Pinocytosis - cell drinking. Taking in a liquid

21.

cell wall	cell membrane
Dead	living

Absent in Animal cells

Present in all cells

Made of diff. subs.

Made of protein + lipid

Plant - cellulose

Fungus - chitin

Bacteria - Peptidoglycan

Rigid (Protective)

Flexible

Freely permeable

Selectively Permeable

Gives shape

Maintains internal environment.

22. Ref @ 2.1

23. Plasmolysis. Can be reversed ~~but~~ ^{by} putting the cell in a hypotonic solution like plain water. Endosmosis will take place and cell will be Deplasmolysed.

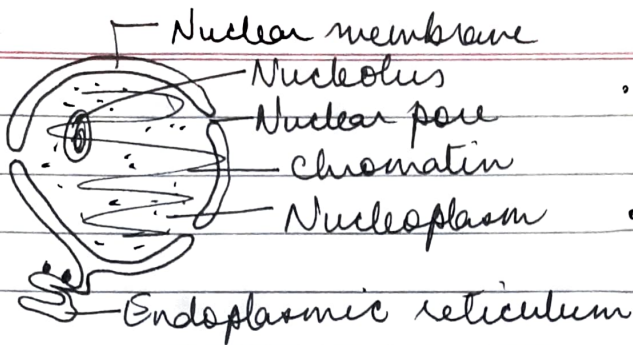
24. Osmosis is shown only by living cells.

25. To prevent drying up of tissues

26. Onion peel - Safranin
Cheek cell - Methylene

27. Cell wall is rigid and protects cells from bursting in hypotonic medium. Plants and fungi can withstand hypotonic media and other changes in surrounding medium much better than animal cells. The cell swells. Pressure is built against cell wall. Cell wall exerts an equal pressure against swollen cell.

28.



- Double membrane bound.
- Has nuclear memb. pores to allow substances to pass through.

Nucleus

- Contains chromatin that is made of DNA and contains genes.
- Nucleolus makes ribosomes.

29. Pores to allow for transport of substances

30. Prokaryotes do not have a membrane bound. nucleus.

31. Chromosomes - (chromo) Darkly staining structures in the nucleus. Made of DNA - Deoxy ribo nucleic acid. Bear genes. They carry heredity (info from one generation to next)

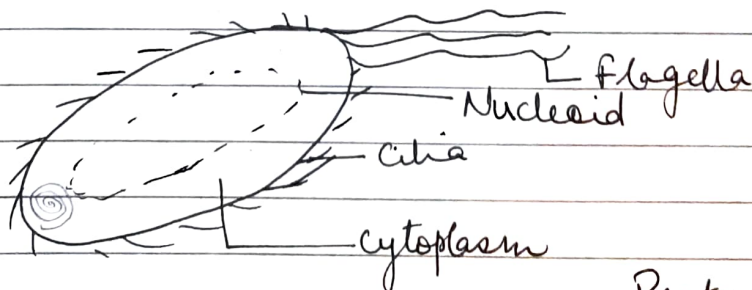
32.	<u>Chromosomes</u>	<u>Chromatin</u>
	Rod-like or X shaped structures	thread like structures
	Seen in ^{nucleus of} dividing cells	Seen in the nucleus of non-dividing cells.

33. Gene

34.	<u>Nucleus</u>	<u>Nucleoid</u>
	Membrane bound	Non membrane bound
	Organelle containing Genetic material	region containing genetic material
	Seen in Eukaryotes	Found in Prokaryotes

35. In absence of organelles, prokaryotes have enzyme systems located on the plasma membrane infoldings called Mesosomes where metabolic processes are carried out.

36.



37.	<u>Prokaryote</u>	<u>Prokaryotic cell</u>
	do not have a well defined Nucleus	Eukaryote
	No membrane-bound organelles	Have a well defined Nucleus
		Have membrane-bound organelles

Prokaryote
 Single chromosome

Eukaryote
 More than one chromosome

Size: Generally small
 (1-10 μm) $1 \mu\text{m} = 10^{-6} \text{m}$

Size - generally large
 (5-100 μm)

38. No, RBC is not a prokaryote. It is a Eukaryotic cell. It has a nucleus initially but on maturity loses the nucleus to make space for Haemoglobin, the respiratory pigment that transports oxygen.

39. Endoplasmic Reticulum is a part of endomembrane system.

Functions $\rightarrow$ Produces proteins (RER), produces lipids (SER), transport channels within the cytoplasm, site of chemical reactions. SER and RER together make lipids and proteins respectively. Lipids + proteins make membranes (Membrane Biogenesis).

40. RER - Rough Endoplasmic reticulum bears Ribosomes which manufacture proteins. SER - Smooth Endoplasmic reticulum makes lipids. Proteins and lipids form membranes. Such synthesis of membranes by cells is called Membrane Biogenesis.

41. a. ER. - Ref a 39, 40.
 b. RER - Ref a. 40
 c. SER - Smooth Endoplasmic reticulum. ER without Ribosomes.
 d. Golgi apparatus - Made of sacs called cisternae. Make and package products of ER.

e. Lysosome - Suicide bags of cells. Contain digestive enzymes. Remove cellular waste + debris. These vesicles are produced by Golgi apparatus.

f. Mitochondria - Power house of cell. Carries out cellular respiration. Produces ATP - Adenosine triphosphate. (Energy currency of cell).

g. Plastid - Found only in plant cells. Contain chlorophyll (Chloroplast) carry out photosynthesis. Chromoplasts contain other pigments (other than chlorophyll) Give color to various plant parts like flowers and fruits. Leucoplasts are colourless plastids that store food.

h. Vacuole - Single membrane bound vesicles that contain H_2O , salts, waste, food and various other substances. Play an important role in waste removal and osmoregulation. Make plant cells turgid.

i. Nucleus - Refer Ans 28.

42.

SER

Smooth Endoplasmic Reticulum.  Does not have Ribosomes.

Produces Lipids
Plays a major role in detoxification in higher vertebrates (Present in liver cells).

RER

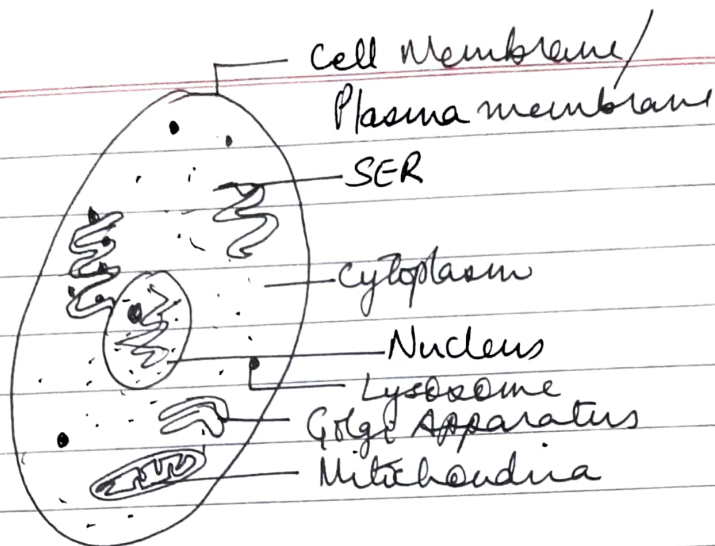
Rough Endoplasmic Reticulum.

 Bears Ribosomes found near nucleus.

Makes Proteins
Seen extensively in cells that make proteins

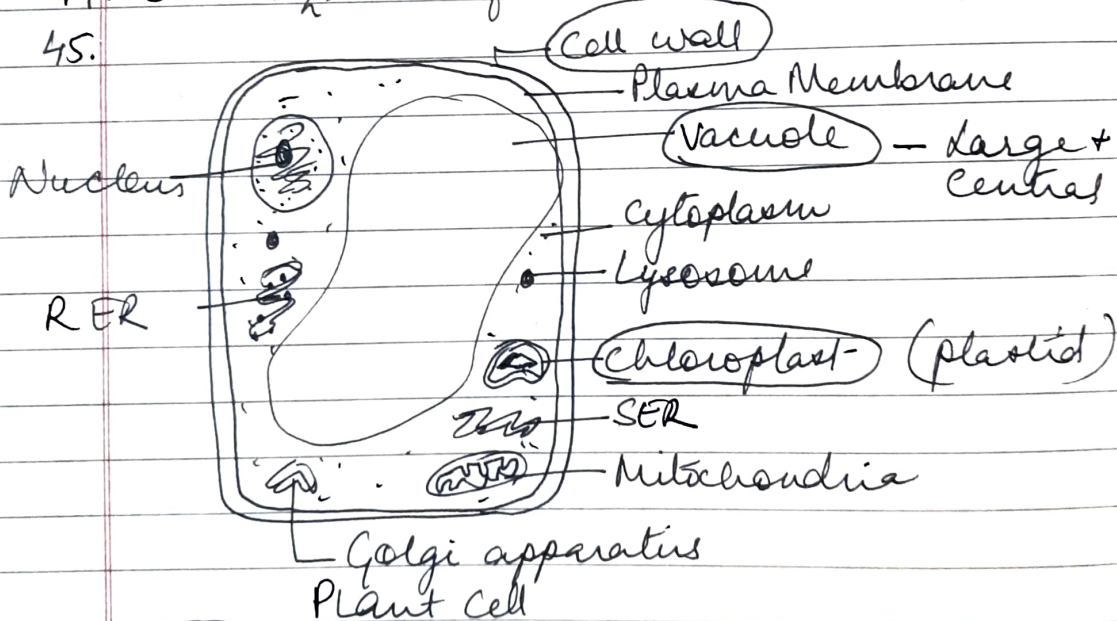
43.

43.

Animal cell.

44. SER in ^{cells of} ~~in~~ ^{lines} of vertebrates detoxifies toxins

45.

Plant cell

Circled ones are present only in Plant cells.

46. Endomembrane system comprises of ER, Golgi apparatus, Lysosomes + vacuoles. They are related by function.

47. Golgi apparatus

48. Mitochondria and chloroplast, both are semi-autonomous. They contain their own

DNA and protein synthesizing machinery.

49. ATP - Adenosine Triphosphate

50. Vacuole

51. ~~Atkin~~ Rough Endoplasmic Reticulum makes the proteins (enzymes)

52. Bacterial - Prokaryotic, Liver cell - Eukaryotic

53. Lysosome

54. ~~Atkin~~, Ribosomes, RER.

55. Amoeba and paramecium are unicellular organisms where one cell performs all the functions of the individual organisms. A cell of our body, a multicellular organism is not capable of performing all the functions of the body. In Unicellular organisms, One cell can exist independently in terms of its ~~own~~ metabolic & life processes.

For multicellular organisms because of levels of organisation and high degree of differentiation, a single cell cannot exist on its own.

56. We begin our lives as Zygote, a single cell that is the product of fertilization of gametes. This single cell grows, divides and develops into a new individual.

57. a). Increase in CO_2 in the cell will cause the cell to remove it by diffusion. If it can't be removed for some reason, the cell will show the effects of CO_2 toxicity.

b) If plasma membrane bursts, cell will die as it will no longer be distinct from the environment.

c) The cell won't be able to perform endocytosis or exocytosis. Movement won't be possible.

d) The cell will not be able to maintain its internal environment.

58. Mitochondria and chloroplast both have their own DNA which is circular and resembles prokaryotic DNA. Both ~~are~~ Mito and chloroplast are also similar in size to prokaryotic cells.

59. Refer Ans 41 - (g)

60. Vacuoles are storage sacs for solid or liquid contents. These organelles are large ~~are~~ in plant cells while they are small sized in animals. Central vacuole of some plant cells can take up 50-90% of cell volume.

In plant cells - vacuoles store cell sap. Give turgidity and rigidity. Store amino acids, sugars, various organic acids & some proteins.

In Amoeba, food vacuoles contain food consumed by amoeba.

In some unicellular organisms, specialized vacuoles play an important role in expelling excess water and some wastes from cells.

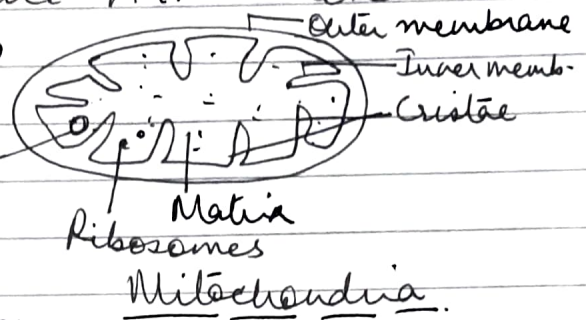
61. Tonoplast

62. Ref Ans 60

63

63. Mitochondria is the site of cellular respiration. Food is oxidized to produce ATP. Adenosine triphosphate. Structure →

Inner wall is thrown into folds called Cristae. This increases surface area for production of ATP.



64. Mito and Chloroplast are called semi-autonomous as both have their own DNA and protein synthesizing machinery and can make their own proteins.
65. On the 'Cristae' the folds of inner membrane. This is where ATP Synthase enzyme is found.
66. Cell membrane or Plasma Membrane.
67. Two factors — Function of Cell & Nature of Organism.
eg. Sperm, RBC, Nerve Cell.
68. Ribosome
69. a) Mitosis — Equational division, maintains chromosomal number in daughter generation. Takes place in body cells for growth.
b) Meiosis — Reductional division. Reduces number of chromosomes by half in the daughter cells. Essential for sexual reproduction. Takes place only for producing gametes. Maintains the chromosomal no. in sexual reproduction.

70.

Mitosis

Single Step

Equational - No. of chromosomes is same in parent & daughter cells.

Produces 2 genetically similar cells

No variation

Takes place in body cells for growth and repair.

Meiosis

Two step process

Reductional - No. of chromosomes is halved in daughter cells.

Produces '4' genetically dissimilar cells.

Produces variation

Takes place only in reproductive organs to produce gametes

71. A cell acquires the ability to function and attains a certain structure through Differentiation.

72. Cells divide to maintain the surface area: volume ratio.

The divide for growth, repair and to produce gametes.

73. Meiosis is the type of cell division that takes place for gamete formation.

Gametes have half the number of chromosomes. When fusion of gametes takes place during fertilization, original chromosomal number is restored.

