

CHANDANA CET 2016
CELL AS THE UNIT OF LIFE

- Cells are the structural and functional units of life (Schleiden&Shwann)
- All cells arise from pre-existing cells (Rudolf Virchow)

Prokaryotic cells	Eukaryotic cells
Primitive	Advanced
No nucleus	Nucleus present
No membrane-bound organelles	Show different membrane-bound organelles
30S, 50S & 70S ribosomes	40S, 60S & 80S ribosomes
No ER	ER present
Eg: Bacteria, Cyanobacteria, Mycoplasma	Eg: Protozoa, Metazoa, Metaphyta, Fungi

EUKARYOTIC CELLS

CELL WALL

CELL (PLASMA MEMBRANE)

ENDOPLASMIC RETICULUM

INCLUSIONS

Mitochondria	Powerhouse of the cell
Plastids	Centres of food production & storage
Golgi bodies	Packaging organelles
Lysosomes	Suicide bags of the cell
Centrosome	Intracellular movements
Vacuoles	Reservoir, storage etc.
Ribosomes	Centres of protein synthesis
Cytoskeleton	Skeletal elements
Cilia & Flagella	Locomotion

NUCLEUS Controlling centre Storehouse of genetic information
Nuclear envelope, Nucleoplasm, Chromatin (Hetero- &Eu-), Nucleoli

CHROMOSOMES

Vehicles of heredity carry sets of genes from one generation to another of the cells or organisms
Chromatin & Chromosomes – DNA, Histones, Non-histones & some RNA
Chromosome structure – chromatids and their arms; centromere & kinetochore; telomere; secondary constriction
Shape of chromosomes on the basis of position of centromere – Metacentric, Submetacentric, Acrocentric & Telocentric
SAT chromosomes

1. Which of the following structures is not found in a prokaryotic cell?
1) Plasma membrane 2) Nuclear envelope 3) Ribosome 4) Mesosome
2. Which of the following is not membrane bound?
1) Mesosomes 2) Vacuoles 3) Ribosomes 4) Lysosomes
3. Cellular organelles with membranes are
1) Lysosomes, Golgi apparatus and Mitochondria 2) Nucleus, Ribosomes and Mitochondria
3) Chromosomes, Ribosomes and Endoplasmic reticulum 4) Endoplasmic reticulum, ribosomes and nuclei.
4. A protoplast is a cell
1) without cell wall 2) without plasma membrane 3) without nucleus 4) undergoing cell division
5. Cells of this organism contain all four types of ribosomes viz., 30S, 40S, 50S and 60S.
1) Bacterium 2) Cyanobacterium 3) Mycoplasma 4) Any eukaryote
6. What is not true about prokaryotic cells?
1) They contain 30S and 40S types of ribosomes 2) They do not possess nucleolus
3) Although DNA is present as loose strands RNA is absent 4) They lack ER
7. Flagella and centrioles are similar in being made up of a protein called
1) Fibrin 2) Tubulin 3) Actin 4) Flagellin
8. Which of the following type of plastids does not contain stored food material?
1) Amyloplasts 2) Chromoplasts 3) Elaeoplasts 4) Aleuroplasts
9. J-shaped chromosomes are also called ----- chromosomes.
a. telocentric 2) submetacentric 3) acrocentric 4) metacentric

10. ----- are also called the packaging organelles of an eukaryotic cell.
 1) Nuclear lamina 2) Centrosome 3) Golgi complex 4) ER
11. Lysosomes were discovered by -----.
 1) Benda 2) Kolliker 3) Waldeyer 4) De Duve
12. Which of the following types of chromosomes has only one arm?
 1) Metacentric chromosome 2) Telocentric chromosome
 3) Acrocentric chromosome 4) Submetacentric chromosome
13. Animal cells differ from plant cells in having
 1) Abundant chloroplasts 2) Abundant mitochondria 3) Golgi bodies 4) Centrosome
14. Identify the mismatch between component of a living cell and important chemical constituent in it.
 1) Chromosomes – histones 2) Centrosome – Tubulin
 3) Cell wall – Glycolipids 4) Lysosomes – hydrolytic enzymes
15. Match the names of cell organelles with of their important function:

CELL ORGANELLE	IMPORTANT FUNCTION
a. Mitochondria	k. Synthesis of food
b. Ribosomes	l. Storage of genetic information
c. Lysosomes	m. Aerobic oxidation of NADH
d. Chloroplast	n. Translation
e. Nucleus	o. Phagocytosis

- 1) a-m, b-n, c-o, d-k, e-l 2) a-l, b-o, c-k, d-n, e-m 3) a-l, b-o, c-k, d-m, e-n 4) a-m, b-n, c-k, d-o, e-l
16. Plastids that are specialized to store reserve food in the form of lipids are called
 1) Aleuroplasts 2) Amyloplasts 3) Elaeoplasts 4) Chromoplasts
17. Mitochondria are present in
 1) Only plant cells 2) Only animal cells 3) All types of living cells 4) All eukaryotic cells
18. This organelle of the cell is associated with phagocytosis:
 1) Lysosome 2) Ribosome 3) ER 4) Flagellum
19. This part of a chromosome prevents it from joining another chromosome:
 1) Kinetochore 2) Primary constriction 3) Satellite 4) Telomere

BIOMOLECULES

Composition of protoplasm

Primary metabolites & secondary metabolites

Carbohydrates – Monosaccharides, disaccharides and polysaccharides

Proteins – polypeptides (polymers of amino acids) – primary structure, secondary structure, tertiary structure and quaternary structure; simple and conjugate proteins

Nucleic acids (DNA and RNA) – polymers of nucleotides (phosphate+ nucleoside [pentose sugar+nitrogen base])

Enzymes – Definition

Enzymes and their active sites

Enzymes & activation energy

Enzymes are reaction specific

Enzymes are substrate specific

Enzymes in relation to temperature and pH

Enzymes and inhibition

Classification of enzymes

20. Which of the following biomolecules does have a phosphodiester bond?
 - i. 1) Nucleic acids in a nucleotide
 - 2) Fatty acids in a diglyceride
 - ii. 3) Monosaccharides in a polysaccharide
 - 4) Amino acids in a polypeptide
21. The chitinous exoskeleton of arthropods is formed by the polymerization of
 - 1) lipoglycans
 - 2) Keratin sulphate and chondroitin sulphate
 - 3) d-glucosamine
 - 4) N-acetyl glucosamine
22. Which one of the following is non-reducing carbohydrate?
 - 1) Maltose
 - 2) Sucrose
 - 3) Lactose
 - 4) Ribose 5-phosphate
23. Identify the nitrogen containing compound among the following:
 - 1) Ribose
 - 2) Cellulose
 - 3) Pectin
 - 4) Serine
24. Which of the following is the simplest and smallest of sugars?
 - 1) Lactose
 - 2) Erythrose
 - 3) Ribose
 - 4) Galactose
25. What is not true about amino acids?
 - a. They are monomers of polypeptides
 - 2) They exist in great variety
 - 3) They have at least one asymmetric carbon atom
 - 4) They do not have alkaline properties.
26. Normally an enzyme cannot
 - a. Accelerate a reaction
 - 2) Act upon only one substrate
 - 3) Catalyze different types of reactions
 - 4) Function when it is in contact with a substrate.
27. Which of the following reactions of enzymes could be called hydrolytic?
 - a. Addition of phosphate to ADP
 - 2) Transfer of amino group from glutamic acid to oxalo-acetic acid.
 - 3) Conversion of glucose to maltose
 - 4) Conversion of maltose to glucose.
28. Which of the following is not a protein by nature?
 - 1) Insulin
 - 2) Ptyalin
 - 3) Alanine
 - 4) Actin
29. The secondary structure of protein refers to
 - a. The alpha helix
 - 2) The shape of the polypeptide
 - 3) Amino acid sequence
 - 4) Presence of other attachments to the polypeptide.
30. Macromolecule chitin is
 - 1) Nitrogen containing polysaccharide
 - 2) Phosphorus containing polysaccharide
 - 3) Sulphur polysaccharide
 - 4) Simple polysaccharide
31. The essential chemical components of many enzymes are
 - 1) Proteins
 - 2) Nucleic acids
 - 3) Carbohydrates
 - 4) Vitamins
32. Peptidoglycans are polymers made up of -----.
 - a. Sugars and amino acids
 - 2) Sugars and amino-sugars
 - 3) Aminosugars and Amino acids
 - 4) Aminosugars and lipids
33. Which of the following cannot be digested to any simpler sugar?
 - 1) maltose
 - 2) sucrose
 - 3) lactose
 - 4) galactose
34. Nucleic acids do not contain this element in them:
 - a. Phosphorus
 - 2) Nitrogen
 - 3) Oxygen
 - 4) Sulphur
35. The primary structure of proteins refers to -----.
 - a. The alpha helix
 - b. The patterns of folding and bending of the chain of amino acids
 - c. The actual arrangement of amino acids to form the polypeptide
 - d. Mode of link with other components like nucleic acids, sugars etc.

CELL CYCLE

Life cycle of a living cell

Interphase and M-phase (Mitotic phase)

Stages of interphase – G₁ (G₀ phase), S and G₂ phases

Stages in M phase – Karyokinesis [Prophase, Metaphase, Anaphase&Telophase] and Cytokinesis.

- During which phase(s) of the cell cycle the amount of DNA in a cell remains at 4C level if the initial amount is denoted as 2C?**
1) G₀ & G₁ 2) G₂ & M 3) G₁ & S 4) Only G₂
- In S phase of cell cycle**
1) Amount of DNA doubles in each cell 2) Amount of DNA remains the same in each cell
3) Chromosome number is increased 4) Amount of DNA is reduced to half in each cell
- The centrosome duplicates during the -----.**
1) S- phase of cell cycle 2) G₁- phase of cell cycle 3) G₂- phase of cell cycle 4) Prophase of cell cycle

CELL DIVISIONS

MITOSIS (somatic or equational cell division)

Interphase

Karyokinesis Prophase, Metaphase, Anaphase & Telophase

Cytokinesis

Aim of mitosis - Growth by increase in number of cells
Repair and healing after injury
Replacement of worn-out cells
Reproduction in unicellular organisms

MEIOSIS (Reduction division)

Meiosis I and II

Each has Interphase, Karyokinesis (Prophase, Metaphase, Anaphase&Telophase) & Cytokinesis

Prophase I of Meiosis

Leptotene

Zygotene

Pachytene

Diplotene

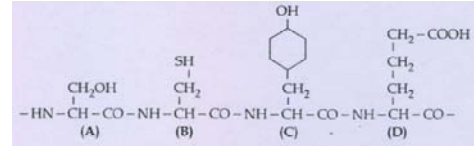
Diakinesis

Aim of meiosis – Reduction of chromosome number from 2n to n
Formation of gametes
Recombination of paternal and maternal characters

- Arrange the following events of meiosis in correct sequence:** a) Crossing over b) Synapsis
c) Terminalization of chiasmata d) Disappearance of nucleolus
1) (b), (c), (d), (a) 2) (b), (a), (d), (c) 3) (b), (a), (c), (d) 4) (a), (b), (c), (d)
- The enzyme recombinase is required at which phase of meiosis?**
1) Pachytene 2) Zygotene 3) Diplotene 4) Diakinesis
- A bivalent of meiosis I consists of**
1) Four chromatids and two centromeres 2) Two chromatids and one centromere
3) Two chromatids and two centromeres 4) Four chromatids and four centromeres.
- Lysosomes are produced by**
1) Golgi complex 2) Mitochondria 3) Endoplasmic reticulum 4) Leucoplasts
- Spot the mismatch between names and events of stages of mitosis:**
1) Anaphase – Polar movement of daughter chromosomes.
2) Telophase – Transformation of chromatin of the nucleus into a set of independent chromosomes.
3) Metaphase – orderly arrangement of duplicated chromosomes along equatorial plate
4) S – Phase – Replication of all DNA of chromosomes
- What is not true about mitotic division in living cells?**
1) Parent cells & daughter cells have the same chromosome number.
2) Centrioles are converted into asters during the process of cell division.
3) Cell plate is formed during mitosis of both plant and animal cells.
4) Centromeres of chromosomes split sometime between metaphase and anaphase.

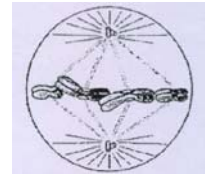
7. What is not true about meiotic division?
- 1) It results in 4 cells at the end of second division
 - 2) Genetic recombination occurs at Pachytene stage
 - 3) Mendelian recombination occurs during Metaphase
 - 4) Meiosis in a cell can repeat if necessary
8. The microscopic view of a living cell shows some stage of cell division. There are two groups of chromosomes separating from each other and moving to opposite poles; each chromosome has two highly condensed chromatids; spindle fibres are gradually becoming short. Therefore the stage of the cell division must be
- 1) Anaphase I of Meiosis
 - 2) Anaphase II of Meiosis
 - 3) Metaphase of Mitosis
 - 4) Anaphase of Mitosis.
9. Pairing of homologous chromosomes to form bivalents begins during this stage of meiotic prophase:
- 1) Zygotene
 - 2) Pachytene
 - 3) Leptotene
 - 4) Diplotene
10. The figure shows a hypothetical tetrapeptide portion of a protein with parts labeled A-D. Which one of the following options is correct?

- 1) A is sulphur containing amino acid methionine
- 2) D is acidic amino acid glutamic acid
- 3) C is aromatic amino acid tryptophan
- 4) A is C-terminal amino acid and D is N-terminal amino acid



11. A stage of mitosis is shown in the diagram. Which stage is it and what are its characteristics?

- 1) Late prophase - chromosomes move to spindle equator
- 2) Metaphase – spindle fibres attach to kinetochores, centromeres split and chromatids separate
- 3) Metaphase - chromosomes move to spindle equator, chromosomes made up of two sister chromatids
- 4) Anaphase – centromeres split, chromatids separate and start moving away



12. What is not true about chiasma during meiosis?
- 1) Every bivalent can show only one chiasma.
 - 2) Chiasma is always formed between non-sister chromatids in a bivalent.
 - 3) Chiasma results in exchange of genetic material between paternal and maternal chromosomes in a bivalent.
 - 4) Chiasma becomes clearly visible during Diplotene stage of meiotic prophase.

13. During Meiosis I, chromosomes start pairing at
- 1) Leptotene
 - 2) Zygotene
 - 3) Pachytene
 - 4) Diplotene

14. One of the following is not true for meiotic division; identify it.

- 1) Chromosome number is halved.
- 2) Genes in chromosomes become reshuffled.
- 3) Paternal and maternal sets of chromosomes are rearranged.
- 4) A cell in an organism can undergo meiosis any number of times.

15. Identify the stage of the mitotic cell division of a cell when two groups of chromosomes could be seen separating from each other.

- 1) Telophase
- 2) Anaphase
- 3) Metaphase
- 4) Prophase

16. Identify the exact stage of meiotic division when actual reduction of chromosome number from diploid to haploid takes place:

- 1) prophase of meiosis I
- 2) metaphase of meiosis I
- 3) anaphase of meiosis I
- 4) anaphase of meiosis II

17. Identify the statement that is wrong:

- 1) meiosis results in reduced chromosome number in daughter cells
- 2) meiosis usually results in four cells
- 3) cells derived by meiotic division are genetically dissimilar
- 4) meiosis results in gamete formation in most plants

18. What is not true about chiasma during meiosis?

- 1) Every bivalent can show only one chiasma.
- 2) Chiasma is always formed between non-sister chromatids in a bivalent.
- 3) Chiasma results in exchange of genetic material between paternal and maternal chromosomes in a bivalent.
- 4) Chiasma becomes clearly visible during Diplotene stage of meiotic prophase.

19. In which of the following stages of cell division, there would be only one chromatid for every chromosome?

- 1) Metaphase of Meiosis I
- 2) Metaphase of Mitosis
- 3) Anaphase of Mitosis
- 4) Anaphase of Meiosis I

20. Match the names of stages of prophase of meiosis-1 with the list of important events in it and select the correct matching:

STAGE	IMPORTANT CHANGE
a. Leptotene	k. Pairing of homologous chromosomes
b. Diakinesis	l. Beginning of crossing over
c. Pachytene	m. Homologous chromosomes start separating
d. Diplotene	n. Chromosomes make their appearance
e. Zygotene	o. Chiasma clearly formed and visible.

1) a-n, b-o, c-l, d-m, e-k. 2) a-o, b-l, c-m, d-k, e-n. 3) a-l, b-m, c-k, d-n, e-o. 4) a-n, b-m, c-l, d-o, e-k.

Compiled by Dr. B. Shivashankar
Retd. HOD of Botany, The National College,
Basavanagudi, Bengaluru-560004