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ASSIGNMENT-7

INNOVATIVE TECHNOLOGY & BIO-SCIENCES

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SECTION 'C'; SR : 72.
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Q1. Differences between prokaryotic & eukaryotic cell ?

FEATURE	PROKARYOTIC	EUKARYOTIC
Cell membrane	complex cell membrane + cell wall + glycocalyx (slime/ capsule)	cell membrane (animals) cell membrane + wall (plants) microfilaments.
Nuclear membrane	Naked genetic material	Nuclear membrane enclosing genetic material.
Genetic Material	Genomic DNA (single chromosome) + some bacteria contain plasmid DNA communicates directly with cytoplasm. Supercoiled DNA.	Genomic DNA (multiple chromosomes) DNA communicates indirectly via nuclear pores & ER. Histone coiled DNA
Organelles	Non except non membranous ribosomes	various specialised membrane bound organelles like mitochondria, ER etc.
Spl.	Characteristic mesosomes: (extensions of plasma membrane)	None.
Storage	Inclusion Bodies	Membranous vacuoles.
Size	Smaller in size Bacteria 1-2 µm PPLO 0.3 µm Mycoplasma 0.1 µm Blue green Algae	Larger in size RBC 7 µm WBC 10-20 µm.
Reproduction	Generally Binary fission, fast.	Mitosis, slow
Shape	Extensions of cell wall Flagella, fimbrae, pilli Bacillus (rod like) Coccus (spherical) vibrio (comma) spirillum (spiral)	RBC (round, biconcave) WBC (Amoeboid) Nerve cell (branched, long) Tracheid (elongated) Mesophyll (round, oval)

Q2 what are the different stages of prophase 1 of meiosis 1?

1. LEPTOTENE

During this stage the chromosomes become gradually visible. The compaction of chromosomes continues throughout leptotene.

2. ZYGOTENE

Chromosomes start pairing together and this process of association is called synapsis. Such paired chromosomes are called homologous chromosomes. Chromosone synapsis is accompanied by formation of complex called synaptonemal complex. The complex formed by a pair of synapsed homologous chromosomes is called a bivalent or a tetrad.

3. PACHYTENE

Bivalent chromosomes now clearly appear as tetrads. This stage is characterised by the appearance of recombination nodules, the sites at which crossing over occurs between non-sister chromids of the homologous chromosomes. Crossing over is an enzyme mediated process by recombinase. Crossing over leads to recombination of genetic material on the two chromosomes. Recombination b/w homologous chromosomes is completed by the end of pachytene, leaving the chromosomes linked at the sites of crossing over.

4. DIPLOTENE

The beginning of diplotene is recognised by dissolution of the synaptonemal complex & the tendency of the recombined homologous chromosomes of the bivalents to separate from each other except at sites of cross overs. These x shaped structures, are called chiasmata. In oocytes of some vertebrates, deplotene can last for months or years.

5. DIKINESIS

This is marked by the terminalisation of chismata. During this phase, the chromosomes are completely condensed and the meiotic spindle is assembled to prepare the homologous chromosomes for separation. By the end of dikinesis, the nucleolus disappears and the nuclear envelope also breaks down. Dikinesis represents trosition to metaphase.

Q3. what are the different functions of carbohydrates?

(i) Energy Production
(ii) Energy Storage
(iii) Building macromolecules
(iv) sparing protein
(v) Lipid Metbolism.

(i) Energy production

The primary goal of carbohydrates is to supply energy to all cells in the body. Many cells prefer glucose as a source of energy versus other compounds like fatty acids. Some cells such as RBC, are able to produce energy only from glucose. The brain is also highly sensitive to low blood glucose because it uses only glucose to produce energy & function.

The energy from glucose comes from the chemical bonds b/w the carbon atoms. cells break these bonds & capture energy by performing cellular respiration. A cell uses many chemical reactions in multiple enzymatic steps to slow the release of energy and more efficiently capture it.

The first stage of breakdown of glucose is Glycolysis, occurs in an intricate series of ten enzymatic reaction steps. The second stage occurs in the energy factory organelles, called mitochondria.

(ii) Energy Storage

In case of glucose surplus, excess glucose is stored as glycogen (majority of which is stored in the muscles & liver). A molecule of glycogen may contain thousands of single glucose units and is highly branched, allowing for the rapid dissemination of glucose when it is needed to make cellular energy.

(iii) Building Macromolecules.

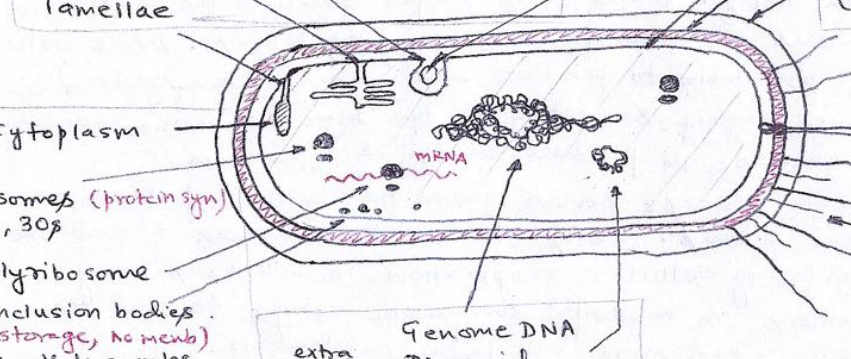
Although most absorbed glucose is used to make energy, some glucose is converted to ribose and deoxyribose, which are essential building blocks of important macromolecules such as RNA, DNA, and ATP. Glucose is Additionally utilised to make molecule NADPH, which is important for protection against oxidative stress and is used in many other reactions in the body. If all the energy, glycogen storing capacity, building needs of the body are met, excess glucose is used to make fat.

(iv) Sparing protein.

In situation where there is not enough glucose to meet the body's needs, glucose is synthesized from amino acids. Because there is ~~not~~ no storage molecule of amino acids, this process requires destruction of proteins, primarily from muscle tissue.

(v) Lipid Metabolism.

A blood glucose levels rise, the use of lipids as an energy source is inhibited. Thus glucose additionally has a fat sparing effect. This is because an increase in blood glucose stimulates release of hormone insulin, which makes cells to use glucose (instead of lipids) to make energy. Adequate glucose level in blood also prevent ketosis.



Extensions of Plasma Memb (Mesosomes)
vesicles
Tubules
lamellae

Mesosome
plasma membrane semipermeable
cell wall : bursting / collapsing
Glycocalyx
(slime / capsule)

Cytoplasm

Ribosomes (protein syn)
50s, 30s

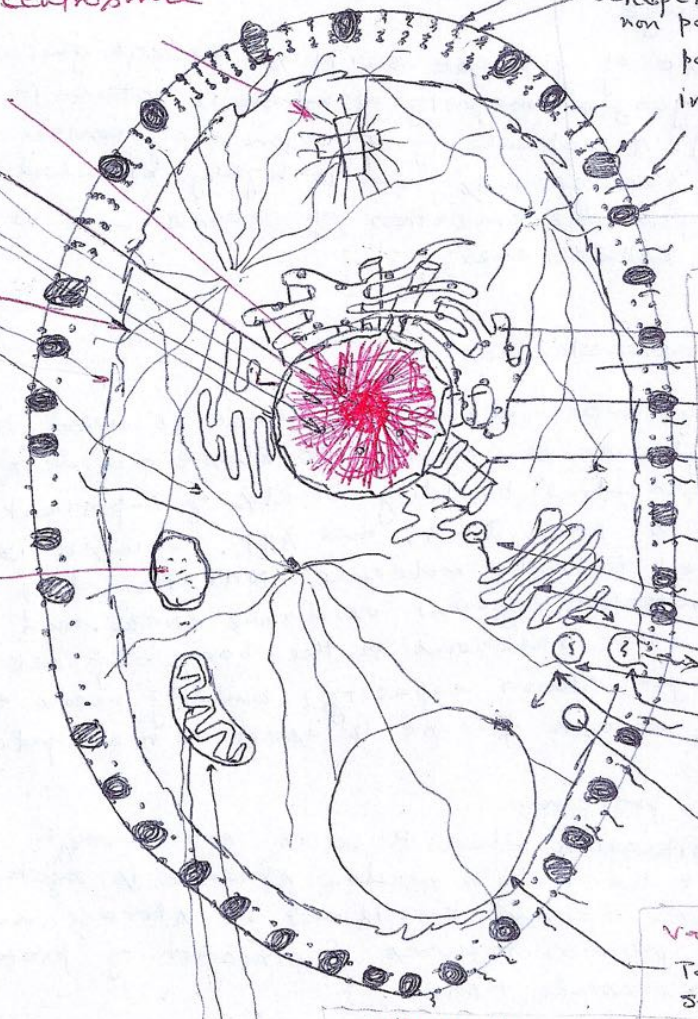
Polyribosome

Inclusion bodies.
(storage, no memb)
phosphate granules
cyanophycean granules
glycogen granules.
Gas vacuoles
(in photosynthetic bac)

Genome DNA
extra circular DNA : Plasmid

Extensions of cell wall
Flagella : Motility
Fimbrae : Attach
Pilli

PROKARYOTIC CELL



Plasma Membrane
Quasifluid Nature
hydrophilic hydrophobic
polar nonpolar
lipid bilayer (Phosphate fatty Acid)
semipermiable
non polar mol: passive (diffusion)
polar mole. : Active transport (Carrier protein)
integral proteins (Nak pump)
peripheral proteins
low to high
erythrocyte 52% protein
40% lipids.

Centrosome

Nucleus
nucleolus
Chromatin
Nuclear pores
Nuclear membrane

cytoskeleton
filaments
microtubules

Endoplasmic Reticulum tubes
luminal compartment
extraluminal compartment
RER (Rough Ribosomes)
protein synthesis
SER (smooth)
lipid synthesis

Lysosomes
hydrolases -
lipases,
proteases,
carbohydrases

Golgi Apparatus
cis face forming face
Cisternal
Trans face maturing face
vesicles. (packed synth. material)
extracellular targets
intracellular targets.
synthesis of
glycoproteins,
glycolipids.
Lysosomes : Hydrolytic

Vacuole
Tonoplast (ions against conc gradient)
store water,
sap,
excretory products etc

Mitochondrion
outer membrane
inner membrane compart 1
compart 2 Matrix
cristae
. Aerobic res. → ATP
divide by fission

EUKARYOTIC CELL (ANIMAL)

X
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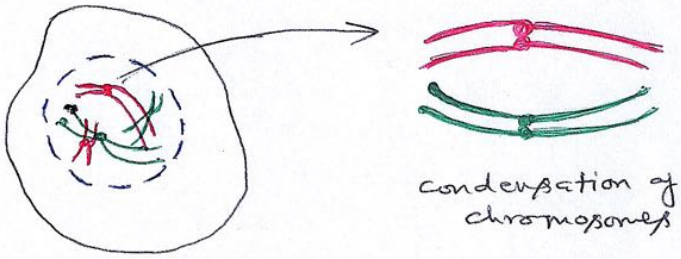
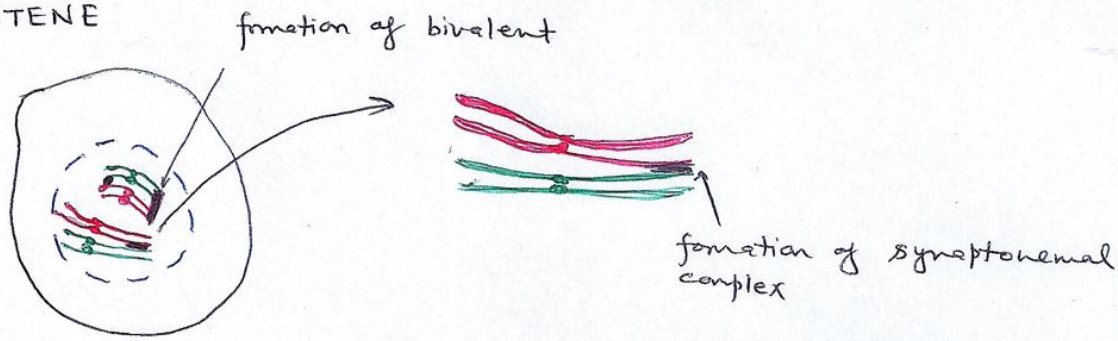
STAGES OF PROPHASE-1

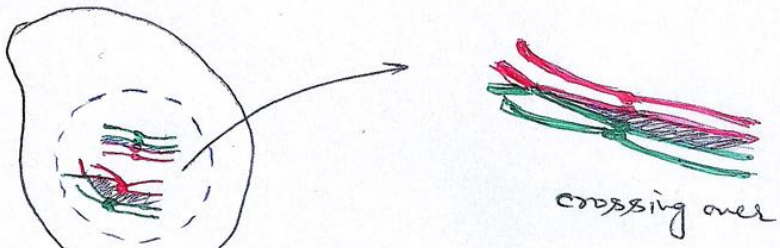
LEPTOTENE



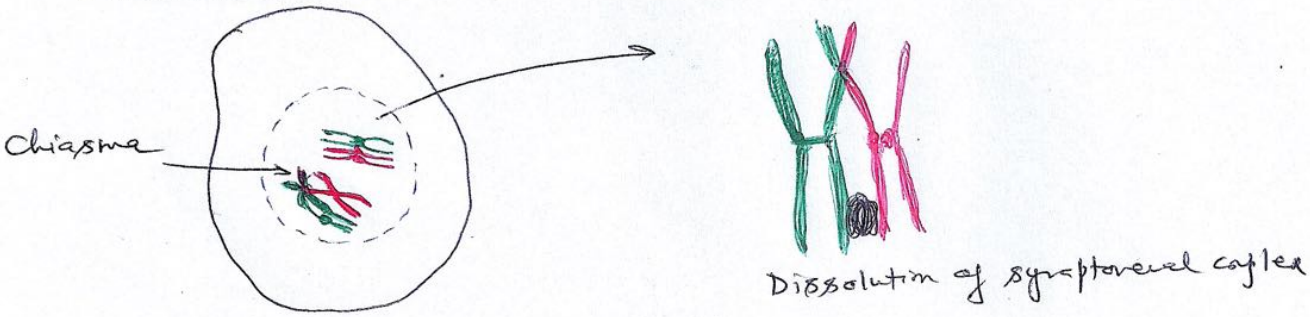
ZYGOTENE



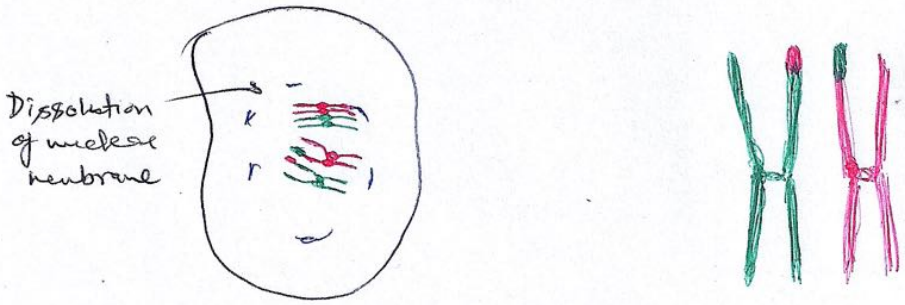
PACHYTENE



DIPLOTENE



DIAKINESIS



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