ST. LAWRENCE HIGH SCHOOL

FOR GOD AND COUNTRY

FIRST TERM EXAMINATION 2018

Sub: BIOLOGICAL SCIENCES **Class: XI A2** **F. M.: 70**

Duration: 3 Hours and 15 minutes **Date: 08.08.2018**

SECTION- I

(All questions are compulsory)

Choose the correct answer: 1 X 14 = 14

1. The unit of classification of living organisms is termed as _____ .
a.Nomenclature b.Taxon c.Systematics d.Phylum
2. Places where wild animals are kept in protected environment are called _____.
a.National Park b.Biosphere reserve c.Zoological parks d.None of these
3. "All cells originate from pre-existing cells"-was proposed by _____.
a.Scleiden b.Schwann c. Virchow d.Camillo
4.Which one of the following is a eukaryote?
a.Mycoplasma b.PPLO c.Yeast d.Bacteria
5.The type of Leucoplast which stores oils & fats is _____.
a.Amyloplast b.Elaioplast c.Aleuroplast d.None of these
6.In a polysaccharide ,monosaccharides are linked by_____ bond.
a.Glucosidic b.Glycosidic c.Peptide d.None of these
7.Any change in the surrounding environment to cause an organism to respond is _____.
a. Defence b.Stimulus c.Irritability d.Paralysis
8.Biological species concept comprises
a.Morphologically indistinct groups of individuals
b.Reproductively isolated groups of individuals
c. Sexually interbreeding population
d.None of these
9.An order is
a.Higher in systematic hierarchy than family
b.Higher in systematic hierarchy than class
c.Lower in systematic hierarchy than class
d. Higher in systematic hierarchy than genus
10.Which of the following structure is not bounded by membrane?
a.Spherosome b.Lysosome c.Mitochondria d.Ribosome
11.Which of the following structure is present in mitochondria?
a.Oxysome b.Polysome c.Dictyosome d.Quantasome
12.Lysosome along with the food contents is called _____.
a.Primary lysosome b.Lomasome c.Glyoxysome d.Secondary lysosome
13.Metaphase chromosome with medial centromere is called_____.
a.Metacentric b.Sub-metacentric c.Acrocentric d.Telocentric

14.DNA synthesis occurs in _____.

a.Interphase b.Prophase c.Metaphase d.Anaphase

SECTION – II

GROUP – A

Answer the following questions (Alternatives to be noted) : (1 X 4 = 4)

1.Where is dyenin found?

Or

Name a semi - autonomous organelle.

2.How many chromosomes does an onion root tip cell has?

3.Give one difference between purine & pyrimidine nitrogenous base.

4.In which category of organisms ,chitin is present in cell wall?

Or

What do you mean by synaptonemal complex?

GROUP – B

Answer the following questions (Alternatives to be noted) : (2 X 5 = 10)

5.Why is mitochondria considered as a semi autonomous organelle?

or

What is a chiasma?

6.What is G_0 stage?

7.What do you mean by a competitive inhibitor?How does it work?(1+1)

Or

Define turnover number of an enzyme.What are isomerases? (1+1)

8.What is hydroponics?

9.Define critical concentration of an essential mineral.

Or

State one function of molybdenum as an essential mineral.

GROUP – C

Answer the following questions (Alternatives to be noted) : (3 X 9 = 27)

10.Write three important characteristic features of Prokaryotic cells.

Or

State the significance of cell cycle.

11.Write three key features of meiotic cell division.

12.Write the steps of catalytic cycle of an enzyme action.

Or

Differetiate between DNA & RNA.

13. State the postulates of cell theory.

14.Differentiate between Gram positive & Gram negative Bacteria.

Or

Explain the concept of Activation energy of enzyme action.

15. Describe the ultrastructure of Nucleus.

16. What is meant by tertiary structure of protein?

Or

What is a plasmid?Name a photosynthetic bacteria.(2+1)

17. Why is a cell called the structural & functional unit of life?

18. What is GERL system?Explain its role.(1+2)

Or

How is a key helpful in the identification and classification of an organism?

GROUP – D

Answer the following questions (Alternatives to be noted) : (5 X 3 = 15)

19. Explain the Fluid Mosaic Model of Cell membrane with a suitable diagram.

Or

Describe the detailed structure of cell wall of a plant cell .

20. Explain the steps involved in the formation of a root nodule with suitable diagram.

Or

Describe the detailed structure of DNA with appropriate diagram.

21.Why meiosis is called a reduction division?Write one feature of each of the stages of meiotic Prophase I: leptotene,zygotene,pachytene,diakinesis.(1+4)

Or

Give five important points of difference between Mitosis & Meiosis supported by diagram.

Debjani Chakraborty 09.08.18.

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SECTION- I

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Choose the correct answer: **(1 X 14 = 14)**

1. b.Taxon
2. c. Zoological parks
3. c. Virchow
4. c.Yeast
5. b.Elaioplast
6. b.Glycosidic
7. b.Stimulus
8. b.Reproductively isolated groups of individuals
9. a.Higher in systematic hierarchy than family & c.Lower in systematic hierarchy than class
10. d.Ribosome
11. a.Oxysome
12. d.Secondary lysosome
13. a.Metacentric
14. a.Interphase

SECTION – II

GROUP – A

Answer the following questions (Alternatives to be noted) : **(1 X 4 = 4)**

1. Dyenin is found near the radial spokes in the A subunit of microtubule.

Or

Mitochondria and chloroplast are semi-autonomous organelles of the cell.

2. Onion root tip has 16 chromosomes in each cell.

3.

Purine Nitrogenous Base	Pyrimidine Nitrogenous Base
a.These are of two types-adenine,guanine. b. Consists of two rings .	a.These are of three types-uracil,thymine & cytocine. b.Consists of a single ring.

4.In Fungi ,the cell wall is made up of chitin.

Or

Synaptonemal complex : In the Zygotene stage of meiotic prophase I the two homologous chromosomes get paired to each other laterally due to formation of nucleoprotein between them forming a supportive frame,known as Synaptonemal complex.

GROUP – B

Answer the following questions (Alternatives to be noted) : (2 X 5 = 10)

5.Mitochondria consists of its own DNA known as the mitochondrial DNA or mtDNA.Its DNA undergoes normal replication process just as the nuclear DNA.As a result it can double itself whenever required ,unlike most other organelles within a cell.But this process of self-doubling or self-replication of mitochondria can only take place under the direction of the nucleus,thus it is not autonomous but semi-autonomous.

Or

Chiasma: During the diplotene stage of meiosis the homologous chromosome of the bivalents start moving away from each other where the chromatids of the different homologues may remain attached at some points.These X shaped points of attachment of the non-sister chromatids are known as chiasma.

6. G_0 stage: Some cells in the adult animals do not appear to exhibit division & many other cells divide only occasionally as needed to replace cells that have been lost because of injury or cell death.These cells that do not divide further exit G_1 to enter an inactive stage called quiescent stage(G_0) of the cell cycle.

7. Competitive inhibitor: When the inhibitor closely resembles to the substrate in its molecular structure & inhibits the activity of the enzyme,it is known as competitive inhibitor.It competes with the substrate for the substrate binding site as a result the substrate cannot bind & the enzyme action declines ,this is competitive inhibition,e.g.,malonate inhibits the action of Succinic dehydrogenase.

Or

Turnover number: The number of molecules of substrate ,converted to product per enzyme per molecule per second is called the turnover number.

Isomerases: These enzymes bring about intramolecular rearrangement of atoms in the molecules & thus form one isomer from another.

Ex: ISOMERASE

Glucose-6-phosphate ⟶ Fructose-6-phosphate

8. Hydroponics: The technique of growing plants in a nutrient solution is called hydroponics.In 1860,Julius Von Sachs demonstrated that plants could be grown to maturity in a defined nutrient solution in complete absence of soil.

9. Critical Concentration: The concentration of an essential element below which plant growth is retarded is termed as critical concentration.Whenever the supply of essential element becomes limited, plant growth is retarded.

Or

Molybdenum: Plants obtain it in the form of molybdate ions (MoO_2^{2-}).It is a component of several enzymes including nitrogenase & nitrate reductase both of which participate in nitrogen metabolism.

GROUP – C

Answer the following questions (Alternatives to be noted) : (3 X 9 = 27)

10.Characteristic features of Prokaryotic cells: a. Hereditary material is not enclosed within a membrane ,the central body of the cell containing DNA is known as nucleoid or genophore.

b.Absence of membrane bound cell organelles.

c.Ribosomes are of 70 S type.

d.Cell wall is made of peptidoglycan or murein.

e.Absence of basic protein Histone.

Or

Significance of cell cycle: a.In multicellular organisms cell cycle leads to reproduction,cell growth,replacement of dead cells.

b.the interphase allows time for synthesis & growth of dividing cells.

c. Properly controlled & regulated cell cycle results in normal & proportionate growth of organisms.

d. Loss of control over cell cycle can lead to cancerous growth.

11.Features of Meiotic cell division: a. The specialized type of cell division that reduces the chromosome number by half results in the formation of haploid daughter cells required for the process of sexual reproduction.

b.It involves pairing of homologous chromosomes & recombination between them which leads to variation.

c.Four haploid cells are formed at the end of meiosis II.

d. Meiosis I is initiated after the parental chromosomes have replicated to produce identical sister chromatids at the S phase.

12. Catalytic cycle of an enzyme action: a. The substrate binds to the active site of an enzyme, fitting into the active site.

b. The binding of the substrate induces the enzyme to alter its shape fitting more tightly around te substrate.

c.The active site of an enzyme in close proximity of the substrate breaks the chemical bond of the substrate & the new enzyme product complex is formed.

d. The enzyme releases the products of the reaction & the free enzyme is ready to bind to another molecule of the substrate & run through the catalytic cycle once again.

Or

DNA	RNA
a.Present in the chromosomes of nucleus. b.DNA is double stranded. c.DNA has a helical orientation. d.Larger in size. e.Pentose sugar is deoxyribose sugar. f. Nitrogenous bases are adenine,guanine,thymine ,cytosine. g.DNA acts as the genetic material.	a.Present mainly in the cytoplasm of the cell. b.RNA is single stranded. c.RNA is linear ususally. d.Smaller in size. e.Pentose sugar is ribose. f. Nitrogenous bases are adenine,guanine,uracil,cytosine. g.RNA helps in the expression of genes in the form of proteins.

13.Postulates of cell theory:Mathias J Schleiden & Theodor Schwann proposed the cell theory.

a.The cell is the structural & functional unit of the living body.

b.The functions performed by an individual organism are the sum total of the functions performed by a cell.

c.All cells originate from pre-existing cells.(Virchow)

d.In unicellular organisms cell divides for reproduction & in multicellular organisms cell divides to provide growth as well as reproduction.

Or

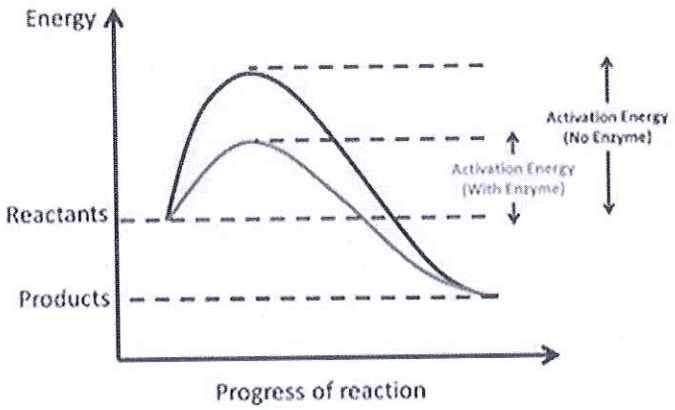
14.

Gram positive bacteria	Gram negative bacteria
a.They retain the crystal violet stain & appear purple violet in colour. b.Cell wall is very thick & contains more mucopeptide. c.pH is more acidic.	a.These bacteria cannot retain the crystal violet stain & can only be stained by safranin.They appear pink. b.Cell wall is thin & contains less mucopeptide. c.Less acidic.

Or

Activation energy of enzyme action: In biochemical processes, molecules similarly require energy in order to start a reaction. For example, molecules need to have some kinetic energy, or velocity, to collide with other molecules to initiate a reaction. If the collisions don't happen often or don't have enough kinetic energy, no reaction will take place. The energy required to start a reaction is called the activation energy.

Reactants and products have specific energies. In order to transform the reactants into products, the reactants would have to go through a transition state which is usually higher in energy. To get to this transition state, the system requires the activation energy. Finally, the products reduce their energy to arrive to the final product state. Reactants have higher energy than products. The energy of the reactants increase and then decrease to the final product energy. The energy required to achieve the intermediate state is the activation energy of the reaction.



15. Ultrastructure of Nucleus: Nucleus: The cell organelle discovered by Robert Brown. It has primarily four parts:

<u>Nuclear membrane:</u> This is a parallel double membrane structure consisting of the outer & the inner membrane with a space of 10-50 nm called the perinuclear space.It forms a barrier.The outer memebrane is continuous with the endoplasmic reticulum with

ribosomes on them.Nuclear envelope is interrupted by nuclear pore complex at certain places.Molecules like RNA & proteins can pass through this pore.

Nucleoplasm: The matrix of the nucleus is called the nucleoplasm containing nucleolus & chromatin.

Nucleolus :These are spherical structures present in the nucleoplasm.It is not a membrane bound structure which is the site for active ribosomal RNA synthesis.Some larger nucleoli carry out protein synthesis partially.

Nuclear chromatin material: Thread like Chromatin materials carrying genetic information remain diffused in the nucleoplasm, & just before cell division they condense & coil around each other tightly forming thick rod like structures.

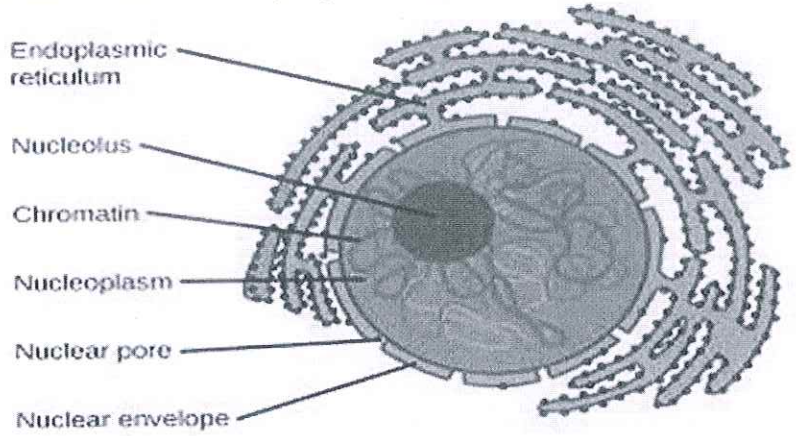


FIGURE:NUCLEUS

16.TERTIARY STRUCTURE OF PROTEINS:The long protein chain is also folded upon itself like a hollow woolen ball giving rise to the tertiary structure. This gives a 3-Dimentional structure of a protein consisting of the Hydrogen bonds & disulphide bonds.

17.Plasmid is the extra chromosomal ,circular DNA present in the cytoplasm of the bacterial cells.They are used in the laboratory for manipulation of genes.

Purple & green bacteria, cyanobacteria are examples of photosynthetic bacteria.

18.GERL system: It comprises of Golgi Complex, Endoplasmic reticulum & lysosome.

These organelles work together for a set of functions like synthesis, processing ,packaging ,modification and storage or secretion of proteins.

OR

The keys are based on the contrasting characters in a pair of couplet. It represents the choice made between two opposite options. This results in acceptance of only one & rejection of others.

GROUP – D

Answer the following questions (Alternatives to be noted) : (5 X 3 = 15)

19. Fluid Mosaic Model of Cell membrane :i. This model was proposed by Singer & Nicolson.

ii. According to this model the quasi fluid nature of lipid enables lateral movement of proteins within the overall bilayer.This ability ability to move within the membrane is measured as its fluidity.

iii. Presence of lipid bilayer which is interrupted by several globular proteins.

iv.The proteins which lie on the outer surface of the bilayer that is on the ECF surface are called peripheral proteins .There are certain proteins which span the entire depth of the lipid bilayer called transmembrane proteins.

v.Cholesterol molecules are seldom present in between the phospholipid molecules.

vi.Carbohydrate chains reamin attached with the phospholipid molecule & protein globules called glycolipid & glycoprotein .

OR

Cell wall of a plant cell : A cell wall is a structural layer surrounding some types of cells, just outside the cell membrane. It can be tough, flexible, and sometimes rigid. It provides the cell with both structural support and protection, and also acts as a filtering mechanism. Cell walls are present in most prokaryotes (except mycoplasma bacteria), in algae, plants and fungi but rarely in other eukaryotes including animals. A major function is to act as pressure vessels, preventing over-expansion of the cell when water enters.

The composition of cell walls varies between species and may depend on cell type and developmental stage. The primary cell wall of land plants is composed of the polysaccharides cellulose, hemicelluloses and pectin. Often, other polymers such as lignin, suberin or cutin are anchored to or embedded in plant cell walls. Algae possess cell walls made of glycoproteins and polysaccharides such as carrageenan and agar that are absent from land plants. In bacteria, the cell wall is composed of peptidoglycan.

Three strata or layers may be found in plant cell walls:

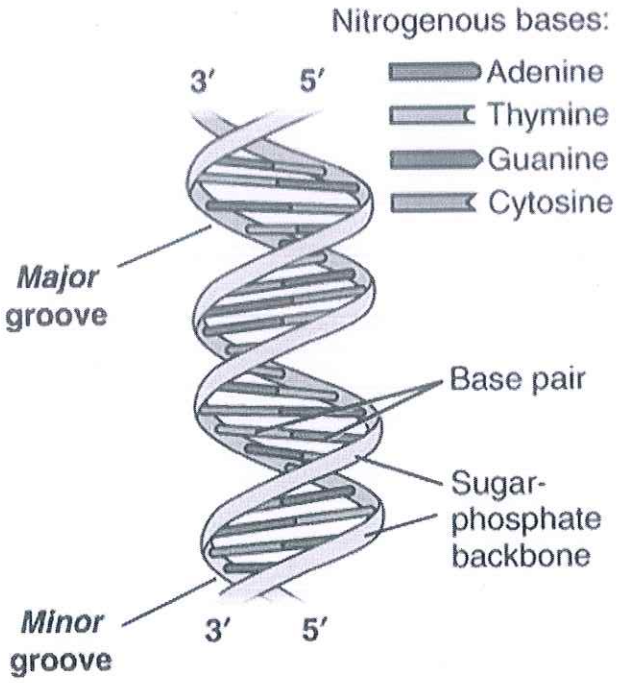
- The primary cell wall, generally a thin, flexible and extensible layer formed while the cell is growing.
- The secondary cell wall, a thick layer formed inside the primary cell wall after the cell is fully grown. It is not found in all cell types. Some cells, such as the conducting cells in xylem, possess a secondary wall containing lignin, which strengthens and waterproofs the wall.
- The middle lamella, a layer rich in pectins. This outermost layer forms the interface between adjacent plant cells and glues them together.

20. Root nodules occur on the roots of plants (primarily Fabaceae) that associate with symbiotic nitrogen-fixing bacteria. Under nitrogen-limiting conditions, capable plants form a symbiotic relationship with a host-specific strain of bacteria known as rhizobia. Within legume nodules, nitrogen gas from the atmosphere is converted into ammonia, which is then assimilated into amino acids (the building blocks of proteins), nucleotides (the building blocks of DNA and RNA as well as the important energy molecule ATP), and other cellular constituents such as vitamins, flavones, and hormones. Their ability to fix gaseous nitrogen makes legumes an ideal agricultural organism as their requirement for nitrogen fertilizer is reduced.Legumes release compounds called flavonoids from their roots, which trigger the production of nod factors by the bacteria. When the nod factor is sensed by the root, a number of biochemical and morphological changes happen: cell division is triggered in the root to create the nodule, and the root hair growth is redirected to wind around the bacteria multiple times until it fully encapsulates one or more bacteria. The bacteria encapsulated divide multiple times.The bacteria enter the developing nodule through a structure called an infection thread, which grows through the root hair into the basal part of the epidermis cell, and onwards into the root cortex; they are then surrounded by a plant-derived membrane and differentiate into bacteroids that fix nitrogen. Nodulation is controlled by a variety of processes, both external (heat, acidic soils, drought, nitrate) and internal (autoregulation of nodulation, ethylene). Autoregulation of nodulation controls nodule numbers per plant through a systemic process involving the leaf. Leaf tissue senses the early nodulation events in the root through an unknown chemical signal, then restricts further nodule development in newly developing root tissue.

OR

Deoxyribonucleic acid is a molecule composed of two chains (made of nucleotides) which coil around each other to form a double helix carrying the genetic instructions used in the growth, development, functioning and reproduction of all known living organisms and many viruses. The two DNA strands are also known as polynucleotides since they are composed of simpler monomeric units called nucleotides.Each nucleotide is composed of one of four nitrogen-containing nucleobases (cytosine [C], guanine [G], adenine [A] or thymine [T]), a sugar called deoxyribose, and a phosphate group. The nucleotides are joined to one another in a chain by covalent bonds between the sugar of one nucleotide and the phosphate of the next, resulting in an alternating sugar-phosphate backbone. The nitrogenous bases of the two separate polynucleotide strands are bound together, according to base pairing rules (A with T and C with G), with hydrogen bonds to make double-stranded DNA.

The complementary nitrogenous bases are divided into two groups, pyrimidines and purines. In DNA, the pyrimidines are thymine and cytosine; the purines are adenine and guanine.



21.

Meiosis is considered to be a reduction division as in Meiosis I as the chromosome number is reduced to half from the diploid parent cell.

Leptotene: The first stage of prophase I is the *leptotene* stage, also known as *leptonema*, from Greek words meaning "thin threads".In this stage of prophase I, individual chromosomes—each consisting of two sister chromatids—become "individualized" to form visible strands within the nucleus.The two sister chromatids closely associate and are visually indistinguishable from one another. During leptotene, lateral elements of the synaptonemal complex assemble. Leptotene is of very short duration and progressive condensation and coiling of chromosome fibers takes place.

Zygotene: The zygotene stage, also known as zygonema, from Greek words meaning "paired threads",occurs as the chromosomes approximately line up with each other into homologous chromosome pairs. In some organisms, this is called the bouquet stage because of the way the telomeres cluster at one end of the nucleus. At this stage, the synapsis (pairing/coming together) of homologous chromosomes takes place, facilitated by assembly of central element of the synaptonemal complex.

Pachytene: The *pachytene* stage also known as pachynema, from Greek words meaning "thick threads".At this point a tetrad of the chromosomes has formed known as a bivalent. This is the stage when homologous recombination, including chromosomal crossover (crossing over), occurs. Nonsister chromatids of homologous chromosomes may exchange segments over regions of homology. Sex chromosomes, however, are not wholly identical, and only exchange information over a small region of homology. At the sites where exchange happens, chiasmata form. The exchange of information between the non-sister chromatids results in a recombination of information.

Diakinesis : Chromosomes condense further during the diakinesis stage, from Greek words meaning "moving through".This is the first point in meiosis where the four parts of the tetrads are actually visible. Sites of crossing over entangle together, effectively

overlapping, making chiasmata clearly visible. Other than this observation, the rest of the stage closely resembles prometaphase of mitosis; the nucleoli disappear, the nuclear membrane disintegrates into vesicles, and the meiotic spindle begins to form.

OR

MITOSIS	MEIOSIS
a.It takes place in somatic cells. b.Cells undergoing mitosis may be haploid or diploid. c.It produces two daughter cells. d.Number of chromosomes remain the same. e.No variations are introduced.	a.It takes place in germ cells. b.Cells are always diploid. c.It gives rise to four daughter cells. d. Number of chromosomes is halved. e.It introduces variation.