



# ST. LAWRENCE HIGH SCHOOL



## A JESUIT CHRISTIAN MINORITY INSTITUTION FIRST TERM EXAMINATION- 2019

Sub: Biological Science  
Duration: 3hrs 15mins

Class: XI A2

F. M.-70  
Date:09.08.2019

### SOLUTION

### SECTION I

(All questions are compulsory)

Choose the correct answer:

(1x14=14)

- Which of the following is not a Mollusc?  
a. *Pinctada*                      b. *Echinus*                      c. Cuttlefish                      d. Devil fish
- Spongin fibres are present in the organisms belonging to phylum \_\_\_\_\_.  
a. Cnidaria                      b. Ctenophora                      c. Porifera                      d. None of these
- Which of the following has Electric Organs ?  
a. *Trygon*                      b. *Torpedo*                      c. *Exocoetus*                      d. *Myxine*
- Types of cell junctions which help to stop substances from leaking across a tissue is \_\_\_\_\_.  
a. Gap junction                      b. Adhering junction                      c. Tight junction                      d. Desmosomes
- The type of connective tissue which contains mast cell is \_\_\_\_\_.  
a. Adipose tissue                      b. Areolar tissue                      c. Loose connective tissue                      d. All of these
- The sclerites covering the ventral surface of the thorax of Cockroach is called \_\_\_\_\_.  
a. Tergum                      b. Sternum                      c. both a & b                      d. None of these.
- Which is the type of DNA present in Chloroplast?  
a. Linear DNA                      b. Linear DNA with histone                      c. Circular DNA                      d. a & c
- The type of leucoplast which stores carbohydrates are called \_\_\_\_\_.  
a. Elaioplast                      b. Aleuroplast                      c. Oleosome                      d. Amyloplast
- The most abundant protein in the biosphere is \_\_\_\_\_.  
a. Collagen                      b. RuBisCO                      c. Elastin                      d. Both a & b
- The Phosphodiester bond in DNA is formed in  
a. 5' to 3' direction in both strands                      b. 5' to 3' in one of the strands  
c. 3' to 5' in both strands                      d. Both a & b
- Which of the following is true?  
a. Extreme low temperature makes enzyme more active                      b. Increase in temperature causes increase in enzyme activity  
c. Enzyme activity is maximum at optimum temperature                      d. Both b & c
- Backbone of the DNA is formed by the  
a. Sugar-phosphate-sugar                      b. Sugar-phosphate-base                      c. Both a & b                      d. None of these
- The duration of which phase of cell cycle is maximum?  
a. G<sub>1</sub>                      b. S                      c. G<sub>2</sub>                      d. M
- Interphase is present between  
a. two subsequent mitosis                      b. Mitosis & subsequent Meiosis                      c. Meiosis I & II                      d. None

**SECTION II**

**GROUP A**

**Answer the following questions ( Alternatives to be noted):**

**(1x4=4)**

**1. What is Radula?**

*Radula is the mouth of the Molluscs contains a file like rasping organ which helps the organism in feeding.*

**Or**

**Which animal phylum has the characteristic feature of the presence of Comb plates?**

*Organisms belonging to phylum Ctenophora has Comb plates.*

**2. State the structural difference between Deoxyribose & Ribose sugar.**

*Deoxyribose sugar has one oxygen atom attached to the 2' carbon whereas Ribose sugar has OH group attached to the 2' carbon .*

**3. Name the part of Cockroach which acts as the tongue.**

*Hypopharynx*

**4. Define Polyribosome.**

*Scattered ribosomes present in the cell cytoplasm align themselves in a chain like fashion forming the seat for protein synthesis, are called Polyribosome.*

**Or**

**What is the difference between Chromatin & Chromosome?**

*Chromatin is the diffused hydrated thread like genetic material present in the nucleus of a cell whereas Chromosome is the tightly coiled, dehydrated rod shaped structural form of chromatin just before cell division.*

**GROUP B**

**Answer the following questions (Alternatives to be noted):**

**(2X5=10)**

**5. What is Axoneme?**

*Axoneme is the core of the cilia & flagellum possessing a number of microtubules running parallel to the long axis containing nine pairs of doublets of radially arranged peripheral microtubules & a centrally arranged microtubule forming 9+2 array.*

**Or**

**Why is Chloroplast called a semi-autonomous organelle?**

*Chloroplasts are called semi autonomous organelles because they have their own DNA. And this DNA codes for some proteins used by the chloroplast. Moreover, they can generate their own energy and do not necessarily need the cell. But their replication is controlled by the cell.*

**6. What is the difference between Prometaphase & Metaphase?**

PROMETAPHASE	METAPHASE
<i>1. Condensation of chromatin is almost over. 2. The chromosomes though attached with the spindle at their centromeres, are trying to align themselves at the metaphase plate.</i>	<i>1. Condensation of chromatin to form chromosome is complete. 2. The chromosomes have aligned themselves at the metaphase plate.</i>

**7. What is Synaptonemal complex?**

*The synaptonemal complex (SC) is a protein structure that forms between homologous chromosomes during meiosis and is thought to mediate chromosome pairing, synapsis, and recombination.*

Or

**Give an example of Competitive Inhibitor.**

*Inhibition of Succinic dehydrogenase by malonate(competitive inhibitor)which closely resembles the substrate succinate.*

**8.In a Polypeptide chain, which chemical groups are present at the two extreme ends?**

*Chemical groups like  $-NH_2$  (amine)&  $-COOH$  (carboxylic acid)are present at the extreme ends of a polypeptide chain.*

Or

**State the function of the protein GLUT-4.**

*GLUT-4 helps in glucose transport in cell.*

**9. What do you mean by Couplet & Lead of Key?**

*Taxonomical aid called key is based on the contrasting characters which are in pairs called couplets.*

*Each of the statements of a key forming couplet is called lead.*

### GROUP C

**Answer the following questions (Alternatives to be noted):**

**(3X9=27)**

**10. "All vertebrates are chordates but all chordates are not vertebrates"-Justify the statement.**

*All vertebrates consists of a notochord during the embryonic stage which is replaced by a cartilaginous or bony vertebral column in the adult.Thus all vertebrates are chordates but all chordates are not vertebrates in which the notochord doesn't get replaced by a vertebral column.*

**11. What is GERL system? Explain its function.**

**(1+2)**

*Golgi complex,Endoplasmic reticulum & Lysosome together in co-ordination with each other to carry out a set of functions like synthesis ,processing,packaging ,storage & secretion of proteins,thus called GERL system.*

**12. Explain the Structure of Centrioles in brief.**

*Centrosome consists of two perpendicularly arranged cylindrical structures having a cart wheel like organisation made up of nine evenly spaced peripheral fibrils of tubulin protein.,where each adjacent triplet remains linked.The central part is a proteinaceous hub connected with spokes of protein ,The centrioles form the basal body of cilia.*

Or

**Name the membrane of the Vacuole. State two distinct functions of Vacuole. (1+2)**

*Tonoplast.*

*Vacuole stores salts, minerals, nutrients, proteins, pigments, helps in plant growth, and plays an important structural role for the plant. Under optimal conditions, the vacuoles are filled with water to the point that they exert a significant pressure against the cell wall. This helps maintain the structural integrity of the plant, along with the support from the cell wall, and enables the plant cell to grow much larger.*

**13. What are Secondary Metabolites? Give two examples of each of Alkaloids & Polymeric substances.**

**(1+2)**

*Secondary metabolites a large number of specialized compounds that do not aid in the growth and development of plants but are required for the plant to survive in its environment.*

*Alkaloid –Morphine,Codeine*

*Polymeric substance-rubber,gum,cellulose*

**14. Why is cockroach called a Uricotelic animal?**

*The Malpighian tubules absorb the nitrogenous waste products and convert them into uric acid which is excreted out through the hindgut.Thus it is a uricotelic animal.*

Or

**Name the Mouth parts of Cockroach. Give one Structural difference between the Male & Female Cockroach. (2+1)**

*The mouth parts of cockroach consists of –Lbrum, Labium, Maxillae, Mandibles & Hypopharynx*

Male Cockroach	Female cockroach
1. A pair of short, thread like anal style is present.	1. Anal style is absent in female.

**15. Why is the development of *P.americana* considered as paurometabolous? What is Spermatophore? (2+1)**

*The development is called paurometabolous as the larval and pupal stage is skipped and they develop through three stages of egg, nymph, adult.*

*The sperms of male cockroach are stored in the seminal vesicles & are glued together in the form of bundles called spermatophores which are discharged during copulation.*

**16. What is Kinetochore? State its function. (1+2)**

*The trilamellar protein disc shaped structure present in the centromere of chromosomes are called kinetochore.*

*The spindle fibres during cell division get attached to the kinetochores of the centromere of chromosomes and helps in proper anchorage.*

Or

**Name one phospholipid present in the cell membrane. Explain the Zwitterionic form of an amino acid. (1+2)**

*Lecithin.*

*Zwitterionic form of amino acid consists of equal amount of positive and negative charge having the  $\text{NH}_3^+$  &  $\text{COO}^-$  charged groups.*

**17. Explain the formation of the three-dimensional structure of a protein with suitable diagram.**

*The amino acid sequence of a protein determines its three-dimensional shape.*

*Primary structure - the linear sequence of residues (amino acids) in a polypeptide chain.*

*Secondary structure - the arrangement of a polypeptide chain into more or less regular hydrogen-bonded structures -- has two basic elements - Alpha helix & Beta strand -*

*Tertiary structure - the level of protein structure at which an entire polypeptide chain has folded into a three-dimensional structure. In multi-chain proteins, the term tertiary structure applies to the individual chains.*

*Quaternary structure - the fourth order of complexity of structural organization exhibited by protein molecules, and refers to the arrangement in space of the complete protein, without regard to the internal geometry of the subunits. Quaternary structure is possessed only when the molecule is made of at least two subunits that are separable.*

**18. Define active site of an enzyme. What will happen if the gene coding the active site of an enzyme gets mutated?**

*The backbone of the protein chains folds upon itself & criss-crosses itself and make crevices or pockets called active sites where specific substrates bind to cause a possible change.*

*If the gene coding the active site gets mutated, then the amino acids supposed to be formed will not be present at the site and will not have the same conformation of the crevices or the active*

site, thus the substrate will not be able to bind or any other substrate will bind causing an abnormal functioning of the enzyme. (1+2)

Or

**What is the difference between Prosthetic group & Co-factor? What are Ligases? (1+2)**

The non-protein constituents bound to the enzyme to make the enzyme more active catalytically are called co-factors and if the co-factor is an organic molecule or group, then it is called prosthetic group. Ligases-Enzymes catalysing the linking together of two compounds by forming C-O, C-N, C-S bonds. Example-DNA ligase.

#### GROUP D

**Answer the following questions (Alternatives to be noted):**

**(5X3=15)**

**19. What do you mean by Terminalisation of Chiasmata? State the important features of Meiosis.**

Or

**(2+3)**

At the end of crossing over between the non sister chromatids of homologous chromosomes the x-shaped chiasma either meet at the centre or slip off the two ends of the chromosome ending with the recombination process, called terminalisation of chiasmata.

Meiosis – Meiosis results in formation of four daughter cells from a single mother cell in each cycle of cell division. In other words, the nuclei divide twice in each cell cycle.

2. Daughter cells are identical to mother cell in shape and size but different in chromosome composition. The daughter cells have haploid chromosome number. The chromosome types also differ in daughter cells due to segregation and recombination.

3. Meiosis occurs in reproductive organs like anthers and ovaries and leads to the production of gametes or spores.

4. The complete process of meiosis consists of two types of division. The first division results in reduction of chromosome number to half and is called reductional division. The second division is like mitotic division.

Or

**If initially a cell contains 2n number of chromosome and amount of DNA is 2C, what will be the possible change after S phase of cell cycle? State one important feature of the following:**

**Pachytene, Zygotene & Diplotene**

**(2+3)**

After S PHASE of cell cycle the DNA becomes 4C but the number of chromosome remains 2n.

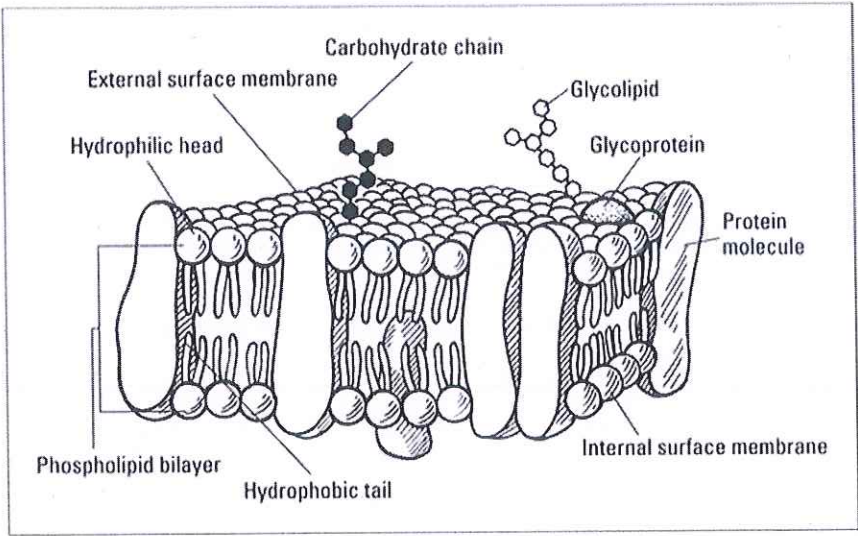
Pachytene – Crossing over takes place between the non-sister chromatids of homologous chromosomes.

Zygotene- The homologous chromosome starts pairing together causing synapsis with the help of synaptonemal complex.

Diplotene- Dissolution of synaptonemal complex takes place and the recombined homologous chromosomes tend to separate.

**20. Explain the Fluid Mosaic Model of cell membrane with a suitable diagram.**

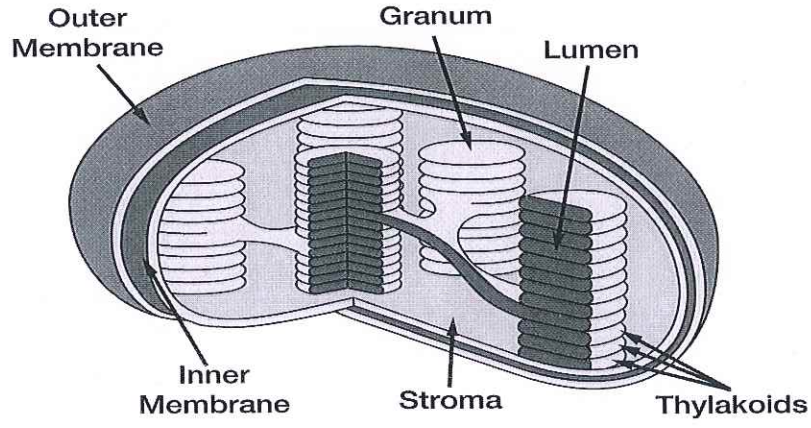
The fluid mosaic model explains various observations regarding the structure of functional cell membranes. According to this biological model there is a lipid bilayer (two molecules thick layer) in which protein molecules are embedded. The lipid bilayer gives fluidity and elasticity to the membrane. Small amounts of carbohydrates are also found in the cell membrane. The biological model, which was devised by S.J. Singer and G. L. Nicolson in 1972, describes the cell membrane as a two-dimensional liquid that restricts the lateral diffusion of membrane components. Such domains are defined by the existence of regions within the membrane with special lipid and protein cocoon that promote the formation of lipid rafts or protein and glycoprotein complexes.



**Explain the structure of Chloroplast with a suitable diagram.**

All chloroplasts have at least three membrane systems—the outer chloroplast membrane, the inner chloroplast membrane, and the thylakoid system. Chloroplasts that are the product of secondary endosymbiosis may have additional membranes surrounding these three. Inside the outer and inner chloroplast membranes is the chloroplast stroma, a semi-gel-like fluid that makes up much of a chloroplast's volume, and in which the thylakoid system floats. The chloroplast double membrane is also often compared to the mitochondrial double membrane. This is not a valid comparison—the inner mitochondria membrane is used to run proton pumps and carry out oxidative phosphorylation across to generate ATP energy. The only chloroplast structure that can be considered analogous to it is the internal thylakoid system.

**Chloroplast**



**21. Differentiate between Chondrichthyes & Osteichthyes. Name the three distinct body parts of Hemichordates.**

(3+2)

Characteristics	Chondrichthyes	Osteichthyes
Endoskeleton	Commonly known as cartilaginous fish as they have cartilaginous endoskeleton	Commonly known as bony fish as they have bony endoskeleton

Body size	Large-sized fish	Comparatively smaller in size
Mouth position	Ventral	Terminal (anterior)
Type of scale present on skin	Placoid scales	Scales absent, if present, cycloid scales
Number of gills present	5-7 pairs of gills, not covered by operculum	4 pairs of gills, covered by operculum
Caudal fin	Heterocercal	Homocercal
Excretory waste	Urea	Ammonia

*Proboscis, collar & trunk are the three distinct parts of Hemichordates.*

**Or**

**Write four characteristic features of Phylum Echinodermata. What are metameres? (4+1)**

*Characteristic Features of Phylum Echinodermata*

- *These are exclusively marine animals & the larval forms show bilateral symmetry and adult forms show pentamerous radial symmetry.*
- *They are triploblastic, exhibits organ system grade of organisation.*
- *They have a true coelom & the body is uniquely shaped. It can star like, elongated or spherical.*
- *The body surface is covered with calcareous spicules.*
- *Body cavity has the distinguishing water vascular system with Tube feet for locomotion.*
- *Respiration occurs through tube feet and gills.*
- *Sexes are separate & Fertilisation is external.*

**Metameres:** *serial repetition of unit subdivisions of ectoderm and mesoderm products. Endoderm is not involved in metamerism. Metamerism is far more important biologically since it results in metameres - also called somites - that play a critical role in advanced and is a characteristic feature of annelids.*