Answer key

QP code 67020 Dated: 6.5.2018

FYB.Sc. Life Sciences

Sem II Paper I

Q.1 A. Fill in the blanks **7M**

1. Smooth endoplasmic reticulum

2. signal recognition protein

3. Pitcher

4. autolysis

5. phagocytosis

6. tonofilaments

7. 70S

B) Match the columns: **(07)**

Column A	**Column B**
a) Chlorobium chlorophyll	i) Glyoxysomes
b) Beta oxidation	ii) Pachytene
c) $NADPH_2$	iii) Phaeoplast
d) Synapsis	iv) Yellow colour
e) Fucoxanthin	v) Photosynthetic bacteria
f) Xanthophyll	vi) Zygotene
g) Crossing over	vii) Ferrodoxin

Ans: a)-v), b)- i), c)-vii), d)- vi), e)- iii), f)- iv), g)- ii)

C. Define:

1. Salting in and salting out

Salting-in is the effect when adding a salt to a solvent containing an organic solute increases the solubility of that solute.

Salting-out is the effect when adding a salt to a solvent containing an organic solute reduces the solubility of that solute.

2. **Derived lipids**. **Derived lipids** are the substances**derived** from simple and compound **lipids** by hydrolysis. These includes fatty acids , alcohols , monoglycerides and diglycerides , steroids , terpenes, carotenoids .

3. Cholesterol - The most common type of steroid in the body. Cholesterol has a reputation for being associated with an increased risk for heart and blood vessel disease. However, cholesterol is essential to the formation of bile acids, vitamin D, progesterone, estrogens (estradiol, estrone, estriol), androgens (androsterone, testosterone), mineralocorticoid hormones (aldosterone, corticosterone), and glucocorticoid hormones (cortisol). Cholesterol is also necessary to the normal permeability and function of the membranes that surround cells. A diet high in saturated fats tends to increase blood cholesterol levels, whereas a diet high in unsaturated fats tends to lower blood cholesterol

levels. Although some cholesterol is obtained from the diet, most cholesterol is made in the liver and other tissues. The treatment of elevated cholesterol involves not only diet but also weight loss, regular exercise, and medications.

4. Nucleotide - a compound consisting of a nucleoside linked to a phosphate group. Nucleotides form the basic structural unit of nucleic acids such as DNA.

5. Mobile phase in chromatography

In **paper chromatography**, substances are distributed between a stationary **phase** and a **mobile phase**. The stationary **phase** is the water trapped between the cellulose fibers of the **paper**. The **mobile phase** is a developing solution that travels up the stationary **phase**, carrying the samples with it.

6. DNA - deoxyribonucleic acid, a self-replicating material which is present in nearly all living organisms as the main constituent of chromosomes. It is the carrier of genetic information.

Q. 2. A. 1. Define lipids. Give detailed account on their functions in living organisms

Lipids- any of a class of organic compounds that are fatty acids or their derivatives and are insoluble in water but soluble in organic solvents. They include many natural oils, waxes, and steroids.

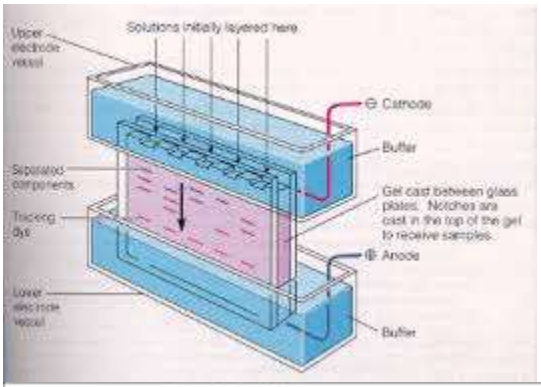
Lipids can serve a diverse range of functions within a cell, including:

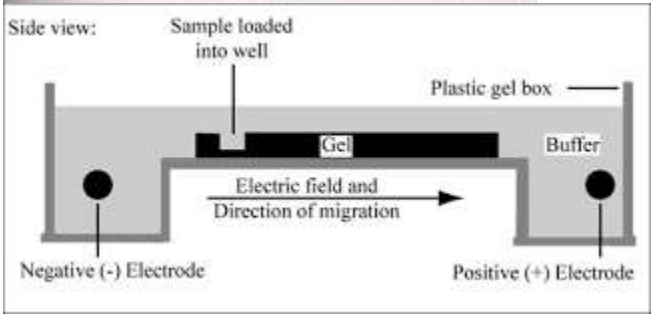
- **Storage of energy** for long-term use (e.g. triglycerides)
- **Hormonal roles** (e.g. steroids such as oestrogen and testosterone)
- **Insulation** – both thermal (triglycerides) and electrical (sphingolipids)
- **Protection** of internal organs (e.g. triglycerides and waxes)
- **Structural components** of cells (e.g. phospholipids and cholesterol)

(Students have to explain each of the above functions)

2. Give the principle and working of Electrophoresis

Q. Electrophoresis





Principles of DNA Gel electrophoresis

Gel electrophoresis separates **DNA** fragments by size in a solid support medium (an **agarose gel**). **DNA** samples are pipetted into the sample wells, seen as dark slots at the top of the picture. Application of an **electric current** at the top (anodal, negative) end causes the negatively-charged **DNA** [remember it's an acid] to migrate (electrophorese) towards the bottom (cathodal, positive) end. The rate of migration is proportional to size: smaller fragments move more quickly, and wind up at the bottom of the gel.

DNA is visualized by including in the gel an intercalating dye, **ethidium bromide**. **DNA** fragments take up the dye as they migrate through the gel. Illumination with **ultraviolet light** causes the intercalated dye to fluoresce with a pale pink colour.

Note that the larger fragments fluoresce more intensely. Although each of the fragments of a single class of molecule are present in **equimolar** proportions, the smaller fragments include less mass of **DNA**, take up less dye, and therefore fluoresce less intensely. This is most evident in the lane at the extreme right, which shows a "***ladder***" set of **DNA** fragments of known size that can be used to estimate the sizes of the other unknown fragments.

Q. 2. B. 1. Principle of differential centrifugation

Differential centrifugation is a common procedure in microbiology and cytology used to separate certain organelles from whole cells for further analysis of specific parts of cells. In the process, a tissue sample is first lysed to break the cell membranes and mix up the cell contents.

Centrifugation is the general name given to separation methods, which involves rotation about a fixed axis to produce a centrifugal (g) force. This centrifugal force forces cells down through a liquid medium and the rate of falling or sedimentation varies principally according to cell density and size. Thus, cells of different density or size sediment at different rates and at some point will be physically separate from each other. Values of sedimentation coefficients for cells are of little use as cells are rarely truly spherical and interactions among cell surfaces and the medium can occur, producing anomalous sedimentation rates. There are two basic types of centrifugation for cell separation, differential pelleting and density gradient. Density gradient centrifugation can be subdivided in two principle types, rate zonal, and isopycnic. The main difference between these two is that in isopycnic, a high-density gradient is used and cells are separated solely on differences in density. In rate zonal, a lower density gradient is used and cells are principally separated on size differences.

Differential centrifugation is a common procedure in microbiology and cytology used to separate certain organelles from whole cells for further analysis of specific parts of cells. In the process, a tissue sample is first lysed to break the cell membranes and mix up the cell contents.

Application of Differential centrifugation is a common procedure in microbiology and cytology used to separate certain organelles from whole cells for further analysis of specific parts of cells. In the process, a tissue sample is first lysed to break the cell membranes and mix up the cell contents.

2. Advantages and disadvantages of Thin layer chromatography

Thin Layer Chromatography (TLC) is an analytical technique of separation which is used to qualitative analysis and observes the reaction of complex mixtures of analytes and also for identifying the unknown compounds. It is also significant to determine the right solvent system with which to implement in the column chromatography.

Advantages of Thin Layer Chromatography

- This is a very easy way to separate the components.
- TLC is a sensitive method.
- In comparison to other separation techniques, very few types of equipment are used. The components are separated in a very short time because the components will elute rapidly.
- It is feasible to visualize all components of UV light.
- The non-volatile compounds are separated by the TLC method.
- The only small sample size is required in TLC, and it can be in microlitre.
- A comparison with standard material, tentative identification is possible.
- The components there in the complex mixture of samples are able to easily separate and recovered by scratching the plate.

Disadvantages of Thin Layer Chromatography

- There is a no longer stationary are available in TLC plates Therefore, its separation length is insufficient in comparison to other chromatographic techniques.
- Results obtained from TLC are difficult to reproduce.
- Only soluble components of the mixtures are possible.
- This is the only qualitative analysis possible, not quantitative.
- Usually, it is not automatic.
- TLC works in the open system, therefore, due to temperature and humidity can affect the results.

3. Difference between A and Z forms of DNA

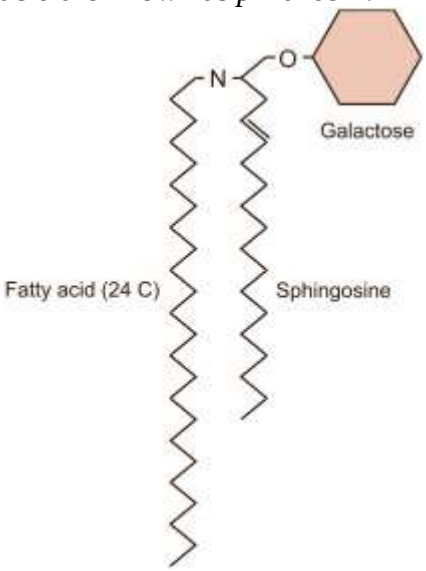
Characteristics	A form of DNA	B form of DNA	Z form of DNA
Helical sense	Right handed	Right handed	Left handed
Diameter	26Å	20Å	18Å
Rise per turn of helix	28Å	36Å	44Å
Base pairs per helical turn	11 base pairs	10 base pairs	12 base pairs
Helix rise per base pair	2.6Å	3.6Å	3.7Å
Base tilt normal to the helix axis	20^0	6^0	7^0
Glycosyl bond conformation	Anti	Anti	Anti for pyrimidine and syn for purines

Table: Differences between various forms of DNA (A-DNA, B-DNA and Z-DNA

Namrata Heda

4. Cerebrosides

Cerebrosides are neutral compounds that consist of ceramide (sphingosine and FA) and a monosaccharide bound by a β-glycosidic bond to the C1 of esfingol. Often the carbohydrate is galactose (galactocerebroside). The most common FAs are lignoceric and hydroxylignoceric or cerebronic acid, both of which have 24 carbons. The cerebrosides containing lignoceric acid are called *kerasin*, while those having cerebronic acid are known as *phrenosin*.



Glucocerebrosides (glucose bound to ceramide) are found in very small proportions in the body, along with galactocerebrosides. Cerebrosides are abundant in brain white matter and nerve myelin sheaths and they are present in small quantity within the cell membranes of other tissues.

Brain white matter and, to a lesser extent, other tissues, also have lipids that contain sulfur. These compounds, formerly called sulfatides, are galactocerebrosides in which the monosaccharide is esterified with sulfate.

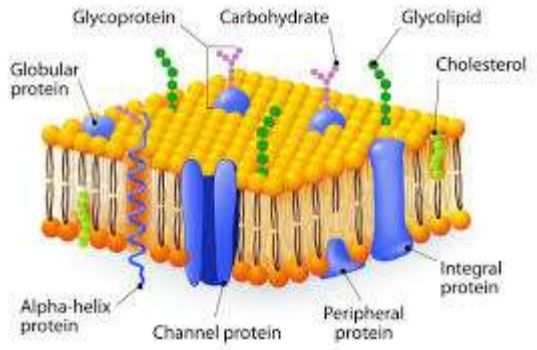
Glycosphingolipids with a more complex carbohydrate portion (di, tri, and tetrasaccharidesinstead of a monosaccharide) have been identified. Compounds of this type containing *N*-acetyl-galactosamine are called *globosides*.

Q.3.A. Describe any one **10M**

1. Fluid mosaic model

The fluid mosaic model describes the structure of the plasma membrane as a mosaic of components —including phospholipids, cholesterol, proteins, and carbohydrates—that gives the membrane a fluid character. Plasma membranes range from 5 to 10 nm in thickness.

The lipid bilayer gives fluidity and elasticity to the membrane. Small amounts of carbohydrates are also found in the cell membrane. The model, which was devised by SJ Singer and GL 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. Another way to define membrane domains is the association of the lipid membrane with the cytoskeleton filaments and the extracellular matrix through membrane proteins.[1] The current model describes important features relevant to many cellular processes, including: cell-cell signaling, apoptosis, cell division, membrane budding, and cell fusion.



Functions: Fluidity to the membrane, transport of molecules, shape and dynamicity to the membrane

2. Functions of golgi complex:

They play a key role in sorting cell's proteins and membrane constituents and in directing them to their proper destination.

Plants-- Secretion of materials of primary and secondary cell walls, formation and export of glycoprotein, lipids, pectins and monomers of hemicellulose, cellulose lignin etc.

Animals—packaging and exocytosis of zymogen of exocrine pancreatic cells, mucus secretion of intestine, lactoprotein secretion by mammary gland cells, secretion of thyroxine by thyroid cells, secretion of tropocollagen and collagen, formation of melanin granules, formation of yolk and vitelline membrane of growing oocyte.

Q.3. B. Explain any 2 **10M**

1. **Difference between 80S and 70S Ribosomes:-**

80S ribosome
1. They occur only in eukaryotic cells.
2. They occur inside the cytoplasm of eukaryotes either freely or attached to ER.
3. The ribosomes are larger in size with a length of (300—340 A) and breadth (200—240 A).
4. The sedimentation co-efficient is 80.
5. They are comparatively heavier, 4.0—4.5 million Daltons.
6. The two subunits are 40S and 60S.
7. The rRNAs of BOS ribosomes are 28S + 5.8S + 5S in larger subunit and 18S in smaller subunit.
8. The ribosomes possess less of rRNA as compared to protein (40: 60).
9. 80S ribosomes are synthesized inside the nucleolus.
10. It contains about 73 protein molecules, 40 in larger subunit and 33 in smaller subunit.
11. Protein synthesis is not inhibited by common antibiotics like chloramphenicol.

70S Ribosomes:
1. 70S ribosomes are found both in prokaryotes and eukaryotes.
2. The ribosomes are found freely inside the cytoplasm of prokaryotes and matrix of plastids and mitochondria of eukaryotes.
3. They are comparatively smaller with a length of (200—290 A) and a diameter of (170—210 A).
4. The sedimentation coefficient is 70.
5. 70S ribosomes are comparatively lighter, 2.7—3.0 million daltons.
6. The two subunits are 30S and 50S.
7. The rRNAs of 70S ribosomes are 23S + 5S (larger subunit) and 16S (smaller subunit).
8. The ribosomes contain more of rRNA than protein (60:40).
9. 70S ribosomes are synthesised in the cytoplasm of prokaryotes and matrix of semi-autonomous cell organelles.
10. It possesses about 55 protein molecules, 34 in larger subunit and 21 in smaller subunit.
11. Protein synthesis is inhibited by antibiotics like chloramphenicol.

2. Endocytosis and Exocytosis

Endocytosis

Endocytosis is a type of active transport that moves particles, such as large molecules, parts of cells, and even whole cells, into a cell. There are different variations of endocytosis, but all share a common characteristic: the plasma membrane of the cell invaginates, forming a pocket around the target particle. The pocket pinches off, resulting in the particle being contained in a newly created intracellular vesicle formed from the plasma membrane.

Phagocytosis

Phagocytosis (the condition of “cell eating”) is the process by which large particles, such as cells or relatively large particles, are taken in by a cell. For example, when microorganisms invade the human body, a type of white blood cell called a neutrophil will remove the invaders through this process, surrounding and engulfing the microorganism, which is then destroyed by the neutrophil

Pinocytosis

A variation of endocytosis is called pinocytosis. This literally means “cell drinking” and was named at a time when the assumption was that the cell was purposefully taking in extracellular fluid. In reality, this is a process that takes in molecules, including water, which the cell needs from the extracellular fluid. Pinocytosis results in a much smaller vesicle than does phagocytosis, and the vesicle does not need to merge with a lysosome

Exocytosis

The reverse process of moving material into a cell is the process of exocytosis. Exocytosis is the opposite of the processes discussed in the last section in that its purpose is to expel material from the cell into the extracellular fluid. Waste material is enveloped in a membrane and fuses with the interior of the plasma membrane. This fusion opens the membranous envelope on the exterior of the cell, and the waste material is expelled into the extracellular space (Figure 4). Other examples of cells releasing molecules via exocytosis include the secretion of proteins of the extracellular matrix and secretion of neurotransmitters into the synaptic cleft by synaptic vesicles.

3. **Functions of smooth endoplasmic reticulum**

Synthesis of lipids

Glycogenolysis and blood glucose homeostasis

Sterol metabolism—cholesterol biosynthesis, bile acid synthesis, steroid hormone synthesis

Synthesis of triglycerides

4. Autophagy

Cellular Activity. ... Autophagy (a Greek word that means "self-eating") is a catabolic process in eukaryotic cells that delivers cytoplasmic components and organelles to the lysosomes for digestion. Lysosomes are specialized organelles that break up macromolecules, allowing the cell to reuse the materials.

Diagram is important

Q.4. A) Describe <u>any one</u> of the following:(10)

1. Biochemical and structural aspects of mitochondrial membranes.

Description of outer and inner mitochondrial membrane. Both mebrans are about 6-7 nm thick. Mitochomdria has two membranes, outer and inner. Both are lipoproteinacious. Outer membrane is smooth and more permeable than inner membrane. The inner membrane is thrown into a number of finger like projections, into the matrix called as cristae. Oxysomes or F1 particles are present on the M-face of inner membrane. Outer membrane is monopartite and inner membrane is multiipartite. It is with projections towards matrix side (M face), the cristae. Cristae are the site for ETS and terminal oxidation. Oxysomes have a head piece, a stalk and a base piece.

Chemical composition-
Outer membrane- It contains about 6 times more cholesterol, than inner membrane. It has about <10% total proteins of mitochondria. There are 14different proteins with mol. Wt. between 12000 to 2,20000 daltons. Sialic acid is more init.
Inner membrane -Lipoproteinaceous, about 60% of membrane proteins. Proteins are associated with haeme, flavin,copper and non-haeme iron. Mol. Weight range 10000 to 90000 daltons. Most of the proteins are associated with 5 comlexes.(I-V).ComplesI-IV are electron transport complexes and comples V is the ATP synthesizing complex. Proportion of Sialic acid is less as compared to outer membrane.
Several ion transport components are present for transporting ions such as phosphate, ATP,ADP, dicarboxylate, tricarboxylate,gluterate, alpha keto gluterate, aspertate, pyruvate, citrulline, ornithine, bicarbonate, CO^2, Ca^{2+}, Mg^{2+}, Na^+ .
Enzymes in outer and inner membranes are different.
Diagram of the membranes can be considered.

2. Mitosis in plant cell.
Ans: Karyoskinsis. Prophase, metaphase anaphase and telophase, 4 phases description and diagram. Cytokinesis – cell plate description and diagram.

Q. 4. B) Explain <u>any two</u> of the following:(10)
1. Chloroplast inheritance.
Chloroplast contains DNA. It was first studied in *Mirabilis jalapa var. albomaculata.*

The color of the egg cell-donating branch (female parent) determined the color of the offspring. Female parent branches that were pure green or pure white produced only pure green or pure white offspring, respectively. Female parent branches that were variegated could produce all three types of offspring, but not in any predictable ratios.

A zygote (1-celled embryo) with mixture of chloroplasts inherited from the egg cell. Some of the chloroplasts are green, while others are white. As the zygote undergoes many rounds of mitosis to form an embryo and then a plant, the chloroplasts also divide and are distributed randomly to daughter cells at each division.

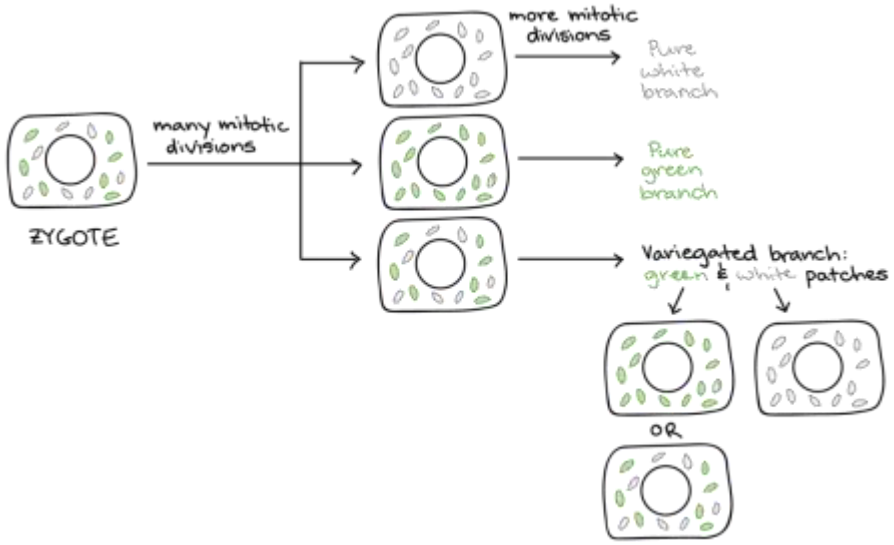


Image showing cytoplasmic segregation of chloroplasts in a plant originating from a zygote with a mixture of white (nonfunctional, mutant) chloroplasts and green (functional, normal) chloroplasts.

After many mitotic divisions in which the chloroplasts replicate and are partitioned randomly, some cells will have only green chloroplasts, others will have only white chloroplasts, and others yet will continue to have a mix. The cells with only white chloroplasts will give rise to pure white branches, and the cells with only green chloroplasts will give rise to pure green branches. The cells with a mixture of chloroplasts will give rise to variegated branches, in which ongoing random segregation of chloroplasts will produce white sectors (progeny of cells with only white chloroplasts) and green sectors (progeny of cells with mixed or green-only chloroplasts). The green cells that contain a mixture of chloroplasts will continue producing occasional pure white and pure green sectors as they divide more.

Over the many cell divisions, some cells will end up with a pure set of normal chloroplasts, making green patches). Others will get a pure set of nonfunctional chloroplasts (making white patches). Others yet will have a mix of normal and nonfunctional chloroplasts, producing green patches that may give rise to pure green or pure white sectors^77start superscript, 7, end superscript.

What about the maternal pattern of inheritance? Plants make germ cells late in development, converting cells at the tip of a branch into gamete-producing cells. A branch that's pure green will make egg cells with green chloroplasts that give rise to pure green offspring. Similarly, a branch that's pure white will make egg cells that contain only white chloroplasts and will give rise to pure white offspring.

If a branch is variegated, it has a mixture of cells, some with only functional chloroplasts, some with only nonfunctional chloroplasts, and some with a mixture of chloroplasts. All three of these cell types may give rise to egg cells, leading to the green offspring, white offspring, and variegated offspring in unpredictable ratios.

2. Role of catalase in peroxisomes.
Ans: Peroxisomes contain enzymes that oxidize certain molecules normally found in the cell, notably fatty acids and amino acids. Those oxidation reactions produce hydrogen peroxide, which is the basis of the name *peroxisome*. However, hydrogen peroxide is potentially toxic to the cell, because it has the ability to react with many other molecules. Therefore, peroxisomes also contain enzymes such as catalase that convert hydrogen peroxide to water and oxygen, thereby neutralizing the toxicity. In that way peroxisomes provide a safe location for the oxidative metabolism of certain molecules. Thus it cleanses the cell.
Reactions with oxidases and catlases necessary.

3. Cyclic photophosphorylation.
Ans: Definition of photophosphorylation. Description, schematic representation of cyclic photophosphorylation.

4. Holiday model of genetic recombination.
Ans: The Holliday model of DNA crossover.
(a) Two homologous DNA molecules line up (e.g., two nonsister chromatids line up during meiosis).
(b) Cuts in one strand of both DNAs.

(c) The cut strands cross and join homologous strands, forming the *Holliday structure* (or *Holliday junction*).
(d) Heteroduplex region is formed by *branch migration*.
(e) Resolution of the Holliday structure. Figure 8-D-2e is a different view of the Holliday junction than Figure 8-D-2d. DNA strands may be cut along either the vertical line or horizontal line.
(f) The vertical cut will result in crossover between f-f' and F-F' regions. The heteroduplex region will eventually be corrected by mismatch repair.
(g) The horizontal cut does not lead to crossover after mismatch repair. However, it could cause gene conversion.
Diagram expected.

Q.5.Short notes any 4 **20M**

1. DNA is favoured as genetic material against RNA

With the exception of certain viruses, DNA rather than RNA carries the hereditary genetic code in all biological life on Earth. DNA is both more resilient and more easily repaired than RNA. As a result, DNA serves as a more stable carrier of the genetic information that is essential to survival and reproduction.

DNA Is More Stable

Both DNA and RNA contain the sugar ribose, which is essentially a ring of carbon atoms surrounded by oxygen and hydrogen. But whereas RNA contains a complete ribose sugar, DNA contains a ribose sugar that has lost one oxygen and one hydrogen atom. Fun fact: This minor difference explains the different names assigned to RNA and DNA – ribonucleic acid versus deoxyribonucleic acid. The extra oxygen and hydrogen atoms in RNA leave it prone to hydrolysis, a chemical reaction that effectively breaks the RNA molecule in half. Under normal cellular conditions, RNA undergoes hydrolysis almost 100 times faster than DNA, which makes DNA a more stable molecule.

DNA Is More Easily Repaired

In both DNA and RNA, the base cytosine frequently undergoes a spontaneous chemical reaction known as "deamination." The result of deamination is that cytosine changes into uracil, another nucleic acid base. In RNA, which contains both uracil and cytosine bases, natural uracil bases and uracil bases that resulted from deamination of cytosine are indistinguishable. Therefore, the cell cannot "know" whether uracil should be there or not, making it impossible to repair cytosine deamination in RNA. DNA, however, contains

thymine instead of uracil. The cell identifies all uracil bases in DNA as having been the result of cytosine deamination and can repair the DNA molecule.

DNA's Info Is Better Protected

The double-stranded nature of DNA, as opposed to the single-stranded nature of RNA, further contributes to the favorability of DNA as the genetic material. The double-helix structure of DNA places bases inside the structure, protecting the genetic information from chemical mutagens -- that is, from chemicals that react with the bases, potentially changing the genetic information. In single-stranded RNA, on the other hand, the bases are exposed and more vulnerable to reaction and degradation.

Double Strands Allow Double-Checking

When DNA is replicated, the new double-stranded DNA molecule contains one parent strand -- which serves as the template for replication -- and one daughter strand of newly synthesized DNA. If there is a base mismatch across the strands, as often happens after replication, the cell can identify the correct base pair from the parent DNA strand and repair it accordingly. For example, if at one nucleotide position the parent strand contains a thymine and the daughter strand a cytosine, the cell "knows" to fix the mismatch by following the instructions in the parent strand. The cell will therefore replace the daughter strand's cytosine with an adenosine. Since RNA is single-stranded, it cannot be repaired in this way.

2. Differentiation between Paper chromatography and Electrophoresis

Chromatography is a technique which is meant for separation of component of a mixture. Similarly electrophoresis is also meant for separation of components of a given sample.

But one needs to understand the difference between chromatography and electrophoresis for analytical needs.

In general electrophoresis is used mostly in biological labs and forensic analysis. But chromatography is used in chemistry, phyto-chemistry, medical diagnosis, biology, biochemistry and even in forensic research.

Besides it can be combined with other techniques like spectroscopy for further applications.

Difference between Chromatography and Electrophoresis

Chromatography has different set of principles and instrumentation compared to electrophoresis.

Before we go further, read our article on types of chromatography and also types of electrophoresis.
This will help in understanding the differences outline in the table below even better.

Difference	Chromatography	Electrophoresis
Principle	Separation of molecules based on their partition coefficient and adsorption properties.	Separation of charged molecules by attraction toward opposite charged electrodes.
Technique	Pressure exerted on sample to erupt out of a column.	Electrical field applied to separate sample molecules based on their charge
Types	Many types: Paper, thin layer, HPLC, HPTLC, Gas chromatography etc.	Few types:Capillary, gel etc.
Cost	Expensive instrumentation and even expensive reagents	Inexpensive instrumentation but reagents can be expensive.
Uses	Chromatography can be used for both analytical and also preparatory purposes (extraction of sample.).	Only for analytical purposes. i.e. identification & Quantification

3. Silicosis

Silica is a basic component of soil, sand, and most types of rocks. Silica forms a tetrahedral structure and there are two common forms of silica—crystalline silica and amorphous silica. Crystalline silica has a regular tetrahedral structure, while amorphous silica has an irregular structural arrangement. Environmental or occupational exposure to crystalline silica particles over an extended period of time results in pulmonary inflammation, which plays a vital role in pathological development of silicosis. Silicosis is a lung disease characterized by inflammation and fibrosis and remains a prevalent health problem throughout the world. Currently, treatment choices for silicosis are limited and at present no cure exists for silicosis [1, 2]. Consequently, it is important to further define mechanisms of silica-induced inflammation on which new therapeutic approaches could be developed.

Inhaled silica particles are encountered by alveolar macrophages (AM) in the lungs. The AM are the primary innate immune phagocytic cells at the air tissue interface responsible for clearance of particles through the mucociliary escalator and/or lymphatic systems

4. Signal hypothesis

Signal hypothesis—this was proposed to explain how ribosomes which are meant for synthesis of secretory types of proteins gets specifically attached to RER membrane.

The mRNA is able to recognise free or bound ribosomes with help of special signal codons localised after the initial AUG codon. Luminal surface has signal peptidase that remove signal peptide

Diagram is expected

5. Thylakoids
Ans: A thylakoid is a membrane-bound compartment inside chloroplasts and cyanobacteria. Thylakoids consist of a thylakoid membrane surrounding a thylakoid lumen. Chloroplast thylakoids frequently form stacks of disks referred to as grana (singular: granum). Grana are connected by intergranal or stroma thylakoids, which join granum stacks together as a single functional compartment.
The thylakoid membrane is the site of the light-dependent reactions of photosynthesis with the photosynthetic pigments embedded directly in the membrane. It is an alternating pattern of dark and light bands measuring each 1 nanometre. The thylakoid lipid bilayer shares characteristic features with prokaryotic membranes and the inner chloroplast membrane. For example, acidic lipids can be found in thylakoid membranes, cyanobacteria and other photosynthetic bacteria and are involved in the functional integrity of the photosystems. The thylakoid membranes of higher plants are composed primarily of phospholipids and galactolipids that are asymmetrically arranged along and across the membranes. Thylakoid membranes are richer in galactolipids rather than phospholipids; also they predominantly consist of hexagonal phase II forming monogalacotosyl diglyceride lipid. Despite this unique composition, plant thylakoid membranes have been shown to assume largely lipid-bilayer dynamic organization. Lipids forming the thylakoid membranes, richest in high-fluidity linolenic acid are synthesized in a complex pathway involving exchange of lipid precursors between the endoplasmic reticulum and inner membrane of the plastid envelope and transported from the inner membrane to the thylakoids via vesicles.
Diagram can be considered.

6. Leucoplasts
Ans: Leucoplasts are called as colourless plastids. They are presents in plant parts which are. usually away from sunlight. They are present in storage organs. Types of leucoplasts, their description and function with examples.