



Internal Question Paper Scheme & Solution

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Internal Assessment Test 1 – March – 2026

Sub:	Biology for Engineers (CSE)				Sub Code:	BBOC407	Branch:	ISE
Date:	13.04.2026	Duration:	90 Min	Max Marks:	50	Sem / Sec:	IV/ A,B,C (SET-1)	

QN	Questions Answer any 5 full questions	Marks	OBE	
			CO	RBT
1.	Explain the structure and functions of a eukaryotic cell with a neat diagram.	10	CO1	L2
2.	Explain the structure and functions of DNA and RNA with differences.	10	CO1	L2
3.	Explain the role of vitamins.	10	CO1	L2
4.	Explain DNA fingerprinting in detail with steps involved and its uses in forensic science.	10	CO2	L2
5.	Explain the role of lipids in biodiesel and detergent production.	10	CO2	L2
6.	Describe the structure and working of the eye as a camera.	10	CO3	L2

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HOD-ISE

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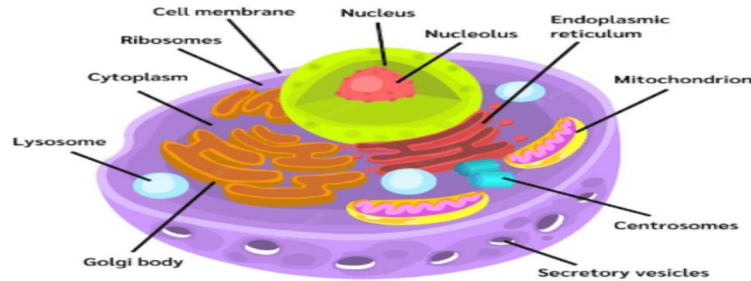
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1. Explain the structure and functions of a eukaryotic cell with a neat diagram. (10M)

Structure (5m) + Functions(5m)

Cells are the fundamental units of life, and they play crucial roles in the functioning of living organisms. As shown in figure, cells have well defined nucleus and has complex structure. Its slightly oval in shape. It has Ribosomes, Endoplasmic reticulum, Mitochondrion, Centrosomes, Golgi body, Lysosome.



1. **Nucleus:** Eukaryotic cells have a well-defined nucleus enclosed within a nuclear membrane, housing multiple linear chromosomes.
2. **Membrane-bound Organelles:** Eukaryotic cells contain various membrane-bound organelles like mitochondria, endoplasmic reticulum, Golgi apparatus, and lysosomes.
3. **Size:** larger and more complex.
4. **Cell Division:** Eukaryotic cells undergo mitosis for growth and repair and meiosis for sexual reproduction.
5. **DNA Structure:** eukaryotic DNA is organized into multiple linear chromosomes.
6. **Ribosomes:** eukaryotic ribosomes are larger(80S).

Here's how cells **contribute** to the functioning of organisms.

1. **Structural Support:** Cells form the structural framework of all living organisms. They provide shape, support, and organization to tissues, organs, and organ systems.
2. **Metabolism:** Cells carry out various metabolic processes necessary for life, such as respiration, photosynthesis (in plant cells), digestion, and synthesis of biomolecules like proteins, carbohydrates, and lipids.
3. **Reproduction:** Cells are responsible for the reproduction of organisms through processes like mitosis.
4. **Communication:** Cells communicate with each other through chemical signals, allowing them to coordinate activities and respond to changes in their environment.
5. **Homeostasis:** Cells maintain internal balance (homeostasis) by regulating factors like temperature, pH, and concentration of ions and molecules.
6. **Defense:** Some cells, like white blood cells in animals and certain cells in plants, play roles in defending the organism against pathogens and other harmful agents.

2. Explain the structure and functions of DNA and RNA with differences. (10M)

Structure Figure+ Explanation 4m

NUCLEIC ACIDS:

- They are long chain **biological polymers**.
- Same Molecules are repeated many times in sequence.
- It is used for storage and transfer of genetic information.
- Artificial Nucleic Acids are also synthesized now-a-days.

- Types: DeoxyRibonucleic Acid (DNA) and Ribonucleic Acid (RNA).
- Both are used for processes like replication, Transcription , Translation of genetic information.

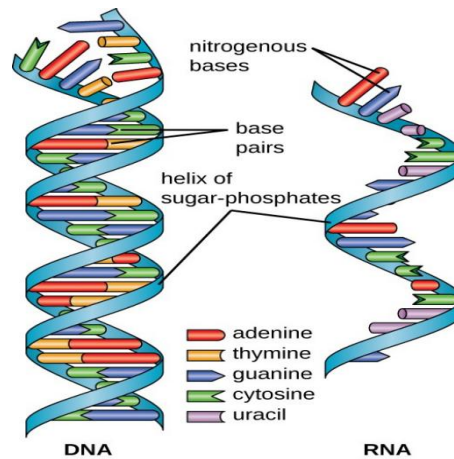


Figure 12. DNA and RNA Schematic representation.

Functions Explanation 4m

- 1) Genetic Information Storage:
- 2) Protein Synthesis:
- 3) Cellular Regulation:
- 4) Hereditary Transmission:
- 5) Transfer of Genetic Code:
- 6) Enzymatic Activities:
- 7) Energy Transfer:
- 8) Cellular Signaling:
- 9) Maintenance of Cell Structure:
- 10) Synthesis of Biomolecules:

Differences Explanation 2m

DNA:

- DNA information is for development, functioning and for reproduction.
- It is actually a double stranded helical structure.
- It consists of sugar molecules, phosphates, and Nitrogen bases like Adenine, Guanine, Cytosine and Thymine.

RNA:

- It involves expression of genetic information stored in DNA by carrying the message from DNA to RNA.
- Used to duplicate the genetic information by separating 1 strand from DNA, and this strand is called messenger RNA(mRNA).
- mRNA carries the information of various nucleotides and their sequence.
- The mRNA becomes a copy of DNA, and is used to build/ produce proteins.
- It acts as a base structure, to act and combine, with amino acids, to produce protein, based on requirement.

3. Explain the role of vitamins.(10M)

Properties: Explanation 4m

- ◆ Vitamins are a group of organic compounds which are essential for normal growth and nutrition and are required in very small amounts for maintaining optimum growth and good health.

- Most of the vitamins cannot be synthesized in our body but plants can synthesis almost all of them.
- Vitamin D is an exception because it can be made in the skin from exposure to sunlight.

Functions: Explanation 6m

Vitamin A: Essential for vision, skin health & immune functions

Vitamin B : aid in development of RBCs & proper muscle tone, production of hormones and cholesterol,

Vitamin C: antioxidant, aids the absorption of iron, growth and repair of body tissues, healing wounds,

Vitamin D: Required for the formation of bones, mineral homeostasis, to maintain normal blood levels of phosphorus and calcium

Vitamin E: antioxidant, Protects the cells from the effects of free-radicals,

Vitamin K: Helps in blood clotting, bone health etc.

4. Explain DNA fingerprinting in detail with steps involved and its uses in forensic science. (10M) Explanation 2m + Process 6m + Uses 2m

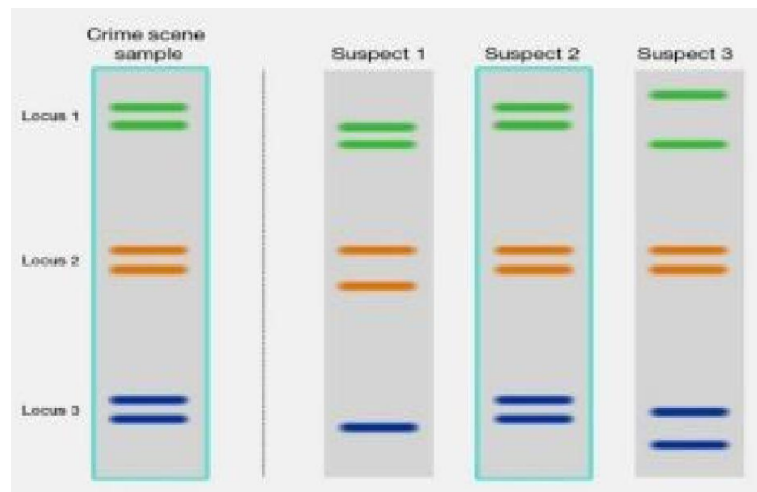
- DNA fingerprinting, is also called DNA typing, DNA profiling, Genetic fingerprinting, Genotyping, or Identity testing.
- It's method of isolating and identifying variable elements within the base-pair sequence of DNA.
- DNA fingerprinting is a laboratory technique.
- It is used to determine the probable identity of a person.
- It is based on the nucleotide sequences of certain regions of human DNA that are unique to individuals

✧ The *procedure* for creating a **DNA fingerprint** consists of following steps:

- ✓ First, obtain a sample of cells, such as skin, hair, or blood cells, which contain DNA.
- ✓ Then, extract DNA from the cells and purify.
- ✓ Then, cut DNA strands at specific points with proteins known as restriction enzymes
- ✓ The fragments are sorted by placing them on a gel
- ✓ Gel is subjected to an electric current (electrophoresis): Shorter the fragment, the more quickly it moved towards the positive pole (anode).
- ✓ The double stranded fragments are then subjected to blotting technique (split DNA into single strands and transfer to a nylon sheet)
- ✓ The fragments undergo autoradiography in which they are exposed to DNA probes (pieces of synthetic DNA that are radioactive).
- ✓ A piece of X-ray film is then exposed to fragments, and a dark mark is produced at any point where a radioactive probe is attached.
- ✓ The resultant pattern of marks could then be analyzed.
- The DNA testing process is comprised of 4 main steps, including: extraction, quantization, amplification, and capillary electrophoresis.
- It can be defined as :

comparison of the DNA in a person's nucleated cells with that identified in biological matter

- Biological matter can be found: at the scene of a crime or with the DNA of another person for the purpose of identification or exclusion.
- The application of these techniques introduces **new factual evidence** to criminal investigations and court cases.



5. Explain the role of lipids in biodiesel and detergent production. (10M)

Lipids in detergent production Process 2m + Explanation 3m

The hydrophobic end of the phospholipid bilayer stays away from the water. This avoids the dissolution of cell membrane in water.

But the detergent can bind to the hydrophobic end of the cell membrane and form a solution with water, thus breaking the cell membrane barrier.

Detergent monomers solubilize membrane proteins by partitioning into the membrane bilayer. With increasing amounts of detergents, membranes undergo various stages of solubilization. The initial stage is lysis or rupture of the membrane.

While lipids also have the same general structure as detergents—a polar hydrophilic head group and a nonpolar hydrophobic tail— lipids differ from detergents in the shape of the monomers, in the type of aggregates formed in solution, and in the concentration range required for aggregation.

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With increasing amounts of detergents, membranes undergo various stages of solubilization.

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- Shape of the monomers
- Type of aggregates formed in solution, and
- Concentration range required for aggregation

Obtaining biodiesel from lipids Figure 2m + Explanation 3m



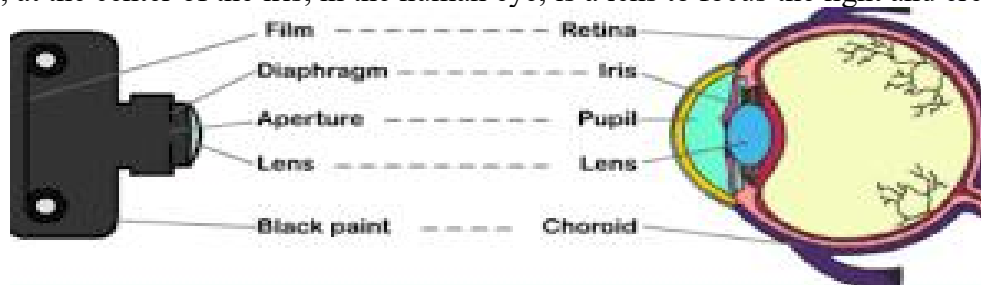
- ❖ Lipid obtained from food waste was used as a potential feedstock for biodiesel production. Biodiesel demonstrates an animal fat-based or vegetable oil based diesel fuel.
- ❖ Biodiesel production used both a chemical catalyst and a biocatalyst.

- ❖ It is generally made by esterifying lipids (e.g. vegetable oil, and animal fat) with an alcohol generating fatty acid esters & can be used singly or blended with gasoline in any proportions.
- ❖ Biodiesel blends can also be utilized as heating oil.

6. Describe the structure and working of the eye as a camera.

Figure 2m + Explanation 3m

- There are many similarities between the human eye and a camera, including:
- A diaphragm to control the amount of light that gets through to the lens. This is the shutter in a camera, and
- The pupil, at the center of the iris, in the human eye, is a lens to focus the light and create an image.



- The image is real and inverted. A method of sensing the image.
- In a camera, film is used to record the image; in the eye, the image is focused on the retina, and a system of rods and cones is the front end of an image-processing system that converts the image to electrical impulses and sends the information along the optic nerve to the brain.
- Photoreceptors in the retina are classified into two groups, named after their physical morphologies, into **rods** and **cones**. These photoreceptors are localized around an area near the centre of the retina called the macula, which is the functional center of the retina.

Rods and Cones : Figure 2m + Explanation 3m

