IMPORTANT QUESTION FOR BIOLOGY FOR ENGINEERS

1Q. Multiple Choice Answers (with explanation)

(i) Highest level of taxonomy hierarchy

Answer: (a) Kingdom

Hierarchy order:
Kingdom → Phylum → Class → Order → Family → Genus → Species
Kingdom is the broadest category.

(ii) Father of Surgery

Answer: (b) Sushruta

- Wrote *Sushruta Samhita*
- Described plastic surgery
- Performed cataract surgery
- Known as pioneer of ancient surgery

(iii) Existence of genes first suggested by

Answer: (a) Gregor Mendel

- Conducted pea plant experiments
- Proposed concept of “factors” (genes)
- Established laws of inheritance

(iv) Powerhouse of cell

Correct Answer: Mitochondria

- Produces ATP (energy)
- Site of cellular respiration

(v) Traditional bacteria placed in

Answer: (a) Eubacteria

- In three-domain system:
    1. Bacteria (Eubacteria)
    2. Archaea
    3. Eukarya

2Q (a) Need of Biology for an Engineer (2 Marks)

1. Helps in biotechnology and biomedical engineering.
2. Important in genetic engineering and bioinformatics.
3. Used in environmental engineering (pollution control).
4. Helps in sustainable development.
5. Important in leather and food industries.

2Q (b) Exciting Aspects & Need in Leather/Environmental Science (3 Marks)

Exciting Aspects:

1. Discovery of DNA structure
2. Genetic engineering
3. Stem cell research
4. CRISPR gene editing
5. Biotechnology innovations

Need in Leather Technology:

1. Enzyme-based tanning process
2. Microbial treatment of waste
3. Pollution reduction

Need in Environmental Science:

1. Bioremediation
2. Biodiversity conservation
3. Waste management

3Q (a) Three Laws of Mendel (3 Marks)

1. Law of Dominance

- In heterozygous condition, dominant trait expresses.
- Example: Tall (T) dominates dwarf (t).

2. Law of Segregation

- Alleles separate during gamete formation.
- Each gamete carries one allele.

3. Law of Independent Assortment

- Different traits inherit independently.
- Dihybrid ratio = 9:3:3:1

3Q (b) Single Gene Disorder (2 Marks)

Definition: Disease caused by mutation in one gene.

Examples:

- Sickle cell anemia
- Colour blindness
- Cystic fibrosis

Caused due to defective allele inheritance.

4Q (a) Difference: Prokaryotic vs Eukaryotic Cell (2 Marks)

Prokaryotic	Eukaryotic
No true nucleus	True nucleus present
No membrane organelles	Organelles present
DNA circular	DNA linear
Small (1–10µm)	Large (10–100µm)

Example:

- Prokaryote: Bacteria
- Eukaryote: Plant/Animal cell

4Q (b) Functions (3 Marks)

Ribosomes

- Protein synthesis
- Found free or attached to ER

Plasma Membrane

- Selectively permeable
- Protects cell
- Regulates transport

Endoplasmic Reticulum

- RER → Protein synthesis
- SER → Lipid synthesis
- Detoxification

✅ **SET – 2**

1Q. Answers with Explanation

(i) Digestive system of cell
Answer: Lysosome

- Contains digestive enzymes
- Breaks waste materials

(ii) Male sex chromosome
Answer: XY

(iii) Continuous random movement
Answer: Brownian motion

- Movement due to collision with molecules

(iv) Dihybrid ratio
Answer: 9:3:3:1

(v) New cell generate from
Answer: Pre-existing cells
Proposed by Rudolf Virchow
Statement: “Omnis cellula e cellula”

2Q (a) Working Principle of Eye & Camera (2 Marks)

Human Eye

1. Light enters cornea
2. Lens focuses image
3. Image formed on retina
4. Retina converts into nerve signals

Digital Camera

1. Lens focuses light
2. Image formed on sensor
3. Converted to digital signal

Similarity: Both use focusing and light principles.

2Q (b) Biology as Important Discipline (3 Marks)

1. Explains life scientifically
2. Basis of medicine and agriculture
3. Uses experiments and data analysis
4. Linked with physics and chemistry
5. Helps solve environmental problems

3Q (a) Dominant & Recessive Traits (2 Marks)

Dominant Trait

- Expressed in TT or Tt
- Example: Brown eyes

Recessive Trait

- Expressed only in tt
- Example: Blue eyes

3Q (b) Genetics & Newton's Laws Comparison (3 Marks)

- Mendel's laws are foundation of genetics
- Explain inheritance patterns
- Like Newton's laws explain motion
- Both are fundamental principles

4Q (b) Classification

(i) Cellularity

Unicellular:

- Single cell organism
- Example: Amoeba

Multicellular:

- Many cells
- Example: Human

(ii) Ammonia Excretion

Aminotelic:

- Excrete ammonia
- Example: Fish

Ureotelic:

- Excrete urea
- Example: Humans

Uricotelic:

- Excrete uric acid
- Example: Birds

✅ **SET – 3**

1Q. Answers

(i) External appearance
Phenotype

(ii) Term Biology introduced by
Jean-Baptiste Lamarck and
Gottfried Reinhold Treviranus

(iii) Exchange of chromatids
Crossing over

(iv) Primary cell wall
Cellulose

(v) Hereditary disease
Colour blindness

2Q (a) Working Principle of Aeroplane & Bird (2 Marks)

1. Based on Bernoulli's principle
2. Wings shaped as airfoil
3. Air pressure difference creates lift
4. Lift overcomes gravity

2Q (b) 20th Century Biological Discoveries (3 Marks)

1. DNA structure discovery by
   James Watson and
   Francis Crick
2. Discovery of antibiotics
3. Development of vaccines
4. Biotechnology revolution
5. Environmental biotechnology

3Q (a) Colour Blindness Cross

Father: X^cY
Mother: XX

Daughters:
X^cX (carrier)

Sons:
XY (normal)

(i) Colour blind daughter → 0/4
(ii) Carrier daughter → 2/4

3Q (b) Model Organisms (3 Marks)

Examples:

Drosophila melanogaster
Mus musculus
Danio rerio

Strength:

- Short life cycle
- Easy genetic study
- Similar genes to humans

Weakness:

- Not fully identical to humans
- Limited complexity

4Q (b) Plant vs Animal Cell

Plant Cell	**Animal Cell**
Cell wall present	No cell wall
Chloroplast present	No chloroplast
Large vacuole	Small vacuole
Rectangular shape	Irregular shape