Pathfinder's

PRACTICE BOOK FOR

CSIR-UGC-NET

MCQs

LIFE SCIENCES | BIOTECHNOLOGY

EIGHTH EDITION

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Preface

Unlock deeper understanding and efficient practice with this MCQ book!

This book is strategically designed to maximize your learning and save valuable time through the following key features:

- **Systematic practice of PYQs through topic-wise segregation**: Questions are organized by topic, providing a structured approach to learning and making it easy to target specific areas for focused practice and review.
- **Concept-driven learning**: Each question is meticulously selected based on concepts. You'll gain a thorough understanding with our comprehensive, step-by-step solutions accompanying most of the questions.
- **Enhanced clarity and accuracy**: Previous years' questions have been thoroughly corrected and refined, including improvements to language, clarity of options, and overall accuracy, ensuring you're practicing with the best possible material.
- **Concept-based, analytical, and synthetic questions**: This book goes beyond simple recall. It features practice-oriented questions designed to strengthen your conceptual understanding, analytical reasoning, and synthetic problem-solving skills—preparing you for complex challenges.
- **Focused and targeted learning**: This MCQs book is designed for aspirants who want to maximize preparation efficiently. It features well-structured questions, clear explanations, and topic-wise practice to strengthen core concepts. Perfect for students seeking a strategic and goal-oriented approach to CSIR-UGC-NET Life Sciences.
- **Concept and revision-oriented questions**: These questions are designed to strengthen your understanding of key topics. They help clarify core concepts and improve problem-solving skills. Ideal for efficient and focused exam preparation.

Acknowledgements

A book of this nature demands meticulous and dedicated efforts from all its contributors. This work is the result of collaboration among several diligent and hardworking individuals, whose commitment has shaped the book into its present form. We extend our heartfelt gratitude to each of them, with special thanks to Dr. Neeraj Tiwari, Ankit Gupta, Ankit Mahajan and Ajay Kumar for their valuable contributions. We are particularly grateful to Pradeep Verma for his exceptional work in designing, layout, and organization, which played a crucial role in bringing this book to completion.

Pranav Kumar

Usha Mina

About **Pathfinder Publication**

Pathfinder Publication - a unit of Pathfinder Academy, Delhi publishes scientific books and educational materials for graduate and postgraduate students as well as lifelong learners. Founded in 2007, Pathfinder Publication has established itself as a reliable, high-quality solutions provider in the publishing fraternity, catering to individuals seeking to meet their needs and fulfill their aspirations. We produce quality print products with meticulous attention to detail in layout, design, photography, and content. Currently, our focus lies in producing the finest scholarly works in Life Sciences and Biotechnology.

Our publications are tailored to help students strengthen their scientific and competitive expertise and temperament. We continually explore, create, and adopt new innovations to stay ahead of the curve. Our commitment is to deliver the best competitive solutions, offering a custom approach specifically designed to meet your needs, without being costly.

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Chapter 1

Biomolecules and Catalysis

Amino acids and Proteins

Amino acids and Peptides

01. Which of the following statements about standard amino acids are *correct*?

P. Lysine has butylammonium side chain.

Q. Average mass of an amino acid residue is ~110 Da.

R. Universal genetic code specifies only standard amino acids.

S. Proline has a secondary amino group.

a. P and Q
b. Q and S
c. Q and R
d. P, Q, R and S

02. Which of the following statement is *not true*?

a. The pI is the pH value at which a protein has overall charge of +1.
b. At a pH value equal to pI, a protein will not move in the electric field.
c. An acidic protein will have a pI less than 7.
d. A basic protein will have a pI greater than 7.

03. Which of the following statements is *not true* about the amino acids?

a. Only 22 standard amino acids are used in ribosome-mediated protein synthesis.
b. All amino acids exist in two stereoisomeric forms.
c. Amino acids have an amino group, carboxyl group and R groups.
d. There are over 300 different types of amino acids found in cells, including 22 standard amino acids.

04. Select the *incorrect* statement regarding standard amino acids:

a. Aspartate has the lowest isoelectric point (pI).
b. Arginine has the highest isoelectric point (pI).
c. The side chain pK_a value is highest for aspartate.
d. Isoleucine has the highest hydropathy value among standard amino acids.

05. Which of the following is *not true* about alanine?

a. At pH 1, the overall charge is +1.

b. At pH 1, it will move towards cathode.

c. An equimolar mixture of d and *l* alanine does not rotate the plane polarized light.

d. It contains branched side chain.

06. Which of the following statements are *correct* among the standard amino acids?

P. Isoleucine and threonine can exist as diastereomers.

Q. Isoleucine and threonine contain three chiral centers.

R. Side chain of lysine has an amino group whereas arginine contains a guanidinium group.

S. In the RS system, all standard amino acids have the S absolute configuration, except cysteine.

a. P and Q b. Q and S

c. P, R and S d. P, Q, R and S **[CSIR-NET]**

07. Which statement best describes the pK_a of amino groups in proteins?

a. pK_a of α-amino group is higher than the pK_a of ε-amino group.

b. pK_a of α-amino group is lower than the pK_a of ε-amino group.

c. pK_a of α-amino group is same as the pK_a of ε-amino group.

d. pK_a of α-amino group is higher than the pK_a of guanidine side chain of arginine. **[CSIR-NET]**

08. The C-terminal carboxyl group and the N-terminal amino group in amino acids have a dissociation constant (pK_a) of 2.2 and 9.2, respectively. The pK_a of side chain carboxyl group in glutamic acid is 4.2 and side chain amino group in lysine is 10.2. The difference in isoelectric point (pI) of lysine and glutamic acid is

a. 6.5 b. 3.2

c. 7.3 d. 2.2 **[GATE]**

09. Which of the following statements are *correct* among the standard amino acids?

P. The pK_a of the side chain in aspartic acid is lower than that of the side chain in glutamic acid.

Q. The aromatic side chains of amino acids absorb light in the range of 260 nm to 320 nm (near-UV).

R. The pK_R of histidine is close to physiological pH.

S. The most nonpolar side chain is present in isoleucine.

a. P and Q b. P and S

c. P, R and S d. P, Q, R and S

10. Which one of the following statement is *correct* about a water soluble globular protein?

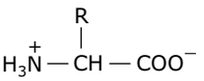
a. Charged amino acid side chains are always buried.

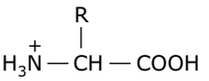
b. Charged amino acid side chains are seldom buried.

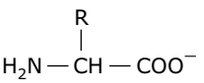
c. Non-polar amino acid side chains are seldom buried.

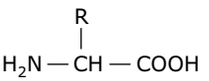
d. Tyrosine residues are always buried. **[CSIR-NET]**

11. An amino acid contains no ionizable group in its side chain. It is titrated from pH 0 to 14. Which of the following ionizable state is not observed during the entire titration in the pH range 0-14?

a. 

b. 

c. 

d.  **[CSIR-NET]**

Chapter 2

Metabolism

Metabolism – General features

01. Which of the following *best* defines metabolism?
    a. The process of breaking down molecules to release energy
    b. The sum of all chemical reactions occurring in a cell or organism
    c. The synthesis of complex molecules from simpler ones
    d. The production of ATP through cellular respiration

02. Which of the following statements about metabolic pathways is *incorrect*?
    a. Metabolic pathways are regulated by feedback inhibition to maintain homeostasis.
    b. Intermediates in one pathway can serve as substrates for another pathway.
    c. All metabolic pathways are linear and do not branch or intersect.
    d. The rate of metabolic pathways can be influenced by enzyme concentration and activity.

03. For each option listed below, identify which are indicative of a catabolic pathway:
    1. Consumption of ATP
    2. Reduction of compounds using NADPH
    3. Energy production
    4. Involvement of the cofactor NAD^+
    5. Decrease in molecular complexity

    a. 1, 2, 4
    b. 2, 3, 5
    c. 2, 3, 4
    d. 3, 4, 5

04. Which of the following statements are *correct*?
    P. ATP stores energy in high-energy phosphoanhydride bonds, which release energy when hydrolyzed.
    Q. Forming a covalent bond releases energy, while breaking one requires an input of energy.
    R. Phosphoester bonds are considered low-energy bonds compared to phosphoanhydride bonds.
    S. A living system is not an open system but a closed system.

    a. P and Q
    b. R and S
    c. P, Q and R
    d. P, Q, R and S

Chapter 3

Cell Biology

Eukaryotic cell: General features and Plasma membrane

01. Which of the following statements accurately describe a eukaryotic cell?

P. It acts as a structural and functional unit of life.

Q. It is an aqueous compartment surrounded by a plasma membrane.

R. It possesses a complex cellular organization.

S. Its genetic material is always a DNA molecule.

a. P and Q
b. R and S
c. Q, R and S
d. P, Q, R and S

02. Which of the following statements is *not* correct?

P. Ribosomes are present in eukaryotic cells and absent in prokaryotic cells.

Q. Unit-membrane bound organelles are found in eukaryotic cells.

R. Circular DNA in the cytosol is typically the characteristic of prokaryotic cells.

S. The first eukaryotic cell on Earth emerged over 3.5 billion years ago.

a. P and Q
b. Q and R
c. P and S
d. P, R and S

03. A new species of organism is discovered, and initial electron microscopy reveals the presence of a distinct nucleus, mitochondria, and an extensive network of internal membranes, including rough and smooth endoplasmic reticulum. However, further analysis shows that this organism lacks chloroplasts and has a rigid external cell wall composed primarily of chitin. Based solely on this information, into which major kingdom of eukarya would this organism most likely be classified?

a. Plantae
b. Animalia
c. Fungi
d. Protista

04. You have homogenized plant tissue and would like to separate chloroplasts from nuclei. Which of the following methods would be most suitable?

a. Polyacrylamide gel electrophoresis.

b. Differential centrifugation using sucrose gradients.

c. Equilibrium density gradient centrifugation on CsCl gradients.

d. Size-exclusion chromatography.

Chapter 4

Prokaryotes and Viruses

Bacterial cell structure

01. Which statement is *true* about both prokaryotic and eukaryotic cells?
    a. Prokaryotic cells are generally much larger than eukaryotic cells.
    b. Eukaryotic cells have ribosomes and prokaryotic cells do not.
    c. Both have DNA as their primary genetic material.
    d. Eukaryotic cells have plasma membranes and prokaryotic cells do not.

02. Which of the following statements about bacteria are *correct*?
    P. They are microscopic cellular organisms.
    Q. They lack a defined nucleus.
    R. They are typically single-celled organisms.
    S. They have a simple cellular structure without membrane-bound organelles.
    a. P and Q
    b. Q, R and S
    c. P, Q and R
    d. P, Q, R and S

03. Which of the following statements about acid-fast staining are *correct*?
    P. It is a differential staining technique.
    Q. It distinguishes acid-fast bacteria from non-acid-fast bacteria.
    R. It is commonly used to identify members of the genus Mycobacterium.
    S. Differentiation is based on the presence of mycolic acid, a branched-chain hydroxy fatty acid.
    a. P and Q
    b. Q, R and S
    c. P, Q and R
    d. P, Q, R and S

04. Which of the following statement is *correct*?
    a. Gram staining is a differential staining technique.
    b. Action of lysozyme in Gram-negative bacteria results in formation of protoplast.
    c. Gram staining is due to chemical nature of cell wall.
    d. Cell wall peptide in eubacteria is made up of only L-amino acid residues.

Chapter 5

Immunology

Innate and Adaptive immune response

01. Which of the following statements is *not* correct?
    a. The innate immune response is not antigen specific.
    b. The innate immune response does not generate memory cells.
    c. The innate immune response is mounted only in invertebrates.
    d. The innate immune response is body's first line of defense against infections.

02. Which of the following statements is the key difference between the innate and adaptive immune responses?
    a. The innate immune response has immunological memory, whereas the adaptive immune response does not.
    b. The innate immune response is specific to particular pathogens, while the adaptive immune response is broad and non-specific.
    c. The innate immune response relies on pattern recognition receptors to detect pathogens, while the adaptive immune response relies on antigen-specific receptors.
    d. The innate immune response takes longer to activate than the adaptive immune response.

03. Which of the following is a characteristic feature of the innate immune response?
    a. It provides a rapid but non-specific defense against pathogens.
    b. It requires prior exposure to a pathogen to be activated.
    c. It primarily relies on antibodies for pathogen elimination.
    d. It improves in effectiveness upon repeated exposure to the same pathogen.

04. Inflammation *does not* involve
    a. cytokine production by macrophages.
    b. migration of leukocytes out of the circulation.
    c. pain and swelling at the site of infection.
    d. secretion of antibodies.

05. Inflammatory responses may include which of the following?
    a. Clotting proteins migrating away from the site of infection.
    b. Increased activity of phagocytes in an inflamed area.

Chapter 6

Diversity of Life

Taxonomy

01. Which of the following statements about *biological species concept* are *correct*?

P. A species is a group of interbreeding natural populations that are reproductively isolated from other groups.

Q. Species are genetically distinct because they do not breed with other species, ensuring unique gene pools.

R. A species is characterized by actual or potential interbreeding, not by physical similarities alone.

S. Biological species concept is applicable to both sexually and asexually reproducing organisms.

a. P and Q
b. R and S
c. P, Q and R
d. P, Q, R and S

02. The *biological species concept* defines species as a group of populations that are reproductively isolated from others. However, this definition is not applicable to groups where sexual reproduction has not been observed yet or is extremely rare. Choose the *correct* option of organisms where biological species concept may therefore not apply:

a. Monocots and basal angiosperms
b. Ascomycetes and oligochaetes
c. Mosses and liverworts
d. Cyanobacteria and Euglenophyta **[CSIR-NET]**

03. Which of following shows the *correct* systematic hierarchy?

a. Kingdom → Phylum → Subphylum → Superclass → Class → Subclass → Cohort → Order → Suborder → Superfamily → Family → Subfamily → Genus → Subgenus → Species → Subspecies
b. Kingdom → Phylum → Subphylum → Cohort → Superclass → Class → Subclass → Superfamily → Family Subfamily → Order → Suborder → Genus → Subgenus → Species → Subspecies.
c. Kingdom → Phylum → Class → Order → Cohort → Family → Genus → Species.
d. Kingdom → Phylum → Class → Cohort → Family → Order → Genus → Species. **[CSIR-NET]**

04. *Tautonym* is an informal taxonomic designation used for animals referring to

a. same name for genus and species.
b. same name for species and subspecies.
c. trinomial nomenclature.
d. the name of the author for the species. **[CSIR-NET]**

Chapter 7

Ecology

Environment

01. A *habitat* is
    a. trophic level occupied by organisms.
    b. the same as an ecosystem.
    c. a particular area inhabited by organisms.
    d. the number of different organisms living in a specific area.

02. Assume that an animal generates heat at a rate proportional to its volume and can radiate heat at a rate proportional to its body surface area. Which of these animals would be best at maintaining its body temperature in a cold climate?
    a. Mouse
    b. Rabbit
    c. Fox
    d. Bear

03. A population of individuals of a species that exhibit genetically fixed variations, are interfertile, and are classified under the same taxonomic species is known as:
    a. ecads
    b. ecotype
    c. endemic species
    d. keystone species

04. Which statement explains how animal body size relates to habitat temperature?
    a. Animals in colder regions tend to have smaller body sizes to conserve heat.
    b. Animals in warmer regions tend to have larger body sizes to maximize surface area for heat retention.
    c. Animals in colder regions tend to have larger body sizes to reduce surface area relative to volume and minimize heat loss.
    d. Body size of animals is not influenced by environmental temperature.

05. Temperature decreases with altitude in the troposphere but increases with altitude in the stratosphere. What is the main reason for this reversal of temperature trend in the stratosphere?
    a. Presence of water vapor in the stratosphere.
    b. Absorption of UV radiation by ozone.
    c. Increased density of air at higher altitudes.
    d. Reflection of solar radiation by clouds. **[CSIR-NET]**

Chapter 8

Classical Genetics

Mendel's principle

01. Which of the following statements *accurately* describe Mendel's Law of Segregation?

P. It is derived from the results of a monohybrid cross.

Q. It explains the segregation of alleles located on homologous chromosomes.

R. Segregation occurs during anaphase I of meiosis I.

S. Segregation occurs during metaphase I of meiosis I.

a. Q, R and S
b. P, Q and R
c. Q and R
d. P, Q, R and S

02. Mendel's law of segregation, as applied to the behavior of chromosomes in meiosis, means that

a. pairing of homologs will convert one allele into the other, leading to separation of the types.
b. alleles of a gene separate from each other when homologs separate in meiosis I.
c. genes on the same chromosome will show 50% recombination.
d. alleles of a gene will be linked and passed on together through meiosis.

03. Which of the following statements *accurately* describe the traits studied by Mendel in garden pea (*Pisum sativum*)?

P. The traits were qualitative in nature.

Q. Each trait exhibited two distinct alternative forms.

R. The relationship between traits followed the principle of complete dominance.

S. The genes controlling these traits are either on different chromosomes or far apart on the same chromosome.

Select the *correct* option:

a. Q, R and S
b. P, Q and R
c. Q and R
d. P, Q, R and S

04. Independent assortment of genes occurs due to the orientation of chromosomes at

a. metaphase of mitosis
b. metaphase I of meiosis
c. metaphase II of meiosis
d. any phase of the cell division

Chapter 9

Molecular Genetics

Genome organization

01. Which of the following statements *accurately* define a genome?

P. The complete set of genes present in a cell.

Q. The total genetic material of an organism.

R. Includes both DNA and genetic RNA.

S. In eukaryotes, include only nuclear DNA.

Select the *correct* option:

a. P and Q
b. Q and R
c. R and S
d. P, Q, R and S

02. Which of the following genome feature increases as the complexity of an organism increases?

P. Genome size

Q. Number of genes

R. Density of genes in the genome

S. Average size of individual genes

a. P and Q
b. P and S
c. P, Q and S
d. R and S

03. It is known that there is a large difference in the DNA content between two organisms with similar developmental complexity. This is due to large differences in size of

a. transposable elements, repetitive sequences and coding sequences.
b. transposable elements and repetitive sequences.
c. introns and coding sequences.
d. introns and transposable elements. **[CSIR-NET]**

04. Which of the following is common to both *E. coli* and eukaryotic chromosomal DNA?

a. DNA is circular.
b. DNA is negatively supercoiled.
c. DNA is contained in the nucleus.
d. DNA is packaged into nucleosomes.

Chapter 10

Biotechnology: Principles and Applications

Recombinant DNA Technology (RDT)

Enzymes used in RDT

01. Which of the following are the characteristics of type II restriction endonucleases?

P. Nature of enzyme : Bifunctional enzyme with both endonuclease and methylase activity.

Q. Protein structure : Two identical subunits.

R. Restriction requirement : ATP, Mg^{2+}.

S. Cleavage sites : At or near restriction site.

a. Q and S
b. P and Q
c. P and S
d. R and S

02. Which of the following statements about restriction endonucleases is *incorrect*?

a. These enzymes are derived from bacteria.
b. They cleave DNA at specific recognition sequences.
c. They exclusively cut single-stranded DNA molecules.
d. Their name originates from their role in restricting bacteriophage growth.

03. Which of the following statements about restriction enzymes is *incorrect*?

a. Restriction enzymes cut DNA after recognizing specific sequences.
b. A restriction enzyme is not DNA-specific but sequence-specific.
c. Restriction enzymes function as both exonucleases and endonucleases.
d. Some restriction enzymes create 'sticky ends' by cutting the two DNA strands at slightly different points within their recognition site.

04. SmaI and XmaI are neoschizomers. A circular DNA has two SmaI and one XmaI sites. How many fragments will be generated by digestion with XmaI?

a. 1
b. 2
c. 3
d. 4

Chapter 11

Plant Physiology and Development

Plant–water relationship

01. Which of the following statements *accurately* describes diffusion?
    a. Diffusion is very rapid over long distances.
    b. Diffusion requires energy expenditure by the cell.
    c. Diffusion is a passive process.
    d. Diffusion occurs when molecules move from an area of lower concentration to one of higher concentration.

02. Osmosis is a form of diffusion in which
    a. solute moves freely from a region of higher to lower concentration through a semipermeable membrane.
    b. solvent moves through a semipermeable membrane from higher solute to lower solute concentration.
    c. solvent moves through a semipermeable membrane from higher solvent to lower solvent concentration.
    d. solute as well as solvent moves freely from a region of higher concentration to lower concentration through a semipermeable membrane.

03. You place a cell in a solution. Over time, you observe that the cell shrinks, indicating it is losing water. Which of the following is the most likely explanation?
    a. The solution is a strong buffer.
    b. The solution is acidic.
    c. The solution contains a higher concentration of dissolved solutes than the cell.
    d. The solution contains a lower concentration of dissolved solutes than the cell.

04. Water potential:
    a. is always higher in a solution than in pure water.
    b. represents the potential energy of water within a system.
    c. measures the active movement of water through a system.
    d. is never equal to zero.

05. If a plant cell is placed in deionized water, the water potential of that cell becomes
    a. more positive because the pressure potential becomes more positive.
    b. more positive because the osmotic potential becomes more negative.
    c. more negative because the pressure potential becomes more negative.
    d. less negative because the pressure potential becomes more positive.

Chapter 12

Animal Development

Basic concept of development

01. Which of the following best describes the concept of *potency* in developmental biology?
    a. The number of cells a progenitor can produce.
    b. A cell's ability to divide rapidly.
    c. The range of different cell types a cell can become.
    d. The ability of a cell to migrate.

02. Which of the following is the correct sequence of *commitment stages*?
    a. Specification → Determination → Differentiation.
    b. Determination → Specification → Differentiation.
    c. Potency → Induction → Determination.
    d. Specification → Differentiation → Determination.

03. Which experiment would confirm that a cell is *determined*?
    a. *In vitro* observation of gene expression.
    b. Transplanting it to a different embryonic region and seeing if it changes fate.
    c. Ablating it and observing regeneration.
    d. Labeling it and tracking its progeny.

04. Which of the following statements are *correct* about animal development?
    P. The process by which a cell becomes capable of responding to an inductive signal is called *competence*.
    Q. If a group of unspecified cells changes fate in response to adjacent tissues, the process is called *induction*.
    R. *Morphogens* act through concentration gradients that elicit different cell fates.
    S. A *fate map* is used to predict future developmental outcomes of embryonic cells.
    a. P and Q
    b. P and S
    c. P, Q and R
    d. P, Q, R and S

05. Which of the following is a *true* statement about morphogen gradients?
    a. All cells respond identically to the same morphogen.
    b. Morphogens are always proteins.

Chapter 13

Human Physiology

Nervous system

01. Which of the following statements are *correct* with respect to neuron classification?

P. Sensory neurons are typically unipolar and transmit signals from sensory receptors to the CNS.

Q. Motor neurons are efferent neurons that relay signals from the CNS to muscles or glands.

R. Interneurons connect neurons within the CNS and are typically multipolar.

S. Bipolar neurons are common in the spinal cord and are involved in reflex arcs.

a. P, Q and R
b. Q, R and S
c. P and R only
d. P, R and S

02. Which of the following statements about nervous tissue components are *correct*?

P. Neurons are the structural and functional units of the nervous system.

Q. Glial cells support neurons, form myelin, and help maintain the extracellular environment.

R. Schwann cells are found in the central nervous system and produce myelin.

S. Oligodendrocytes can myelinate multiple axons in the central nervous system.

a. P, Q and R
b. Q, R and S
c. P, Q and S
d. P and S only

03. Which of the following statements regarding the human brain are *correct*?

P. The cerebellum helps coordinate voluntary movements and maintain posture and balance.

Q. The hypothalamus regulates body temperature, hunger, and circadian rhythms.

R. The medulla oblongata primarily integrates emotions like fear and anxiety.

S. The corpus callosum enables communication between the left and right cerebral hemispheres.

a. P, Q and R
b. Q, R and S
c. P, Q and S
d. P and R

04. Which of the following statements about the human cerebral cortex are *true*?

P. The frontal lobe is involved in decision-making, planning, and voluntary motor function.

Q. The occipital lobe processes auditory information and is involved in memory.

R. The parietal lobe integrates sensory input and is important for spatial orientation.

S. The temporal lobe is involved in auditory processing and language comprehension.

Chapter 14

Evolution and Animal behaviour

Origin of life and Evolutionary theory

01. According to the *theory of spontaneous generation*
    a. life came out of decaying and rotting matter.
    b. life came from outer space.
    c. life comes only from pre-existing life.
    d. life comes from chemical evolution.

02. The first life form on Earth came from
    P. pre-existing non-living organic molecules.
    Q. through chemical evolution.
    R. from pre-existing life.
    S. from outer space.
    a. P and Q
    b. Q and R
    c. R and S
    d. P and R

03. Gaseous mixture used by Miller for synthesis of amino acids through heat and electric discharge included
    a. methane, ammonia, hydrogen and water vapours.
    b. methane, ammonia, nitrogen and water vapours.
    c. methane, nitrogen, hydrogen and water vapours.
    d. ammonia, carbon dioxide, nitrogen and water vapours.

04. You wanted to conduct Miller-Urey experiment and used a simplified apparatus with Tungsten electrodes. You heated the glassware at 500°C for 3 hours to remove any organic contaminants. Gases NH_3, CH_4, CO and H_2 were introduced followed by generating electric spark. Which of the essential ingredients did you forget to add?
    a. O_2
    b. H_2O
    c. HCN
    d. CHO **[CSIR-NET]**

Chapter 15

Biophysical, Biochemical & Molecular biology techniques

Biophysical and biochemical techniques

Electrophoresis

01. SDS-PAGE is commonly used to separate proteins. What is the primary role of SDS in this technique?
    a. To denature the proteins and eliminate the influence of their native 3-D structure on their migration.
    b. To create a porous gel matrix through which proteins can migrate based on their size.
    c. To bind to proteins and impart a uniform negative charge proportional to their mass.
    d. Reduces disulfide bonds to analyze individual polypeptide chains.

02. The rate of migration of a protein in an SDS-PAGE is not influenced by
    a. size of the protein
    b. charge density of the protein
    c. pore size of the gel
    d. strength of the electric field **[IISc]**

03. Sodium Dodecyl Sulphate (SDS) is used while separating proteins by SDS-PAGE because
    a. it helps in solubilization of proteins thereby making it easier to separate.
    b. it binds to proteins and confers uniform negative charge density.
    c. decreases the surface tension of the buffer used for electrophoresis.
    d. stabilizes the proteins.

04. What is the main difference between native PAGE and SDS-PAGE?
    a. SDS-PAGE separates proteins based on charge, while native PAGE separates them based on size.
    b. Native PAGE maintains the protein's native conformation, while SDS-PAGE denatures proteins.
    c. SDS-PAGE is used for DNA separation, while native PAGE is for protein separation.
    d. Native PAGE requires a reducing agent, while SDS-PAGE does not.

05. Which of the following statement is *false*?
    a. β-mercaptoethanol acts as reducing agent and used to break disulfide bonds.
    b. Bromophenol blue used as tracking dye during electrophoresis.
    c. Coomassie brilliant blue used for staining proteins.
    d. Sodium dodecyl sulphate is a cationic detergent.