CUET PG 2026 Microbiology Question Paper with Solutions(Memory Based)

Time Allowed :1 Hours 30 min	**Maximum Marks :**300	**Total Questions :**75

General Instructions

1. The exam lasts 90 minutes (1 hour 30 minutes).
2. There are 75 Multiple Choice Questions (MCQs) to be answered.
3. +4 marks for every correct answer. -1 mark (negative marking) for every incorrect answer. 0 marks for unanswered or un-attempted questions.
4. For any discrepancy in questions, the English version is considered final (except for language-specific papers).
5. Click one of the four options to choose an answer.
6. You must click "Save & Next" to confirm your response. Only saved answers are considered for evaluation.
7. Use "Mark for Review & Next" to flag a question for later. You can unselect or change your answer using the "Clear Response" button.
8. All calculations must be done on the Rough Sheets provided at the centre. These must be returned to the invigilator after the exam.

1. Which scientist is known as the "Father of Microbiology" for first observing "animalcules"?
(A) Louis Pasteur
(B) Robert Koch
(C) Antonie van Leeuwenhoek
(D) Edward Jenner

Correct Answer: (3) Antonie van Leeuwenhoek

Solution:

Concept: Microbiology began with the discovery of microscopic life forms. The first person to observe and describe these organisms laid the foundation for this field.
Step 1: Understanding "animalcules".
The term "animalcules" was used to describe tiny living organisms observed under a microscope.
Step 2: Identifying the scientist.
Antonie van Leeuwenhoek, a Dutch scientist, was the first to observe microorganisms using his self-made microscopes in the 17th century.
Step 3: Contribution to science.

- First to observe bacteria and protozoa
- Described microorganisms in detail

- Regarded as the Father of Microbiology

Step 4: Eliminating other options.

- Louis Pasteur: Known for germ theory and pasteurization
- Robert Koch: Known for Koch's postulates
- Edward Jenner: Developed smallpox vaccine

Step 5: Conclusion.
Thus, Antonie van Leeuwenhoek is known as the Father of Microbiology.

Quick Tip

Leeuwenhoek → First to see "animalcules" → Father of Microbiology.

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2. What is the primary component of the bacterial cell wall that is absent in Archaea?
(A) Cellulose
(B) Peptidoglycan
(C) Chitin
(D) Glycogen

Correct Answer: (2) Peptidoglycan

Solution:

Concept: The cell wall is an essential structural component in microorganisms, providing shape and protection. Its composition varies between different domains of life.
Step 1: Understanding bacterial cell walls.
Bacterial cell walls are primarily composed of **peptidoglycan**, a polymer consisting of sugars and amino acids.
Step 2: Archaea cell wall composition.
Archaea lack true peptidoglycan; instead, they may have pseudopeptidoglycan or other unique polymers.
Step 3: Significance of this difference.

- Basis for classification of microorganisms
- Important in antibiotic action (e.g., penicillin targets peptidoglycan)

Step 4: Eliminating other options.

- Cellulose: Found in plant cell walls
- Chitin: Found in fungi and exoskeletons of insects

- Glycogen: Storage carbohydrate

Step 5: Conclusion.
Thus, peptidoglycan is the primary component present in bacterial cell walls but absent in Archaea.

Quick Tip

Bacteria → Peptidoglycan cell wall; Archaea → No true peptidoglycan.

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3. Which staining technique is used specifically to identify *Mycobacterium tuberculosis*?
(A) Gram Staining
(B) Acid-fast Staining
(C) Capsule Staining
(D) Endospore Staining

Correct Answer: (2) Acid-fast Staining

Solution:

Concept: Different microorganisms require specific staining techniques based on their cell wall composition. *Mycobacterium tuberculosis* has a unique waxy cell wall rich in mycolic acids.
Step 1: Understanding Acid-fast property.
Due to the presence of mycolic acids, the bacteria resist decolorization by acid-alcohol after staining.
Step 2: Staining technique used.
Acid-fast staining (Ziehl–Neelsen staining) is specifically used to identify such bacteria.
Step 3: Procedure insight.

- Primary stain: Carbol fuchsin
- Decolorizer: Acid-alcohol
- Counterstain: Methylene blue

Acid-fast bacteria appear red, while non-acid-fast bacteria appear blue.
Step 4: Eliminating other options.

- Gram staining: Not effective due to waxy cell wall
- Capsule staining: Identifies capsules
- Endospore staining: Detects spores

Step 5: Conclusion.
Thus, Acid-fast staining is used to identify *Mycobacterium tuberculosis*.

Quick Tip

Mycobacterium → Acid-fast → Ziehl–Neelsen staining → Red cells.

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4. In the Lac Operon, which molecule acts as an inducer?
(A) Glucose
(B) Lactose
(C) Galactose
(D) Maltose

Correct Answer: (2) Lactose

Solution:

Concept: The lac operon is a classic model of gene regulation in prokaryotes, controlling the metabolism of lactose in *E. coli*.
Step 1: Understanding the inducer.
An inducer is a molecule that initiates gene expression by inactivating the repressor protein.
Step 2: Role of lactose.
Lactose (specifically its isomer allolactose) binds to the repressor protein, causing it to detach from the operator site.
Step 3: Effect on gene expression.
Once the repressor is removed, RNA polymerase can transcribe genes required for lactose metabolism.
Step 4: Eliminating other options.

- Glucose: Represses lac operon (catabolite repression)
- Galactose and Maltose: Not involved in lac operon induction

Step 5: Conclusion.
Thus, lactose acts as the inducer in the lac operon system.

Quick Tip

Lac operon → Lactose (allolactose) = Inducer → Turns ON gene expression.

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5. Which type of antibody is the only one capable of crossing the human placenta?
(A) IgA
(B) IgM
(C) IgG
(D) IgE

Correct Answer: (3) IgG

Solution:

Concept: Antibodies (immunoglobulins) are proteins produced by the immune system to fight pathogens. Different classes of antibodies have distinct structures and functions.
Step 1: Understanding IgG.
IgG is the most abundant immunoglobulin in human serum and plays a crucial role in secondary immune response.
Step 2: Placental transfer.
IgG is the only class of antibody that can cross the placenta from mother to fetus.
Step 3: Significance.

- Provides passive immunity to the fetus
- Protects newborns against infections during early life

Step 4: Eliminating other options.

- IgA: Found in secretions like saliva and milk
- IgM: First antibody produced but too large to cross placenta
- IgE: Involved in allergic reactions

Step 5: Conclusion.
Thus, IgG is the only antibody capable of crossing the human placenta.

Quick Tip

IgG → Only antibody crossing placenta → Provides passive immunity to fetus.

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6. What is the name of the process by which bacteria take up naked DNA from their environment?
(A) Transduction
(B) Conjugation
(C) Transformation
(D) Translation

Correct Answer: (3) Transformation

Solution:

Concept: Bacteria can acquire genetic material from their surroundings through different mechanisms, contributing to genetic variation and evolution.
Step 1: Understanding transformation.
Transformation is the process by which bacteria take up free or "naked" DNA fragments from their environment.
Step 2: Mechanism.

- DNA from dead or lysed cells is released into the environment
- Competent bacterial cells absorb this DNA
- The DNA may integrate into the bacterial genome

Step 3: Other gene transfer methods.

- Transduction: DNA transfer via bacteriophages
- Conjugation: Direct transfer through cell-to-cell contact
- Translation: Protein synthesis (not gene transfer)

Step 4: Significance.

- Contributes to antibiotic resistance
- Enhances genetic diversity

Step 5: Conclusion.
Thus, the process is called transformation.

Quick Tip

Naked DNA uptake → Transformation → Important for genetic variation.

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7. Which enzyme is responsible for the synthesis of RNA from a DNA template?
(A) DNA polymerase
(B) RNA polymerase
(C) Ligase
(D) Helicase

Correct Answer: (2) RNA polymerase

Solution:

Concept: The process of synthesizing RNA from a DNA template is known as transcription. This is a fundamental step in gene expression.
Step 1: Understanding transcription.
During transcription, genetic information stored in DNA is copied into messenger RNA (mRNA).
Step 2: Role of RNA polymerase.
RNA polymerase is the enzyme that binds to DNA and catalyzes the formation of RNA by adding ribonucleotides complementary to the DNA template strand.
Step 3: Functions of other enzymes.

- DNA polymerase: Synthesizes DNA during replication
- Ligase: Joins DNA fragments

- Helicase: Unwinds DNA strands

Step 4: Conclusion.
Thus, RNA polymerase is responsible for RNA synthesis from a DNA template.

Quick Tip

Transcription → RNA polymerase → DNA → RNA.

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8. What is the typical pore size of a membrane filter used to sterilize heat-sensitive liquids?
(A) 1.0 µm
(B) 0.45 µm
(C) 0.22 µm
(D) 5.0 µm

Correct Answer: (3) 0.22 µm

Solution:

Concept: Membrane filtration is a method used to sterilize heat-sensitive liquids such as vaccines, enzymes, and culture media by physically removing microorganisms.
Step 1: Understanding membrane filtration.
It involves passing liquid through a filter with very small pore sizes to retain microorganisms.
Step 2: Typical pore size.
A pore size of **0.22 µm** is commonly used to remove bacteria and achieve sterilization.
Step 3: Why this size is effective.

- Most bacteria are larger than 0.22 µm
- Ensures removal of microbial contaminants

Step 4: Eliminating other options.

- 1.0 µm and 0.45 µm: May allow some bacteria to pass
- 5.0 µm: Too large, ineffective for sterilization

Step 5: Conclusion.
Thus, 0.22 µm is the standard pore size used for sterilizing heat-sensitive liquids.

Quick Tip

Membrane sterilization → 0.22 µm filter → Removes bacteria effectively.

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9. Which microorganism is primarily used in the commercial production of Citric Acid?
(A) Saccharomyces cerevisiae
(B) Aspergillus niger
(C) Lactobacillus acidophilus
(D) Penicillium chrysogenum

Correct Answer: (2) Aspergillus niger

Solution:

Concept: Citric acid is an important organic acid widely used in food, pharmaceutical, and chemical industries. It is produced commercially using microbial fermentation.
Step 1: Understanding industrial production.
Citric acid is produced through submerged fermentation using specific microorganisms.
Step 2: Identifying the microorganism.
Aspergillus niger, a filamentous fungus, is the primary organism used due to its high yield and efficiency.
Step 3: Reasons for its use.

- High production capacity
- Ability to grow on inexpensive substrates
- Ease of cultivation and control

Step 4: Eliminating other options.

- Saccharomyces cerevisiae: Used in alcohol fermentation
- Lactobacillus acidophilus: Produces lactic acid
- Penicillium chrysogenum: Produces penicillin

Step 5: Conclusion.
Thus, *Aspergillus niger* is used for commercial citric acid production.

Quick Tip

Citric acid production → Aspergillus niger → High yield fermentation.

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10. The Baltimore Classification system categorizes viruses based on which characteristic?
(A) Shape of the virus
(B) Type of host infected
(C) Nature of genetic material and replication strategy
(D) Size of the virus

Correct Answer: (3) Nature of genetic material and replication strategy

Solution:

Concept: Viruses are classified in different ways based on their properties. The Baltimore Classification is a widely accepted system based on molecular biology.
Step 1: Basis of classification.
The Baltimore system classifies viruses according to:

- Type of nucleic acid (DNA or RNA)
- Single-stranded or double-stranded nature
- Method of replication and mRNA synthesis

Step 2: Groups in the system.
There are seven groups (I to VII), including:

- dsDNA viruses
- ssDNA viruses
- dsRNA viruses
- ssRNA (+/-) viruses
- Retroviruses

Step 3: Significance.
This classification helps in understanding viral replication mechanisms and guides antiviral strategies.
Step 4: Eliminating other options.

- Shape and size: Used in morphological classification
- Host type: Used in ecological classification

Step 5: Conclusion.
Thus, the Baltimore Classification is based on genetic material and replication strategy.

Quick Tip

Baltimore system → Classifies viruses by genome type + replication method.

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11. Which nitrogen-fixing bacteria forms a symbiotic relationship with the water fern Azolla?
(A) Rhizobium
(B) Azotobacter
(C) Anabaena
(D) Clostridium

Correct Answer: (3) Anabaena

Solution:

Concept: Nitrogen fixation is an essential biological process in which atmospheric nitrogen is converted into a usable form like ammonia. Certain microorganisms form symbiotic relationships with plants to carry out this function.
Step 1: Understanding Azolla symbiosis.
Azolla is an aquatic fern that forms a symbiotic association with nitrogen-fixing microorganisms.
Step 2: Identifying the microorganism.
Anabaena, a cyanobacterium (blue-green algae), resides in the leaf cavities of Azolla and fixes atmospheric nitrogen.
Step 3: Significance of this relationship.

- Enriches soil with nitrogen
- Widely used as a biofertilizer in paddy fields

Step 4: Eliminating other options.

- Rhizobium: Symbiotic with leguminous plants
- Azotobacter: Free-living nitrogen fixer
- Clostridium: Anaerobic nitrogen fixer

Step 5: Conclusion.
Thus, *Anabaena* forms a symbiotic relationship with Azolla.

Quick Tip

Azolla + Anabaena → Symbiotic nitrogen fixation → Used as biofertilizer.

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12. What is the net yield of ATP molecules produced during the glycolysis of one glucose molecule?
(A) 2 ATP
(B) 4 ATP
(C) 6 ATP
(D) 8 ATP

Correct Answer: (1) 2 ATP

Solution:

Concept: Glycolysis is the first stage of cellular respiration, occurring in the cytoplasm, where one molecule of glucose is broken down into two molecules of pyruvate.
Step 1: ATP investment phase.
During the initial steps of glycolysis, 2 ATP molecules are consumed.

Step 2: ATP generation phase.
In later steps, 4 ATP molecules are produced through substrate-level phosphorylation.
Step 3: Net ATP calculation.

$$\text{Net ATP} = 4 - 2 = 2$$

Step 4: Additional products.

- 2 NADH molecules
- 2 pyruvate molecules

Step 5: Conclusion.
Thus, the net gain of ATP from glycolysis of one glucose molecule is 2 ATP.

Quick Tip

Glycolysis → Invest 2 ATP, produce 4 ATP → Net gain = 2 ATP.

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13. Which class of MHC molecules is found on the surface of all nucleated cells?
(A) MHC Class I
(B) MHC Class II
(C) MHC Class III
(D) MHC Class IV

Correct Answer: (1) MHC Class I

Solution:

Concept: Major Histocompatibility Complex (MHC) molecules are cell surface proteins that play a crucial role in immune response by presenting antigenic peptides to T-cells.
Step 1: Understanding MHC Class I.
MHC Class I molecules are present on the surface of all nucleated cells in the body.
Step 2: Function.
They present endogenous (intracellular) antigens to cytotoxic T-cells (CD8+ T cells).
Step 3: Comparison with other classes.

- MHC Class II: Found only on antigen-presenting cells (macrophages, dendritic cells, B-cells)
- MHC Class III: Involved in complement proteins, not antigen presentation

Step 4: Importance.
This widespread presence allows the immune system to monitor all cells for infection or abnormal changes.
Step 5: Conclusion.
Thus, MHC Class I molecules are found on all nucleated cells.

Quick Tip

MHC I → Present on all nucleated cells → Presents intracellular antigens.

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14. What is the main structural protein that forms the capsid of a virus?
(A) Glycoprotein
(B) Capsomere
(C) Nucleoprotein
(D) Lipoprotein

Correct Answer: (2) Capsomere

Solution:

Concept: Viruses consist of genetic material enclosed within a protein coat called the capsid. The capsid protects the viral genome and aids in infection.
Step 1: Understanding capsid structure.
The capsid is made up of repeating protein subunits.
Step 2: Identifying the structural unit.
These subunits are called **capsomeres**, which assemble to form the complete capsid.
Step 3: Function of capsomeres.

- Provide structural stability
- Protect viral nucleic acid
- Determine shape of the virus

Step 4: Eliminating other options.

- Glycoproteins: Found in viral envelopes
- Nucleoproteins: Associated with nucleic acids
- Lipoproteins: Present in envelopes, not capsid

Step 5: Conclusion.
Thus, capsomeres are the main structural protein units forming the viral capsid.

Quick Tip

Capsid = Made of capsomeres → Protein units forming viral coat.

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15. Which method is used to determine the Minimum Inhibitory Concentration (MIC) of an antibiotic?

(A) Disk diffusion method
(B) Broth dilution method
(C) Gram staining
(D) Streak plate method

Correct Answer: (2) Broth dilution method

Solution:

Concept: Minimum Inhibitory Concentration (MIC) is the lowest concentration of an antibiotic that inhibits visible growth of a microorganism. It is an important parameter in antimicrobial susceptibility testing.
Step 1: Understanding MIC.
MIC helps determine the effectiveness of an antibiotic against a specific pathogen and guides appropriate dosage.
Step 2: Method used.
The **broth dilution method** is commonly used to determine MIC by preparing serial dilutions of an antibiotic in liquid growth medium.
Step 3: Procedure.

- Prepare a series of tubes with decreasing concentrations of antibiotic
- Inoculate each tube with the test microorganism
- Incubate and observe for growth
- The lowest concentration with no visible growth is the MIC

Step 4: Other methods explained.

- Disk diffusion: Gives zone of inhibition, not exact MIC
- Gram staining: Identifies bacteria type
- Streak plate: Used for isolation of colonies

Step 5: Conclusion.
Thus, the broth dilution method is used to determine MIC.

Quick Tip

MIC determination → Broth dilution method → Lowest concentration with no growth.