

**Solved Paper for Common Entrance Test for Admission to PG Courses
under CSS, May 2007**

BIOTECHNOLOGY

Time: 2 Hours

Max. Marks: 100

Instructions: Answer all the multiple choice questions from Part A and any ten of the descriptive questions from Part B.

- In this paper I have answered Part A and supported the answers with relevant explanations.
- Descriptive questions from Part B have also been jotted down.

PART – A

Time: 1 Hour

(50 x 1 = 50 Marks)

Each question carries 1 mark. No negative marks.

Q.1. Proto oncogenes are

- a) Present exclusively in viruses
- b) Present in fully developed cancer cells
- c) The genes present in normal cells similar to viral oncogenes
- d) Present in murine sarcoma virus

Ans C

Exp: A proto-oncogene is a normal gene that can become an oncogene due to mutations or increased expression.

Q.2. Cholesterol is transported to extrahepatic tissue mainly by

- a) HDL
- b) LDL
- c) VLDL
- d) IDL

Ans B

Exp: Cholesterol is transported from liver to extrahepatic tissues in Low density lipoprotein particles and (LDL) of plasma and from extrahepatic tissues to liver in High density lipoprotein particles (HDL).

Q.3. The chloride shift involves

- a) H⁺ leaving RBC for each CO₂ that enters
- b) HCO₃⁻ leaving RBC in exchange for Cl⁻
- c) K⁺ accompanying each HCO₃⁻ ion
- d) None

Ans B

Exp: Chloride shift is the simultaneous exchange of chloride (Cl⁻) and bicarbonate (HCO₃⁻) between plasma and the erythrocytes occurring whenever HCO₃⁻ is generated or decomposed within the erythrocytes.

Q.4. Actinomycin D is an inhibitor of

- a) Transduction
- b) Transcription
- c) Translation
- d) All the above

Ans B

Exp: Actinomycin D is effective as an inhibitor of transcription. It does this by binding DNA at the transcription initiation complex and preventing elongation by RNA polymerase.

Q.5. The idea of homeostasis was presented in 1859 by

- a) Claude Bernard
- b) Julian Huxley
- c) Charles Darwin
- d) Louis Pasteur

Ans A

Q.6. The surface area of a human lung is made larger by alveoli and is approximately the size of a

- a) Dinner plate
- b) Table

- c) Four person tent
- d) Tennis court

Ans D

Exp: Together, the lungs contain approximately 2400 km (1500 mi) of airways and 300 to 500 million alveoli, having a total surface area of about 70 m^2 ($8.4 \times 8.4 \text{ m}$) in adults — roughly the same area as one side of a tennis court.

Q.7. The Bowman's capsule functions as a

- a) Filter
- b) bellows
- c) suction pump
- d) sponge

Ans A

Exp: It is a part of kidney which filters blood and forms urine.

Q.8. Artificial immunity can be acquired from a

- a) Serious illness
- b) Vaccination
- c) Repeated exposure to the same microbe
- d) Treatment with penicillin

Ans B

Exp: Artificially or acquired active immunity can be induced by a vaccine, which contains antigen

Q.9. The regions of an antibody that determine its general role, or effector function are its

- a) variable (v) regions
- b) constant(c) regions
- c) mutated (m) regions
- d) bifurcated (b) regions

Ans B

Exp: Effector functions are determined by the constant regions of the heavy chains (Fc). The effector functions of immunoglobulins are mediated by this part of the molecule. Normally the ability of an antibody to carry out an effector function requires the prior binding of an antigen

Q.10. Lymphocytes that activate B cells and T cells are

- a) Activator B cells
- b) Macrophages
- c) Helper T cells
- d) Cytotoxic T cells

Ans C

Exp: T helper cell (T_H cells) assist other white blood cells in immunologic processes, including maturation of B cells into plasma cells and memory B cells, and activation of cytotoxic T cells and macrophages, among other functions.

Q.11. The major histocompatibility complex is a

- a) series of complement enhanced reactions to antigen
- b) group of antigens coded by a family of genes on the surfaces of body cells
- c) form of autoimmunity
- d) the major cause of cancer

Ans B

Exp: Major histocompatibility complex (MHC) is the name given to the human leukocyte antigen (HLA) system in humans. The super locus containing a large number of genes related to immune system resides on chromosome 6. The proteins encoded by certain genes of MHC are also known as antigens.

Q.12. K_m is equal to

- a) $[V_m/V = 1]$
- b) $[s]$ when $V = V_m$
- c) $[s]$ when $V = 0$
- d) $[s]$ when $V = 1/2 V_m$

Ans D

Exp: The Michaelis constant K_m is the substrate concentration at which the reaction rate is half of V_{max} .

Q.13. The identification of a compound on the basis of absorption of a particular wavelength of light is done through

- a) Autoradiography
- b) X-ray crystallography
- c) Spectrophotometry

d) Chromatography

Ans C

Exp: A spectrophotometer is employed to measure the amount of light that a sample absorbs.

Q.14. Milk casein is a

- a) Nucleoprotein
- b) Phosphoprotein
- c) Chromoprotein
- d) Glycoprotein

Ans B

Exp: Casein is the name for a family of related phosphoprotein proteins (α S1, α S2, β , κ). These proteins are commonly found in mammalian milk, making up 80% of the proteins in cow milk and between 60% and 65% of the proteins in human milk.

Q.15. The base present in Lecithin is

- a) Choline
- b) Serine
- c) Ethanolamine
- d) Inositol

Ans A

Exp: Phosphatidylcholine or lecithin has choline as nitrogenous base and it belongs to the family of phospholipids.

Q.16. A Ketogenic amino acid among the following is

- a) Leucine
- b) Alanine
- c) Glycine
- d) Serine

Ans A

Exp: A ketogenic amino acid is an amino acid that can be converted into ketone bodies through ketogenesis. This is in contrast to the glucogenic amino acids, which are converted into glucose. In humans, two amino acids are exclusively ketogenic: leucine and lysine

Q.17. Crossing over is

- a) Exchange of Genetic material
- b) Deletion of Chromosomes
- c) Linkage of Chromosomes
- d) Duplication of chromosomes .

Ans A

Exp: Crossing over is exchange of genetic material between non sister chromatids of homologous chromosomes.

Q.18. The First stable organic product of Carbon fixation in Photosynthesis is

- a) Phosphoglyceric acid
- b) Glucose
- c) Starch
- d) Pyruvic acid

Ans A

Q.19. The technique of recombinant DNA first became available

- a) 1880s
- b) 1930s
- c) 1950s
- d) 1970s

Ans D

Exp: Paul Berg and Herb Boyer produced the first recombinant DNA molecules in 1972.

Q.20. How many carbon atoms are there in a molecule of Glyceraldehyde phosphate?

- a) 2
- b) 3
- c) 4
- d) 6

Ans B

Exp: Glyceraldehyde phosphate is a phosphate ester of the 3-carbon sugar glyceraldehyde and has chemical formula $C_3H_7O_6P$.

Q.21. Virus that affects E. coli is called

- a) Virioids
- b) Bacteriophage
- c) Prions
- d) HIV

Ans B

Exp: Bacteriophages are the viruses which attack bacteria.

Q.22. Double bond consists of

- a) Two alpha bonds
- b) Two pi bonds
- c) One alpha and one pi bond
- d) None

Ans d

Exp: A double bond consists of a sigma bond (using hybrid orbitals) and a pi bond (using p orbitals).

Q.23. Denitrification is carried out under the influence of Microorganisms such as

- a) Thiobacillus
- b) Xanthomonas
- c) Nostoc
- d) Anabaena

Ans A

Exp: Denitrifying bacteria reduce nitrates or nitrites to nitrogen-containing gases. Potential examples include *Thiobacillus denitrificans*, *Micrococcus denitrificans*, *Paraoccus denitrificans* and *Pseudomonas*.

Q.24. Which one of the following methods is the best to separate enzymes?

- a) Electrophoresis
- b) Affinity Chromatography
- c) Ion Exchange Chromatography
- d) Salting out

Ans B

Exp: Affinity Chromatography exploits the capacity of biomolecules for specific, noncovalent binding of other molecules called ligands. Ex: Enzyme and ligands, Hormones and receptors etc.

Q.25. In blue green Algae the Photosystem II contains an important pigment concerned with

- a) Beta carotene
- b) Chlorophyll
- c) Cytochrome
- d) Phycocyanin

Ans A

Exp: Photosystem II (or water-plastoquinone oxidoreductase) is located in the thylakoid membrane of plants, algae, and cyanobacteria and is involved in Light-dependent reactions. It contains 12 beta-carotene units.

Q.26. The cytochrome participating in bacterial photosynthesis are

- a) A type
- b) B type
- c) C type
- d) F type

Ans C

Q.27. The first enzyme that reduces Nitrates to Nitrite and Ammonia in Plants is

- a) Nitrate reductase
- b) Nitrite reductase
- c) Glutamine synthetase
- d) Glutamate dehydrogenase

Ans A

Q.28. The Enzyme Nitrilase convert

- a) Indole acetonitrile to IAA
- b) IAA to Indole acetonitrile
- c) Indole pyruvic acid to IAA
- d) Tryptamine to IAA

Ans A

Exp: Nitrilase enzymes catalyses the hydrolysis of nitriles to carboxylic acids and ammonia, without the formation of "free" amide intermediates. Nitrilases are involved in natural product biosynthesis and post translational modifications in plants, animals, fungi and certain prokaryotes.

Q.29. The diameter of axial hole of TMV is

- a) 23A°
- b) 40 A°
- c) 14 A°
- d) 30 A°

Ans B

Q.30. A monocentric chromosome with a central centromere is known as

- a) Metacentric
- b) Sub metacentric
- c) Monocentric
- d) Acrocentric

Ans A

Exp: Metacentric chromosomes have their centromere located exactly in the centre and the two arms are of the same length. Such a chromosome assumes the shape of 'V' during anaphase.

Q.31. A chemical made by white blood cells whose molecules have a shape that can recognize and inactive foreign bodies are known as

- a) Antibody
- b) Antigen
- c) Lymphocytes
- d) Leucocytes

Ans A

Q.32. The remains of a follicle in a ovary where progesterone is made

- a) Corpus luteum
- b) Corpus callosum
- c) Corpus striatum
- d) Corpus spinosum

Ans A

Exp: The corpus luteum is a temporary endocrine structure in mammals, involved in production of relatively high levels of progesterone and moderate levels of estradiol and inhibin A. It develops from an ovarian follicle during the luteal phase of the menstrual cycle or estrous cycle.

Q.33. An anaerobic organism that can only survive in parasitizing the host is known as

- a) Obligate parasite
- b) Obligate anaerobe
- e) Saprophyte
- d) Derobe

Ans B

An obligate parasite is a parasitic organism that cannot live independently of its host.

Q.34. The organism that appear blue under the microscope after gram staining is known

- a) Gram positive organisms
- b) Gram negative organisms
- e) Photosensitive organisms
- d) Chemosensitive organisms

Ans A

Exp: Gram-positive bacteria are those that are stained dark blue or violet by Gram staining.

Q.35. A unit composed of the base and sugar is known as

- a) Nucleoside
- b) Nucleotide
- c) Polynucleotide
- d) Polypeptide

Ans A

Q.36. An intercalating dye used to detect nucleic acid when viewed under UV light

- a) Ethidium bromide
- b) Aeridine blue
- c) Cromassie blue

d) Gram stain

Ans A

Exp: Ethidium bromide is an intercalating agent commonly used as a fluorescent tag (nucleic acid stain) in molecular biology laboratories for techniques such as agarose gel electrophoresis.

Q.37. An organelle of photosynthetic organisms such as algae and higher plants which captures light energy and converts it into chemical energy in the form of Carbohydrates

- a) Chloroplast
- b) Leucoplast
- c) Carotene
- d) Xanthophylls

Ans A

Exp: Chloroplasts are photosynthetic organelles found in plant cells and other eukaryotic organisms that conduct photosynthesis.

Q.38. A device which uses steam under pressure to sterilize materials at elevated temperatures

- a) Autoclave
- b) Fermentor
- c) Laminarflow
- d) Thermo cool

Ans A

Exp: An autoclave is an instrument used to sterilize equipment and supplies by subjecting them to high pressure saturated steam at 121 °C for around 15–20 minutes depending on the size of the load and the contents.

Q.39. The process of microbial reduction of nitrate to reduced forms of nitrogen, such as dinitrogen gas or N_2O is known as

- a) Denitrification
- b) Nitrification
- c) Ammonification
- d) Saccharification

Ans A

Exp: Denitrification is a microbially facilitated process of nitrate reduction that may ultimately produce molecular nitrogen (N₂) through a series of intermediate gaseous nitrogen oxide products.

Q.40. Naked DNA taken into cells through transient created by brief pulses of high voltage. A very efficient method for the transfection of yeast, plant and thinner cells

- a) Electroporation
- b) Transfection
- c) Injection
- d) Transduction

Ans A

Q.41. The term used to describe a short region of a polypeptide sequence is

- a) Motif
- b) Domain
- c) Globin fold
- d) Rossmann-fold

Ans A

Q.42. A small insertion or deletion of $3n + 1$ nucleotides which disrupts the reading frame, generating a novel polypeptide sequence distal to the mutation is known as

- a) Frameshift mutation
- b) Read through mutation
- c) Nonsense mutation
- d) Point mutations

Ans A

Q.43. An agent inducing tumor formation

- a) Oncogen
- b) Mutagen
- c) Clastogen
- d) Carcinogen

Ans D

Q.44. The term to define gene as a unit of genetic function a region of DNA which encodes a specific product is known as

- a) Cistron
- b) Operon
- c) Muton
- d) Recon

Ans A

Exp: A cistron is a term used to describe the locus responsible for generating a protein. It can also be defined as the segment of DNA that contains all the information for production of a single polypeptide.

Q.45. The experiment with wheat Kernel colour by Nilsson-ehle led to the foundation of the principles of

- a) Quantitative genes
- b) Polygenic Inheritance
- c) Cumulative genes
- d) All the above

Ans A

Exp: In 1909 Herman Nilsson-Ehle from Sweden did a series of experiments with kernel color in wheat to frame the principles of Quantitative genetics.

Q.46. The protein sequence database is

- a) SWISS-PROT
- b) EMBL .
- c) OMIM
- d) PDB

Ans A

Exp: SWISS-PROT is a curated protein sequence database.

Q.47. The biochemical pathway in the liver that converts ammonia to urea

- a) Ornithine cycle
- b) Calvin cycle
- c) Krebs's cycle
- d) Hatch slack cycle

Ans A

Exp: The urea cycle (also known as the ornithine cycle) is a cycle of biochemical reactions occurring in many animals that produces urea ((NH₂)₂CO) from ammonia (NH₃).

Q.48. A family has 5 daughters probability of 6th child being girl will be

- a) 1 in 2
- b) 1 in 5
- c) 1 in 3
- d) 1 in 6

Ans A

Exp: The probability of production of sperm cells containing a Y chromosome is same as the probability of production of sperm cells containing X chromosome. Hence the chance of the resulting zygote being XX or female is always 1 in 2.

Q.49. The lack of pigmentation is called albinism, it is due to a recessive allele 'a'. Two normal parents have albino child. What will be the probability of the next child will be albino ?

- a) $\frac{1}{4}$
- b) $\frac{1}{16}$
- c) $\frac{1}{2}$
- d) 0

Ans A

PART — B

Time: 1 Hour

(10x5=50 Marks)

Answer any ten questions from Part B: Each question carries 5 marks.

1. Under what conditions does Mendel's law of independent assortment apply ?
2. Enumerate the organization of a typical Chromosome.
3. What is invert sugar? Explain.
4. Write the difference between DNA & RNA.
5. Explain isoelectric point.
6. What is the primary structure of a Protein?
7. Write a note on Sphingolipids.
8. Write a note on Mitochondrial DNA.

9. Describe the structure of a Prokaryotic cell.
10. Differentiate between cell walls of Gram positive and Gram Negative bacteria.
11. Differentiate between Antibiotic and Antibiosis.
12. What is Agglutination?
13. Explain the Method of serial dilution.
14. What is IPR?
15. List the applications of Cloning. Add a note on its advantages.