

(6 pages)

Reg. No. :

Code No. : 6169

Sub. Code : PBTM 31

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2022.

Third Semester

Biotechnology — Core

PLANT BIOTECHNOLOGY

(For those who joined in July 2017-2020)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Plant biotechnology involves
 - (a) Production of valuable products in plants
 - (b) Rapid clonal multiplication of desired genotypes
 - (c) Production of virus free plants
 - (d) All of these

2. The culturing of cells in liquid agitated medium is called
- (a) Liquid culture (b) micropropagation
(c) Agar culture (d) Suspension culture
3. Which of the following plant cells shows totipotency?
- (a) Meristem (b) Sieve tube
(c) Cork cells (d) Xylem vessels
4. Which of the following is the main application of embryo culture?
- (a) Clonal propagation
(b) Production of embryoids
(c) Induction of somaclonal variations
(d) Overcoming hybridisation barriers
5. Plant genome is
- (a) Genes on nuclear DNA
(b) Nuclear DNA + mitochondrial DNA
(c) Nuclear DNA + Mitochondrial DNA + Chloroplast DNA
(d) Nuclear DNA + chloroplast DNA

6. Which sterility is exploited in hybrid seed production
- (a) Male genetic sterility
 - (b) Cytoplasmic sterility
 - (c) Cytoplasmic genetic male sterility is found
 - (d) Genetic
7. Virulence trait of *Agrobacterium tumefaciens* is borne on
- (a) chromosomal DNA
 - (b) tumour inducing plasmid DNA
 - (c) both chromosomal and plasmid DNA
 - (d) cryptic plasmid DNA
8. Which technique is used to introduce genes into dicots?
- (a) Electroporation
 - (b) Particle acceleration
 - (c) Microinjection
 - (d) Ti plasmid infection
9. Transgenic plants
- (a) contain foreign genes in their
 - (b) are used to produce human antibodies
 - (c) both (a) and (b)
 - (d) are plants that differ in geographical locations.

10. Which of the following has been widely used to provide resistance against plant viruses?
- (a) Virus resistance genes from bacteria
 - (b) Expression of virus coat protein genes in transgenic plants
 - (c) Expression of anti-virus genes in vectors that transmit viruses
 - (d) Expression of ribonuclease (RNase) genes in host plants

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) What is Plant Tissue Culture?

Or

- (b) Write a brief note on Auxin.

12. (a) What is an explant? List some explants that are used in plant tissue culture.

Or

- (b) Explain the procedures involved in anther culture.

13. (a) Define cytoplasmic male sterility.

Or

(b) What is Bifunctional vectors? Explain it.

14. (a) Define restriction enzyme (Restriction Endonuclease)

Or

(b) What is Bio-farming?

15. (a) Write a note on transgenic plants resistance to herbicide.

Or

(b) Enumerate the applications of transgenic plants.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)

Each answer should not exceed 600 words.

16. (a) Discuss about sterilization of media and culture vessel.

Or

(b) What are the Advantages of Tissue Cultured Plants?

17. (a) Explain the somatic embryogenesis.

Or

(b) Discuss the applications and limitations of synthetic seeds.

18. (a) How will you make expression of Rubisco gene (rbcL) gene in Chloroplast.

Or

(b) Discuss the mitochondrial genome organisation in plants.

19. (a) What are all the characterize features of a Plasmids that can be considered as a suitable cloning vector?

Or

(b) Write an essay about the Southern blotting technique.

20. (a) Elaborate about Bacillus thuringiensis (Bt) toxin genes and the advantages of transgenic plants with Bt genes.

Or

(b) Briefly recall the demerits of transgenic technology.

(6 pages)

Reg. No. :

Code No. : 6173

Sub. Code : PBTM 41

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2022.

Fourth Semester

Biotechnology – Core

APPLIED BIOINFORMATICS

(For those who joined in July 2017-2020)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. A detailed flow chart is called as
 - (a) Stack
 - (b) Macro
 - (c) Micro
 - (d) Union

2. Actual instructions in flowcharting are represented in
 - (a) Circles
 - (b) Boxes
 - (c) Arrows
 - (d) Lines

3. Each record in a database is called as
- (a) Entry (b) File
(c) Record (d) Ticket
4. Literature database include
- (a) MEDLINE and PubMed
(b) MEDLINE and PDB
(c) PubMed and PDB
(d) MEDLINE and PDS
5. Molecular Phylogeny can be performed with _____ sequences.
- (a) DNA (b) RNA
(c) Protein (d) DNA, RNA, Protein
6. Energy minimization of a modeled protein can be done using
- (a) ChemSketch (b) MolDraw
(c) RasMol (d) Swiss-PDB viewer
7. The number unpaired electron in N_2^+
- (a) 3 (b) 1
(c) 2 (d) 0

8. Molecules are held together in a Crystal by
- (a) Hydrogen bond
 - (b) Electrostatic attraction
 - (c) Vander Waal's attraction
 - (d) Dipole-dipole attraction
9. Which of the following is responsible for specifying the 3D shape of a protein?
- (a) Peptide bond
 - (b) Amino acid sequence
 - (c) Interaction with other peptides
 - (d) Interaction with molecular chaperones
10. SDS used in SDS-PAGE is
- (a) An anionic detergent
 - (b) A cationic detergent
 - (c) An union exchanges
 - (d) A cation exchanges

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Define algorithm with few examples.

Or

- (b) Explain about the process of data mining.

12. (a) Write a short note on GenBank.

Or

- (b) Write about CLUSTAL W.

13. (a) What do you mean by homology modelling?

Or

- (b) Explain the principle of drug designing.

14. (a) Write the electronic structure of sodium atom.

Or

- (b) Explain about covalent bond of a Chemical reaction.

15. (a) Draw the three structure of protein with example.

Or

- (b) Explain the principle and instrumentation of ORD.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)

Each answer should not exceed 600 words.

16. (a) Give an account on low level and high level languages, with binary number system.

Or

- (b) Write a detailed account on programming techniques.

17. (a) Describe the EMBL nucleotide sequence database.

Or

- (b) Discuss the pairwise alignment for nucleic acid and protein sequences.

18. (a) Comment on the RASMOL and MOLMOL.

Or

- (b) Enumerate the steps in access of Web based bioinformatics tool.

19. (a) Write a short note on

- (i) Wave functions.
- (ii) Spin of particles.

Or

- (b) Describe the relationship between the atomic structure and chemical properties.

20. (a) Discuss the Ramachandran plot for protein structure.

Or

(b) Comment on the instrumentation and application of SDS-PAGE.

(6 pages)

Reg. No. :

Code No. : 6175

Sub. Code : PBTM 43

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2022.

Fourth Semester

Biotechnology - Core

MEDICAL BIOTECHNOLOGY

(For those who joined in 2017-2020 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Which of the following is known as royal disease?
 - (a) Sickle cell anaemia
 - (b) Hemophilia
 - (c) Alzheimer's disease
 - (d) Color blindness

2. Huntingting's chorea is characterized by
 - (a) Incogruent muscle movement
 - (b) Inability to speak
 - (c) Disordered muscle movement and mental deterioration
 - (d) Weak eye sight and hearing power
3. Why is probe labeled?
 - (a) Improve visibility
 - (b) Improved stability
 - (c) Improve location identification
 - (d) Improve binding capability
4. The nano particles target the rare-causing cells and remove them from blood.
 - (a) Tumour (b) Fever
 - (c) Infection (d) Cold
5. Vaccination in malaria has not been successful because
 - (a) Plasmodium produces antitoxins
 - (b) Plasmodium produces minute bodies
 - (c) Not produce antibodies and antitoxins
 - (d) None of the above

6. Interferons are
- (a) Cytokine barriers
 - (b) Physical barriers
 - (c) Cellular barriers
 - (d) Physiological barriers
7. Drug aspirin is used for
- (a) Reducing fever
 - (b) Prevention of blood clot
 - (c) Blood thinner
 - (d) All of the above
8. A drug which is effective in curing malaira
- (a) Aspirin (b) Quinine
 - (c) Morpine (d) Analgin
9. In gene therapy, the genetic defect is corrected by the delivery of
- (a) Incorrect (b) Mutant
 - (c) Normal (d) Jumping
10. In which year was the first gene therapy given?
- (a) 2010 (b) 1990
 - (c) 1995 (d) 2000

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Explain the characteristic features of Huntington's disease.

Or

- (b) Bring out signs and symptoms of Duchenne Muscular Dystrophy.

12. (a) Explain the non invasive procedures on diagnosis of diseases.

Or

- (b) Analyze the properties DNA probes.

13. (a) Evaluate the impacts on rDNA drugs.

Or

- (b) Give the current strategies on development of vaccines against malaria.

14. (a) Write about the mechanism and action of aspirin.

Or

- (b) Write about the anti hypertensive drugs.

15. (a) Write about the mechanism of gene therapy.

Or

(b) Write about the nano medicine.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)

Each answer should not exceed 600 words.

16. (a) Describe the molecular aspect of sickle cell disease.

Or

(b) Comment on the microbial disease on hepatitis and lyme disease.

17. (a) Enlist the invasive techniques on prenatal diagnosis.

Or

(b) State the impacts of protein and enzyme markers on diagnosis of disease.

18. (a) Specify about growth hormone and its impact on healthcare.

Or

(b) Mention the development of vaccines against tuberculosis.

19. (a) Give an account on mechanism of action of paracetamol with an example.

Or

- (b) State the importance of bronchodilator drugs with a suitable example.

20. (a) Describe about the nanodevices employed in medical biotechnology.

Or

- (b) Comment on the various neurological disorders.
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(6 pages)

Reg. No. :

Code No. : 6479

Sub. Code : ZBTM 11

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2022.

First Semester

Biotechnology – Core

CELL BIOLOGY AND GENETICS

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. In fluorescence microscopy, which of the following performs the function of removing all light except the blue light?
 - (a) Exciter filter
 - (b) Barrier filter
 - (c) Dichroic mirror
 - (d) Mercury arc lamp

2. Which type of microscope is especially useful for viewing thick structures such as biofilms?
- (a) a transmission electron microscope
 - (b) a scanning electron microscopes
 - (c) a phase-contrast microscope
 - (d) a confocal scanning laser microscope
3. Cdk2/cyclinE functions in _____
- (a) G₂/M transition
 - (b) G₂
 - (c) M
 - (d) G₁ / S this transition
4. Oncogenes do not encode for _____
- (a) Trans-membrane protein receptors
 - (b) Growth factors
 - (c) DNA-dependent RNA polymerase
 - (d) Cytoplasmic G-proteins and protein kinases
5. Chromosome structure can be observed best during _____
- (a) Anaphase
 - (b) Metaphase
 - (c) Prophase
 - (d) None of the above

6. If DNA is damaged, which of the following gene arrest cell cycle?
- (a) Rb
 - (b) p53
 - (c) Hedgehog receptor
 - (d) p16
7. Cancer is caused due to
- (a) Controlled mitosis
 - (b) Uncontrolled mitosis
 - (c) Controlled meiosis
 - (d) Uncontrolled meiosis
8. The enzyme that catalyzes the transposition of an IS element is called _____
- (a) Transposase
 - (b) Integrase
 - (c) Transcriptase
 - (d) Polymerase
9. 25 individuals in a population are homozygous dominant, then the individuals that are expected to be homozygous recessive are
- (a) 100
 - (b) 75
 - (b) 50
 - (d) 25

10. The Phenomenon of two or more than two genes affecting the expression of each other is called _____

- (a) Crossing over
- (b) Pairing
- (c) Gene interaction
- (d) Linkage

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Write a short notes on Cryo microscopy.

Or

(b) Explain Photomicrography with suitable diagram; Photomicrography.

12. (a) Comment on quiescence.

Or

(b) Analyze the cellular responses to environmental signals in plants and animals.

13. (a) Explain aging.

Or

(b) Summarize the Tumor suppressor gene and Oncogenes.

14. (a) Discuss the role of Transposable elements.

Or

(b) Define Linkage, what is the measurement of genetic linkage and mapping?

15. (a) Explain gene Interaction.

Or

(b) Discuss natural selection.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)
Each answer should not exceed 600 words.

16. (a) Describe the principle and instrumentations of fluorescent microscopy and Applications.

Or

(b) Describe TEM and SEM.

17. (a) Discuss the role of cyclin in molecular event of cell cycle.

Or

(b) Describe Immortalization of T antigen

18. (a) Discuss the uncontrolled cell cycle.

Or

(b) Explain Hall mark of cancer.

19. (a) Illustrate Mendelian Inheritance with examples.

Or

(b) Discuss Transcription Prokaryotes.

20. (a) Explain the principle and applications of Hardy Weinberg equilibrium law.

Or

(b) Describe Population genetics

(6 pages)

Reg. No. :

Code No. : 6480

Sub. Code : ZBTM 12

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2022.

First Semester

Biotechnology – Core

MICROBIAL PHYSIOLOGY

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The organism which obtain their energy from chemicals are designated as
 - (a) prototrophs
 - (b) chemotrophs
 - (c) organotrophs
 - (d) autotrophs

2. _____ organisms produce their own food.
- (a) Autotroph (b) Heterotroph
(c) Saprotrophs (d) None of these
3. The average size of the cells in the exponential phase is _____.
- (a) larger than the initial size
(b) smaller than the initial size
(c) equal to the initial size
(d) maybe smaller or larger than the initial size
4. Organisms which do not prepare their own food are called as
- (a) Autotroph (b) Heterotroph
(c) Saprotrophs (d) None of these
5. Which of the following enzymes converts pyruvate to lactate?
- (a) Enolase
(b) Pyruvate kinase
(c) Pyruvate carboxylase
(d) Pyruvate dehydrogenase

6. Oxidative phosphorylation results in the formation of
- (a) Oxygen (b) ADP
(c) ATP + H₂O (d) NADH
7. Fermentation occurs in the
- (a) presence of oxygen
(b) absence of oxygen
(c) presence of nitrogen
(d) presence of carbon
8. Anaerobic respiration by yeast produces
- (a) CO₂
(b) Wine and beer
(c) Alcohol
(d) All of the above
9. Which of the following amino acids is both glucogenic and ketogenic in nature?
- (a) Leucine (b) Lysine
(c) Isoleucine (d) Histidine

10. Classification of organisms as oxygenic or anoxygenic during photosynthesis is based on _____.

- (a) the presence of CO₂
- (b) the generation of oxygen
- (c) the presence of light
- (d) the presence of water

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Summarize Endospore formation in Bacteria.

Or

(b) State Copiotrophs.

12. (a) Write short notes on Curve generation time.

Or

(b) Describe diauxic growth.

13. (a) Comment on ED Pathways.

Or

(b) Explain Hexose mannose phosphate.

14. (a) Criticize propionic acid fermentation.

Or

(b) Write a note on Fermentation.

15. (a) Explain Carbon dioxide fixation.

Or

(b) Describe Bioluminescence.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Illustrate the Autotrophs.

Or

(b) Explain Chemoautotrophs.

17. (a) Write an essay on different phases of growth curve.

Or

(b) Explain the factors influencing microbial growth.

18. (a) Discuss – Glycolysis pathway.

Or

(b) Describe – TCA cycle.

19. (a) Describe Alcoholic fermentation.

Or

(b) Explain anerobic respiration.

20. (a) Explain the Biosynthesis of amino acid.

Or

(b) Analyse Anoxygenic photosynthesis.

2. Which of the following is used in prokaryotic replication?
- (a) DNA polymerase I
 - (b) DNA polymerase II
 - (c) DNA polymerase III
 - (d) DNA polymerase δ
3. The RNA polymerase core enzyme converts into a holoenzyme on the addition of the _____ subunit.
- (a) α
 - (b) β
 - (c) β'
 - (d) σ
4. The enzyme used for capping mRNA is a _____
- (a) Kinase
 - (b) Isomerase
 - (c) Transferase
 - (d) Polymerase
5. Which of the following is the slowest process among the following?
- (a) Replication
 - (b) Translation
 - (c) Splicing
 - (d) Transcription
6. In case of prokaryotes the first tRNA enters the ribosome in the
- (a) A site
 - (b) P site
 - (c) E site
 - (d) Already attached to the mRNA before ribosome association

7. How many structural genes are present in a lac operon?
- (a) One (b) Five
(c) Three (d) Seven
8. To which class of transcription factor do nuclear receptors belong?
- (a) Zinc finger proteins
(b) Leucine zipper proteins
(c) Helix-turn-helix proteins
(d) Helix-loop-helix proteins
9. Sequences that can function as origins of replication are called as
- (a) partial replicating sequences
(b) self replicating sequences
(c) autonomously replicating sequences
(d) modified replicating sequences
10. _____ should enter the cell in the case of activation of the reporter gene for two hybrid system.
- (a) Bait protein
(b) Prey protein
(c) Both bait and prey protein
(d) Either one of them

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Describe the models of DNA replication.

Or

- (b) Demonstrate the rolling circle mode of replication.

12. (a) Outline the synthesis of prokaryotic mRNA with a neat sketch.

Or

- (b) Interpret RNA processing and 5'-Capping.

13. (a) Distinguish prokaryotic and eukaryotic translation.

Or

- (b) Write short notes on Translocation with neat diagram.

14. (a) Write short notes on Cis-acting and trans-acting regulatory factors.

Or

- (b) Illustrate zinc finger motifs and leucine zippers in detail with neat diagram.

15. (a) Define luciferase reporter assay? Explain how it works.

Or

- (b) Narrate the Characteristics of reporter gene and its types.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Listout of events happening during DNA replication process in eukaryotes and discuss the enzymes involved in the process.

Or

- (b) Demonstrate the rolling circle and theta mode of replication.

17. (a) Narrate prokaryotic transcription initiation, elongation and termination mechanisms with suitable diagram and Factors involved in it.

Or

- (b) Demonstrate the process of post transcriptional modification of mRNA.

18. (a) Illustrate prokaryotic translational initiation, elongation and termination mechanisms with suitable diagram and factors involved in it.

Or

- (b) Demonstrate the steps in eukaryotic translation with neat diagram.

19. (a) Discuss the transcriptional control in eukaryotes.

Or

- (b) What are the structural genes controlled by lac operon. Explain the catabolic repression effects of this operon.

20. (a) Demonstrate invitro translation in detail.

Or

- (b) Illustrate nuclear run on assay in detail.
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(6 pages)

Reg. No. :

Code No. : 6482

Sub. Code : ZBTM 14

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2022.

First Semester

Biotechnology – Core

NANO BIOTECHNOLOGY

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. “There is plenty of room at the bottom.” This was stated by _____.
(a) Eric Drexler (b) Richard Feynmann
(c) Harold Croto (d) Richard Smalley

2. The colour of the nano gold particles is _____.
(a) Yellow (b) Orange
(c) Red (d) Variable

3. Size of quantum dots
- (a) 2 nm (b) 3 nm
(c) 5 nm (d) 9 nm
4. Which of the following is an example of top-down approach for the preparation of nanomaterials?
- (a) Gas phase agglomeration
(b) Molecular self-assembly
(c) Mechanical grinding
(d) Molecular beam epitaxial
5. Nano wire are used in _____
- (a) Transistors (b) Resistors
(c) Capacitors (d) Transducers
6. Which of the following is the principal factor which causes the properties of nanomaterials to differ significantly from other materials?
- (a) Size distribution
(b) Specific surface feature
(c) Quantum size effects
(d) All the above

7. Select the incorrect statement from the following options
- (a) Self-assembly is a top-down manufacturing technique
 - (b) In self-assembly, weak interactions play very important role
 - (c) Self-assembling molecules adopt an organized structure which is thermodynamically more stable than the single, unassembled components.
 - (d) Compared to the isolated components, the self-assembled structure has a higher order
8. Which of the following is the application of nanotechnology to food science and technology?
- (a) Agriculture
 - (b) Food safety and biosecurity
 - (c) Product development
 - (d) All of the above
9. What are the advantages of nano-composite packages??
- (a) Lighter and biodegradable
 - (b) Enhanced thermal stability, conductivity and mechanical strength
 - (c) Gas barrier properties
 - (d) All of the above

15. (a) Explain Nano robotics.

Or

(b) Criticize protein microarray.

PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Illustrate the History and future of nanotechnology.

Or

(b) Analyze the applications of nanotechnology.

17. (a) Illustrate the tools and techniques that used in nanotechnology.

Or

(b) Explain in detail about STM.

18. (a) Analyse Nano wires and Nano gears produced using nanomaterial.

Or

(b) Describe conjugation of protein with ligand

19. (a) Explain Nano systems in drug targeting

Or

(b) Describe nano cancer therapy

20. (a) Explain Synthetic chip on bacteriorhodopsins.

Or

(b) Explain in detail about Protein microarray.

(6 pages)

Reg. No. :

Code No. : 6483

Sub. Code : ZBTM 21

M.Sc. DEGREE EXAMINATION, NOVEMBER 2022.

Second Semester

Biotechnology - Core

BIOCHEMISTRY

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Which of the following does not exhibit the osazone formation?
(a) Glucose (b) Fructose
(c) Starch (d) Lactose
2. Cori's disease belongs to which type of glycogen storage disease?
(a) Type I (b) Type II
(c) Type III (d) Type V

3. Uridylic acid present in the RNA is
 - (a) Nucleotides
 - (b) Pyrimidine
 - (c) Purine
 - (d) Nucleoside

4. The type of coiling in DNA is
 - (a) Zig-Zag
 - (b) Left handed
 - (c) Opposite
 - (d) Right handed

5. Name of the bond between the amino acids
 - (a) Glycosidic
 - (b) Peptide
 - (c) Ionic
 - (d) Acidic

6. Urea production occurs exclusively in
 - (a) Kidney
 - (b) Liver
 - (c) Blood
 - (d) Urine

7. β -Oxidation of fatty acids occurs in
 - (a) Peroxisome
 - (b) ER
 - (c) GC
 - (d) Mitochondria

8. Ethanolamine as a base found in the phospholipid of
- (a) Lecithin (b) Cephalin
(c) Sphingosine (d) Shingomyelin
9. Which of the following food source has the highest level of vitamin C?
- (a) Parsley (b) Broccoli
(c) Black currants (d) Orange juice
10. Which of the following is referred to antidiuretic hormone
- (a) TSH (b) Oxytocin
(c) Adrenalin (d) Vasopressin

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Briefly explain the mutarotation with examples.

Or

- (b) Write about the characteristics features of type I diabetes mellitus.

12. (a) Briefly explain the bio synthesis of purine.

Or

(b) Write down structure and properties of B-DNA.

13. (a) Explain the structure of essential amino acids.

Or

(b) Write about the reactions of transamination.

14. (a) Explain the chemical properties of fatty acids.

Or

(b) Write down the steps in β oxidation of fatty acids.

15. (a) Write a short note on bio chemical properties of Vitamin D.

Or

(b) Briefly explain the hormones of adrenal gland.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)

Each answer should not exceed 600 words.

16. (a) How will you classify carbohydrates in detail?

Or

- (b) Describe the glycogen storage diseases.

17. (a) State the bio synthesis and degradation of thymine.

Or

- (b) Describe the structure of Watson-Crick model.

18. (a) Give an account on properties of amino acids.

Or

- (b) List out the inborn errors of metabolism.

19. (a) Comment on the bio synthesis of unsaturated fatty acids.

Or

- (b) Write an account on structure and significance of phospholipids.

20. (a) Give an account on mechanism of hormonal action and its regulation.

Or

(b) Describe about the oxidative phosphorylation.

(6 pages)

Reg. No. :

Code No. : 6484

Sub. Code : ZBTM 22

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2022.

Second Semester

Biotechnology — Core

BIOLOGY OF IMMUNE SYSTEM

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Which of the following characteristics are common in lymphocytes, macrophages and neutrophils?
 - (a) They are all part of the nonspecific immune response in vertebrates.
 - (b) They are all part of the specific immune response in vertebrates
 - (c) They are all part of the internal defences of nonvertebrate.
 - (d) They are all types of white blood cells

2. Which of the following blood proteins can destroy pathogens?
 - (a) Major histocompatibility complex
 - (b) Platelets
 - (c) Fibrinogen
 - (d) Complement system

3. What type of B cell is like a tiny factory that produces antibodies identical to the B cell receptor that bind to the original antigen?
 - (a) T cells
 - (b) Memory cells
 - (c) Plasma cells
 - (d) Macrophages

4. What is the behavior in which T cells and B cells constantly travel throughout the body seeking out and destroying foreign substances?
 - (a) Antibody-mediated immune response
 - (b) Immune surveillance
 - (c) Cell-mediated immune response
 - (d) Vaccination

5. What type of B cell remains dormant in the body, but can respond rapidly if the same antigen appears again?
 - (a) T cells
 - (b) Memory cells
 - (c) Plasma cells
 - (d) Macrophages

6. The maturation of T cells and the production of particular T cell receptors occurs in the
 - (a) Thyroid gland
 - (b) Thymus gland
 - (c) Testes
 - (d) All of these

7. Lack of reaction to our own Human Leukocyte Antigens (HLAs) is known as
 - (a) Autoimmunity
 - (b) Complement system
 - (c) Clonal selection
 - (d) Tolerance

8. Kupffer cells are macrophages found on
 - (a) Lung
 - (b) Bone
 - (c) Nephron
 - (d) Liver

9. Which of the following is introduced during smallpox vaccination?
 - (a) Antibodies
 - (b) Antigens
 - (c) Attenuated virus
 - (d) WBC

10. Formation of a large number of effector cells against a particular antigen
 - (a) Mass replication
 - (b) Clonal selection
 - (c) Mass selection
 - (d) Pure line selection

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Write a short note on cell mediated immune response.

Or

- (b) Brief note on Epitopes.

12. (a) Write a short note on interleukins.

Or

- (b) Brief note on agglutination.

13. (a) Structure and functions of MHC.

Or

- (b) Brief note on chronic inflammation.

14. (a) Write a short note on HIV.

Or

- (b) Write a short note on types of hypersensitivity reactions.

15. (a) Briefly describe immuno fluorescence.

Or

(b) Write short on principle of Widal test.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Explain the B lymphocytes and T lymphocytes.

Or

(b) Explain about primary lymphoid organs with suitable diagram.

17. (a) Describe about the structure and functions of Light and Heavy chains.

Or

(b) What are immunoglobulins? Write about types of immunoglobulins.

18. (a) Give a detail note on general organization and inheritance of MHC.

Or

(b) Describe about the cytosolic and endocytic pathways in antigen processing.

19. (a) Define vaccination? Explain the new generation of vaccines.

Or

(b) Give a brief note on tumour immunology.

20. (a) Explain about and Rheumatoid factor test.

Or

(b) Describe about ELISA test.

(6 pages)

Reg. No. :

Code No. : 6485

Sub. Code : ZBTM 23

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2022.

Second Semester

Bio-Technology - Core

BIOPROCESS TECHNOLOGY

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The mechanical means of accomplishing sterilization of fermentation media/equipment is
 - (a) ultrasonic
 - (b) radiation
 - (c) chemical agents
 - (d) none of these

2. Which of the following method is not used in isolation and screening of desired microorganisms?
- (a) crowded plate technique
 - (b) auxanographic technique
 - (c) enrichment culture technique
 - (d) hanging drop technique
3. Which of the following is used as a solidifying agent for media?
- (a) beef extract (b) peptone
 - (c) agar (d) yeast extract
4. Which of the following instrument is used for sterilizing the media after it has been prepared?
- (a) Autoclave
 - (b) Laminar air flow chamber
 - (c) Inoculum needle
 - (d) Incubator
5. According to the small size of the particle, which type of chromatographic separation is applicable?
- (a) High – performance liquid chromatography (HPLC)
 - (b) Fast protein liquid chromatography (FPLC)
 - (c) Gel chromatography
 - (d) Paper chromatography

6. Which of the following is not a type of centrifugation?
- (a) Hydro cyclone
 - (b) Tubular centrifuge
 - (c) Micro filtration
 - (d) Disk stack separator
7. What are the by-products of alcoholic fermentation?
- (a) CO₂ and yeast (b) CO₂ and H₂O
 - (c) CO₂ and ethanol (d) H₂O and glucose
8. Penicillin is produced from
- (a) aminoacylates
 - (b) lactases
 - (c) penicillin amidases
 - (d) aspartase
9. Which of the following organisms have a high resisting effect at high temperatures?
- (a) Mesophiles
 - (b) Psychrophiles
 - (c) Thermophiles
 - (d) Thermoduric

10. Which of the following is a factor that affects the storage stability of food?
- (a) Type of raw material used
 - (b) quality of raw material used
 - (c) method/effectiveness of packaging
 - (d) all of the mentioned

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) What are the methods used to isolate microbes?

Or

- (b) Design media for industrial fermentation.

12. (a) Difference between batch and fed-batch fermentation process.

Or

- (b) Illustrate the advantages of fluidized bed reactor.

13. (a) Explain precipitation in downstream processing.

Or

- (b) Recall the principle of column chromatography.

14. (a) What is the mechanism of entrapment?

Or

(b) Short notes on production of glycerol.

15. (a) Describe about food preservation methods.
Give some examples of preserved foods.

Or

(b) What is food technology and its importance?

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)
Each answer should not exceed 600 words.

16. (a) Describe the isolation, screening and maintenance of industrial microorganisms.

Or

(b) What are the useful properties of medium to be used in fermentation?

17. (a) Write about different types of fermentation process.

Or

(b) Explain any two types of bioreactors.

18. (a) Steps involved in downstream processing.

Or

(b) Explain any two types of chromatography technique.

19. (a) Explain in detail about industrial production of antibiotics.

Or

(b) What is the use of microbes in mineral beneficiation and oil recovery?

20. (a) Explain about sterilization and pasteurization of food products.

Or

(b) Illustrate the steps involved in production of bread with neat pathway.

(6 pages)

Reg. No. :

Code No. : 6486

Sub. Code : ZBTM 24

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2022

Second Semester

Biotechnology – Core

STEM CELL BIOLOGY

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The characteristic feature of embryonic stem cell is
 - (a) Pluripotent
 - (b) Multipotent
 - (c) Unipotent
 - (d) Oligopotent
2. Which of the following TF expressed on the embryonic stem cell?
 - (a) Protein
 - (b) SOX2
 - (c) Glycoprotein
 - (d) Amylose

3. In which year shinya yamanaka produced first generation mouse through iPS?
- (a) 2004 (b) 2006
- (c) 2008 (d) 2010
4. The microenvironment support the stem cell growth is called as
- (a) Niche (b) Temperature
- (c) Guard cells (d) Pressure
5. The source of adult stem cell
- (a) Umbilical cord (b) ESC
- (c) Bone marrow (d) Both (a) and (c)
6. Which of the following is the important functions of umbilical cord stem cells?
- (a) Plasticity (b) Homing
- (c) Engraftment (d) All of these
7. The stem cells are preserved in the liquid of
- (a) Guanine (b) Nitrogen
- (c) Tyrosine (d) Chlorine

8. The predominant animal model for stem cell regeneration?
- (a) Earthworm (b) Hydra
(c) Planarian (d) Mice
9. The stem cell can provide specific cell type to test new drugs, which is useful in
- (a) Parkinson therapy
(b) Cell based therapy
(c) Cancer therapy
(d) SCID
10. In the treatment of heart attack, bone marrow stem cells injected into the cells of
- (a) Muscle (b) Nerve
(c) Legs vein (d) Heart arteries

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Briefly explain the features of embryonic stem cell.

Or

- (b) Explain about the stem cell markers.

12. (a) Write a note on hematopoietic stem cells.

Or

(b) Explain the B cell differentiation and maturation.

13. (a) How will you isolate the MSC from the umbilical cord?

Or

(b) How will you store the umbilical cord blood?

14. (a) Write down the steps in generation of mESC.

Or

(b) Explain the regeneration potency of stem cells using any one animal model.

15. (a) Write about the origin of cancer stem cells.

Or

(b) Explain about the stem cell therapy for cardiac regeneration.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Enumerate the types of regenerative stem cells.

Or

- (b) Enlist the protocol for isolation and characterization of typical stem cell.

17. (a) How will you derive the pluripotent stem cell from the adult somatic cell?

Or

- (b) Describe the molecular mechanism of pluripotent stem cell.

18. (a) Give an account on invitro differentiation of umbilical cord MSC.

Or

- (b) Discuss the steps in cord blood stem cells transplantation.

19. (a) Comment on the generation and manipulation of hESC.

Or

- (b) Discuss the regenerative capability of earthworm and hydra.

20. (a) Give an account on the impact of cancer stem cells on the body.

Or

(b) Specify the stem cell therapy for neurodegenerative diseases.

(6 pages)

Reg. No. :

Code No. : 6487

Sub. Code : ZBTM 31

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2022.

Third Semester

Biotechnology – Core

PLANT AND ANIMAL BIOTECHNOLOGY

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. In-plant tissue culture, the callus tissues are generated into a complete plantlet by altering the concentration _____
 - (a) Sugars
 - (b) Hormones
 - (c) Amino Acids
 - (d) Vitamins and minerals

2. The pair of hormones required for a callus to differentiate are _____
- (a) Ethylene and Auxin
 - (b) Auxin and cytokinin
 - (c) Auxin and Abscisic acid
 - (d) Cytokinin and gibberellins
3. The production of secondary metabolites requires the use of _____
- (a) Meristem (b) Protoplast
 - (c) Axillary buds (d) Cell suspension
4. What is Dimethyl sulfoxide used for?
- (a) A gelling agent (b) Cryoprotectant
 - (c) Chelating agent (d) An Alkylating agent
5. The most common indicator in animal cell culture medium is _____
- (a) Rose Bengal
 - (b) Bromocresol purple
 - (c) Phenol red
 - (d) Crimson orange

6. Which of the following are commonly produced in animal cell cultures?
- (a) Interferon
 - (b) Mab
 - (c) Vaccines
 - (d) AU of these
7. The embryonic germ cells are derived from the part of _____ which will ultimately produce gametes.
- (a) Human embryo
 - (b) Nuclear envelope
 - (c) Foetus
 - (d) Both (a) and (c)
8. Synthetic seeds are produced by the encapsulation of somatic embryos with _____
- (a) Sodium acetate
 - (b) Sodium nitrate
 - (c) Sodium chloride
 - (d) Sodium alginate
9. Which of the following metabolites are implicated in stress tolerance?
- (a) proline
 - (b) betaines
 - (c) both (a) and (b)
 - (d) Citrate

10. Transgenic animals have _____
- (a) foreign protein (b) foreign gene
(c) foreign lipid (d) foreign amino acid

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Layout the procedure for callus culture.
- Or
- (b) Write short notes on transfer and establishment of whole plants in soil.
12. (a) Illustrate GUS gene expression assays.
- Or
- (b) Recall and write about synthetic seed preparation.
13. (a) Recite the types of animal tissue culture media.
- Or
- (b) Write short notes on cell death and apoptosis.
14. (a) Explain Embryonic stem cells, add a note on its properties.
- Or
- (b) Illustrate the biomaterials used in tissue engineering.

15. (a) Discuss cell culture based vaccines.

Or

(b) Write short notes on interleukins and interferons.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)
Each answer should not exceed 600 words.

16. (a) Discuss somatic embryogenesis in detail.

Or

(b) Enumerate the procedure for protoplast isolation and fusion.

17. (a) What is micropropagation? Demonstrate micropropagation of medicinal plants.

Or

(b) How will you preserve plants by cryopreservation, explain the procedure and advantages.

18. (a) Describe cell adhesion, cell proliferation and differentiation.

Or

(b) Interpret the characterization of cultured cells.

19. (a) Discuss tissue engineering of skin.

Or

(b) Listout the methods of animal cloning and justify it.

20. (a) Explain the Pharmaceutical products produced by mammalian cells.

Or

(b) Justify the nutritional value of golden rice with wild variety rice and construct the procedure for golden rice technology.

(6 pages)

Reg. No. :

Code No. : 6488

Sub. Code : ZBTM 32

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2022.

Third Semester

Biotechnology – Core

MEDICAL BIOTECHNOLOGY

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. AIDS day is
 - (a) May 1
 - (b) December 1
 - (c) December 20
 - (d) June 1

2. This nucleic acid is found in hepatitis B virus
 - (a) dsRNA
 - (b) ssDNA
 - (c) ssRNA
 - (d) dsDNA

3. Which of the following tests cannot be examined by Amniocentesis procedure?
- (a) Chromosome analysis
 - (b) Detecting genetic defects
 - (c) Maturity of fetal lungs
 - (d) None of these
4. Nano particles target the rare _____ causing cells and remove them from blood.
- (a) Tumour
 - (b) Fever
 - (c) Infection
 - (d) Cold
5. Which of the following human disease is transmitted from the vector *Anopheles mosquito*?
- (a) Dengue
 - (b) Malaria
 - (c) Filaria
 - (d) Encephalitis
6. Vaccination was invented by
- (a) Jenner
 - (b) Pasteur
 - (c) Koch
 - (d) Salk

7. Which of the following increases the secretion of growth hormone?
- (a) Insulin-like growth factor-1
 - (b) Somatostatin
 - (c) Hypoglycemia
 - (d) Exogenous GH administration
8. The following anticancer drug has high emetogenic potential:
- (a) Vincristine
 - (b) Chlorambucil
 - (c) 6-Mercaptopurine
 - (d) Cisplatin
9. In which year was the first clinical gene therapy given?
- (a) 2010
 - (b) 1990
 - (c) 1995
 - (d) 2000
10. The initial tools used to help launch the nanoscience revolution were _____
- (a) Binoculars
 - (b) Microscope
 - (c) Scanning probe instruments
 - (d) Interferometer

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Recall and recite the symptoms, diagnosis and treatment of tuberculosis.

Or

- (b) Explain in detail about sickle cell diseases.

12. (a) Illustrate the role and implications of nanodiagnosics in clinical diagnosis.

Or

- (b) Summarise prenatal diagnosis techniques.

13. (a) Explain lymphokines and Hepatitis B Vaccine.

Or

- (b) Discuss the production of insulin.

14. (a) Recall and write a note on anticholinergic drugs.

Or

- (b) Enumerate the structure and mode of action, side effects of Aspirin.

15. (a) Justify how do nanoparticles destroy cancer cells?

Or

- (b) Write short notes on nanodevices.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)
Each answer should not exceed 600 words.

16. (a) Demonstrate any two genetic diseases.

Or

- (b) Explain coronary artery diseases and AIDS.

17. (a) Describe the production of monoclonal antibodies.

Or

- (b) Discuss the probes used in diagnosis of diseases.

18. (a) Elaborate the current strategies for the development of vaccines against SARS COVID.

Or

- (b) Illustrate the DNA based vaccines.

19. (a) Elaborate the anticancer drugs and their mechanism.

Or

(b) Evaluate the antihypertensive drugs based on their structure and mode of action.

20. (a) Elaborate the nanodevices available in the medical field .

Or

(b) Discuss medical micro robotics.

(6 pages)

Reg. No. :

Code No. : 6489

Sub. Code : ZBTM 33

M.SC (CBCS) DEGREE EXAMINATION,
NOVEMBER 2022.

Third Semester

Biotechnology - Core

APPLIED BIOTECHNOLOGY

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Ciguatera poisoning?
 - (a) Eating contaminated reef fish
 - (b) Dino flagellates
 - (c) Both a and b
 - (d) None of the above

2. Saxitaxin
 - (a) Fouling
 - (b) Corrosion
 - (c) Paralysis
 - (d) None of the above

3. One type of immuno therapy uses experimentally produced antibody to target specific proteins on the surface of cancer cells. This type of immuno-therapy is called
 - (a) Gene therapy
 - (b) Vaccines composed of antigen
 - (c) Monoclonal antibody therapy
 - (d) Biological responses modifications

4. The process of destroying cancer cells with the help of radiation is
 - (a) Radiotherapy
 - (b) Physiotherapy
 - (c) Uroplasty
 - (d) Rehabilitation

5. Pharmacokinetics is
 - (a) The study of biological and therapeutic effects of drugs
 - (b) The study of absorption, distribution, metabolism and excretion of drugs
 - (c) The study of mechanisms of drug action
 - (d) The study of methods of new drug development

6. Dicer is _____.
- (a) DNA se-like enzyme
 - (b) RNA se-like enzyme
 - (c) An endonuclease
 - (d) An exonuclease
7. The expression of bacteriorhodopsin is especially shown by which of the following organisms?
- (a) Mammals
 - (b) Animals
 - (c) Birds
 - (d) Halobacteria
8. The colour of the nano gold particles is
- (a) Yellow
 - (b) Orange
 - (c) Red
 - (d) Variable
9. The major cause of environmental degradation is
- (a) Bio-magnification
 - (b) Nitrogen deposition
 - (c) Quorum quenching
 - (d) Lyophilization

10. Oil spills have been considered as a major threat to world environment, especially _____.
- (a) Marine ecosystem
 - (b) Terrestrial ecosystem
 - (c) Land ecosystem
 - (d) Vertebrates

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Explain food web?

Or

- (b) Describe the Biodegradation and bioremediation methods for marine pollution?

12. (a) Discuss Ex vivo gene therapy?

Or

- (b) Explain Liposome mediated gene delivery.

13. (a) Explain Bio availability.

Or

- (b) Explain first pass metabolism?

14. (a) Describe Nano structures?

Or

(b) State any two applications of micro array technique?

15. (a) Explain surfactants?

Or

(b) Describe vermicompost?

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)

Each answer should not exceed 600 words.

16. (a) Summarize marine fouling and corrosion and write a note on antifouling.

Or

(b) List out the antiviral and anti microbial agents from marine microorganisms? Explain their importance.

17. (a) Write an essay on cancer treatment – chemotherapy?

Or

(b) Detail notes on Invitro gene therapy.

18. (a) Illustrate the pharmacokinetics of drugs.

Or

(b) List out the new drug delivery strategies?

19. (a) Illustrate synthesis of nanoparticles using microbes.

Or

(b) Elucidate the Non-covalent DNA – Streptavidin conjugates?

20. (a) Explain mushroom cultivation.

Or

(b) Write an essay on solid waste management.

(6 pages)

Reg. No. :

Code No. : 6490

Sub. Code : ZBTM34

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2022.

Third Semester

BIOTECHNOLOGY - CORE

RESEARCH METHODOLOGY AND BIOSTATISTICS

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Which of the following is not an essential element of report writing?
 - (a) Research methodology
 - (b) Reference
 - (c) Conclusion
 - (d) None of these

2. What is the purpose of doing research?
 - (a) Identify problem
 - (b) Find the solution
 - (c) Both a and b
 - (d) None of these

3. In the process of identifying the objectives of research, the researcher must finalize the following:
 - (a) Questionnaire (b) Hypothesis
 - (c) Boundaries (d) All the above

4. Secondary/existing data may include which of the following?
 - (a) Official documents
 - (b) Personal documents
 - (c) Archived research data
 - (d) All of the above

5. Research journals with high _____ are commonly considered to be more important than those with lower ones.
 - (a) Eigen factor (b) h-index
 - (c) Impact factor (d) i10 score

6. A research paper
- (a) Is a compilation of information on a topic
 - (b) Contains original research as deemed by the author.
 - (c) Contains peer-reviewed original research or evaluation of research conducted by others.
 - (d) Can published in more than one journal
7. The value that describes how the scores of a distribution are dispersed or spread about the mean is
- (a) Standard deviation
 - (b) Variance
 - (c) Mean deviation
 - (d) Quartile deviation
8. If Q_1 and Q_3 of a distribution are 37 and 75 respectively. Find the quartile deviation.
- (a) 38
 - (b) 17.5
 - (c) 19
 - (d) 9.5
9. Analysis of variance is a statistical method of comparing the _____ of several populations.
- (a) Standard deviations
 - (b) Variances
 - (c) Means
 - (d) Proportions

10. Kinked demand curve hypothesis was put forward by
(a) Paul M sweezy (b) Augustin cournot
(c) Bertrand (d) Stackelberg

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Research is an art of investigation – justify.
Or
(b) Illustrate the method of sampling design and random sampling.
12. (a) Evaluate the case study method with current examples.
Or
(b) Apply the questionnaire method in research.
13. (a) Explain how will you prepare the research paper.
Or
(b) Illustrate citation index and impact factor.
14. (a) Evaluate the types of correlation with examples.
Or
(b) Calculate mean deviation of the following.

15. (a) Predict two way classification of ANOVA

Or

(b) Summarize the statistical software's for research.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)

16. (a) Construct a research problem and find a research solution with own ideas.

Or

(b) Evaluate the sampling design with examples.

17. (a) Define data collection? Interpret the types of data with suitable examples.

Or

(b) Define computer? How computer involved in role of research?

18. (a) Elaborate the format of journals and proof reading.

Or

(b) What is a research article? Demonstrate the format to write the research article.

19. (a) The table below gives the marks obtained by 10 Biotechnology students in bio statistics examination. Calculate mean and standard deviation.

$x:$	1	2	3	4	5	6	7	8	9	10
$f:$	43	48	65	57	31	60	37	48	78	59

Or

- (b) Analyze the Karl Pearson method of correlation with suitable example.
20. (a) How does an ANOVA test work? When to use a one-way ANOVA?

Or

- (b) In the garden pea, yellow cotyledon color is dominant to green, and inflated pod shape is dominant to the constricted form. Considering both of these traits jointly in self-fertilized dihybrids, the progeny appeared in the following numbers: 193 green, inflated 184 yellow constricted 556 yellow, inflated 61 green, constricted. Do these genes assort independently? Support your answer using Chi-square analysis.
-