Year - April 2024

TYBSC -
Biotech

SEM - V

No. of pages - 22

Paper / Subject Code: 82801 / Cell Biology

TYBSc - BT - Sem V

3 Hours

Total Marks: 100

1. Attempt **all** questions.
2. **All questions** carry **equal** marks.
3. Draw **neat labelled diagrams** wherever necessary.
4. Use of **log tables** and **non-programmable calculators** is **allowed**.

Q.1 a. Select the correct alternative: (Any Six) **06**

1. Restriction check point is a 'master brake' as it is _____
   a. the point of commitment to the cell cycle
   b. the beginning of DNA replication
   c. the checkpoint which is reversible
   d. the beginning of Mitosis
2. When a human cell undergoing Mitosis is fused with a cell in G1 phase
   a. it causes condensation of all chromosomes
   b. it causes DNA replication
   c. it arrests the cell in interphase
   d. it does not affect the cell
3. If the Cell cycle time is shorter than the time required to double in size in yeast cells,
   a. cells will get smaller with each generation
   b. cells will get bigger with each generation
   c. cell size neither increases or decreases
   d. Cells lose their ability to reproduce
4. *Schizosaccharomyces pombe* is also called _____ yeast.
   a. Fusion b. fission c. budding d. mushroom
5. In budding yeast, the more stringent size check point is at _____.
   a. G1 b. G2 c. G0 d. spindle check point
6. The extracellular messenger TNF on triggering the extrinsic pathway binds to _____.
   a. TNFR1 b. EGF1 c. TNFR d. EGFR
7. The enzyme responsible for the "Eat Me" signal is _____.
   a. Caspase b. scramblase c. kinase d. Phosphatases
8. One major difference between yeast and Mammalian cell cycle is _____.
   a. There is no G0 phase in yeast
   b. No rigid rule coupling cell size and cell cycle
   c. Availability of growth factors and nutrients does not matter in yeast
   d. Mammalian cells do not require MPF for mitosis

X51YDB2AC5X51YDB2AC5X51YDB2AC5X51YDB2AC5

9. In multicellular organisms, growth factors play a crucial role in cell control and cell cycle. All of the following are broad specificity growth factors EXCEPT
   a. PDGF b. EGF c. FGF d. erythropoietin

Q.1 b. Answer the following questions: (Any Two) 14

1. Describe the intermediate phases of interphase. Add a note on M- phase of the cell cycle.
2. Explain the pathway of programmed cell death if the cell has internal stimuli such as irreparable genetically damaged and hypoxia.
3. Discuss the differences between the standard cell cycle and embryonic cell cycle and explain composition, activation and function of the cytoplasmic regulator MPF.

Q.2 a. Select the correct alternative: (Any Six) 06

1. G protein coupled receptors are examples of _____receptors.
   a. transmembrane b. nuclear
   c. cytoplasmic d. enzyme coupled
2. The enzyme responsible for formation of cAMP is _____
   a. adenylyl cyclase b. ATP synthase
   c. phosphodiesterase d. AMP kinase
3. The receptors for Ephrins are called _____ receptors.
   a. Eph b. Edu c. Epi d. Epu
4. RAS MAP kinase signalling relay is an example of activation of _____ receptors.
   a. enzyme coupled b. G protein coupled
   c. Ca^{+} gated ion d. Na^{+} gated ion
5. In _____ signalling, signalling molecules are released by a cell that only affect target cells at close proximity.
   a. autocrine b. paracrine c. endocrine d. neurotransmission.
6. Dimerization of the receptor polypeptide after ligand binding is one of the steps for activation of _____ receptors.
   a. Enzyme linked b. G protein coupled
   c. Ca+ gated ion d. Na+ gated ion
7. Receptor methylation in target adaptation is catalysed by _____
   a. methyl transferase b. methyl esterase
   c. methyl kinase d. methyl dehydrogenase

X51YDB2AC5X51YDB2AC5X51YDB2AC5X51YDB2AC5

8. Steroid hormone induced signalling is an example of _____ signalling.
   a. paracrine b. autocrine c. endocrine d. none of the above
9. Serine threonine receptors cause the activation of _____ receptors.
   a. enzyme coupled b. G protein coupled
   c. Ca^{+} gated ion d. Na^{+} gated ion

Q.2 b. Give an account on the following questions: (Any Two) **14**

1. How smell and vision signalling depend on activation of G protein coupled receptors?
2. JAK/STAT signalling pathway.
3. How do some developing cells respond to the morphogen gradient with the help of an example?

Q.3 a. Select the correct alternative: (Any Six) **06**

1. The Fertilized egg cell is also called a
   a. Gamete b.Blastula c Morula d. Zygote
2. Morphogenic movement - ____ involves the local inward buckling of an epithelium.
   a. Epiboly b. invagination c. Involution d. delamination
3. Which one of the following is the source of embryonic stem cells?
   a. Heart b. Stomach c. Inner cell mass d. Gastrula
4. Mouse is a preferred model organism in developmental biology because:
   a. It is the closest mammalian model organism to humans.
   b. Option model organism should have huge adult size
   c. Model organisms should not be easily available.
   d. Model organisms should be expensive.
5. _____is NOT a derivative of the endoderm germ layer.
   a. Gut tube b. bone c. Thymus d. Lung
6. _____ are special molecules that play a very important role during oocyte maturation, in the female's ovary.
   a. Fate map b. ICM
   c. Cytoplasmic determinant d. Nuclear determinants

X51YDB2AC5X51YDB2AC5X51YDB2AC5X51YDB2AC5

7. Select Incorrect statement about model organisms
   a. should have a long life cycle b. should have a small adult size.
   c. should be easily available. d. should be inexpensive.

8. Which one of the following is an artificial marking technique used in the construction of a fate map?
   a. Ziel-Nielson carbolfuchsin staining b. Vital staining
   c. Gram's staining d. Capsule staining

9. _____ will form the placenta and extra-embryonic tissues embryo.
   a. Inner cell mass b. Trophoblast c. Gastrula d. Notochord

Q.3 b. Discuss the following: (Any Two) 14

1. With a suitable example give a brief account of the Importance of model organisms in developmental biology.
2. Fate map: Construction and uses.
3. Overview of developmental Biology and contribution of various disciplines in the emergence of developmental biology

Q.4 a. Select the correct alternative: (Any Six) 06

1. _____ are genes in which a gain of function mutation that drives a cell towards cancer.
   a. Pre-oncogenes b. Proto-oncogenes c. Viral genes d. Oncogenes
2. The accumulation of _____ protein is seen in cells where oncogenes such as Ras and Myc are unusually active.
   a. CA125 b. Rb c. p53 d. BCl2
3. _____are cancer arising from cells in the retina of the eye.
   a. Adenoma b. colour blindness c. Retinoblastomas d. Conjunctivitis
4. _____ genes are mutated in a wide range of human cancers and are one of the most important examples of cancer-critical genes.
   a. Ras b. Tas c. CA-125 d. Bcl-2
5. Penetration of cell into a blood vessel and the exit of the same elsewhere in the body to grow in a new site forming a small clump at first before metastasis is called _____.
   a. angiogenesis b. morphogenesis c. micro-metastasis d. metastasis
6. The virus associated with Burkitt's lymphoma is _____
   a. Papilloma virus b. Epstein-Barr virus
   c. Hepatitis B virus d. HIV virus

X51YDB2AC5X51YDB2AC5X51YDB2AC5X51YDB2AC5

7. _____ virus is associated with liver cancer or hepatocellular carcinoma.
   a. EBV virus b. Hepatitis B virus c. TMV virus d. HIV
8. _____ is an example of a drug that inhibits angiogenesis.
   a. Herceptin b. angiostatin c. heparin d. streptomycin
9. _____ is an assay used to detect potential mutagenicity and carcinogenicity of chemicals.
   a. Ashara test b. Ames test c. Replica plating d. CT Scan

Q.4 b. Attempt the following questions: (Any Two) **14**

1. What is a tumor? Give its types and elaborate on tumor progression with an example.
2. With reference to hallmarks for cancerous growth, discuss
   a. Replicative senescence.
   b. Altered growth with loss of contact inhibition and homeostasis.
3. Discuss lifestyles changes and chemotherapy for control of cancer.

Q.5 Write Short notes on the following: (Any Four) **20**

a. Prokaryotic cell cycle.

b. Programme cell death and its significance.

c. Bacterial chemotaxis.

d. Gastrulation.

e. Tumor suppressor genes- any one example.

f. Type of cancers based on tissues and cell types.

X51YDB2AC5X51YDB2AC5X51YDB2AC5X51YDB2AC5

3 Hours Total Marks: 100

1. Attempt **all** questions.
2. **All questions** carry **equal** marks.
3. Draw **neat labelled diagrams** wherever necessary.
4. Use of **log tables** and **non-programmable calculators** is **allowed**.

Q.1 a. Select the correct alternative: (Any Six) 06

1. Communities that occur between the edge of the continental shelf and the land–sea border
   a. Neritic b. Abyssopelagic
   c. Bathyal d. Hadal
2. Organisms that flow at the mercy of the sea current are called
   a. Nekton b. Plankton
   c. Zooplankton d. Benthos
3. Organisms that are able to swim and move independently of currents are called
   a. Benthos b. Zooplankton
   c. Plankton d. Nekton
4. Which of the following is NOT an adaptation undertaken by rocky intertidal organisms
   a. Strong means of attachment
   b. Mechanism to survive desiccation
   c. Mechanisms of sealing themselves off during low tide
   d. Tolerating substantial saltwater exposure
5. _____ is a semi-enclosed coastal body of water that has a free connection with the open sea and within which seawater is measurably diluted with freshwater derived from land drainage
   a. Tidal basins b. Seagrass beds
   c. Salt Marshes d. Estuary
6. Which of the following molecular tools is used to study the carbon cycle?
   a. FISH b. Carbon Tracker
   c. Stable Isotope Analysis d. Carbon Scanner
7. Domoic acid can be used as
   a. Anti-inflammatory b. Antibiotic
   c. Antiviral d. Antiparasite
8. One of the limitations encountered with the culturing of marine bacteria is the loss of interaction between microbial cells. What is the solution for this limitation?
   a. Dilution
   b. High-throughput cultivation and screening
   c. Use of high-nutrient filtered seawater
   d. Diffusion device

8800096A7F25342DD6B57498F184AA92

9. Carrageenan can be used as
   a. Antibiotic b. Anti-inflammatory
   c. Anticoagulant d. Antiviral

Q.1 b. Answer the following questions: (Any Two) 14

1. What are the defining features of the rocky intertidal zone, and how do organisms living there adapt to their environment?
2. Discuss toxins obtained from marine organisms.
3. Provide an account of the functioning of three different marine ecosystems.

Q.2 a. Select the correct alternative: (Any Six) 06

1. The molecular structure of Kahalalide F is _____.
   a) Cyclic tridecapeptide b) Aminosterol
   c) Polyacetate d) Arabinofuranosyl adenine
2. The relationship between _____ and health has led to the concept of functional food.
   a) Medicine b) Nutrition c) Enzymes d) Cosmetics
3. The specific feature of enzyme lipase B derived from Candida antarctica is _____.
   a) Enzyme is a barophilic enzyme
   b) Enzyme is halotolerant enzyme
   c) Enzyme is a thermophilic enzyme
   d) Enzyme is an enantioselective enzyme
4. The new paradigm in drug discovery is dominated by _____ approaches which are expected to lead to multiple new target.
   a) Pharmacological b) Genomic based
   c) Proteomic based d) Biochemical
5. _____ drug is synthesized by Bugula neritina.
   a) Halichondrin B b) Bryostatin 1
   c) Squalamine d) Kahalalide F
6. _____ is a neurotoxin derived from puffer fish.
   a) Saxitoxin b) Omega conotoxin
   c) Alpha conotoxin d) Tetrodotoxin
7. _____ organism secrets omega conotoxin.
   a) *Aplidium albicans* b) *Tethya crypta*
   c) *Conus magus* d) *Ecteinascidia turbinate*

8800096A7F25342DD6B57498F184AA92

8. The _____ drug is used for the treatment of refractory multiple myeloma and T cell lymphoma.
   a) Vidarabine b) Aplidine
   c) Cytarabine d) Bryostatin 1
9. Fuelzyme is thermostable _____.
   a) Protease b) Lipase
   c) Amylase d) Cellulase

Q.2 b. Give an account on the following questions: (Any Two) **14**

1. Discuss the thermostability and cold adaptivity of marine extremozymes.
2. Elaborate on – Marine natural products at the crossroads between functional foods and pharma.
3. With a suitable example, explain the current use and status of marine microbial enzymes.

Q.3 a. Select the correct alternative: (Any Six) **06**

1. _____ is an example of cyanobacterium.
   a. *Nostoc* b. *Halobacterium* c. *Streptomyces* d. *Aspergillus*
2. _____are the rich sources of EPA and DHA.
   a. Diatoms b. Salmon fish c. Sponges d. Bombay duck
3. _____ is an example of carotenoid pigment derived from salmon fish.
   a. Phycobilins b. Chlorophylls c. Astaxanthin d. Lycopene
4. _____ is used as a stabilizer and thickener in gels and foods.
   a. PUFAs b. Carrageenan c. Lutein d. Astaxanthin
5. _____ has the ability to protect eye related complications such as cataract.
   a. Lutein b. Astaxanthin c. Lycopene d. Xanthophyll
6. _____ could be the functional food ingredients.
   a. Water b. Buffer c. PUFAs d. Salt
7. _____ is the most common and representative marine sulphated polysaccharide.
   a. Histamine b. Heparin c. Fucoidan d. Pentosan
8. Polysaccharides produced by _____ have the viscosity properties similar to xanthan gum.
   a. *Undaria pinnatifida* b. *Cyanospira capsulata*
   c. *Ecklonia cava* d. *Ascophylum nodusum*
9. _____ are sold as powders or pills or other medicinal forms not associated with foods.
   a. Functional foods b. Nutraceuticals c. Fruits d. Vegetables

8800096A7F25342DD6B57498F184AA92

Q.3 b. Discuss the following: (Any, Two)

1. Functional foods incorporating marine-derived seaweeds and polysaccharides
2. Biological activities of fatty acids and phenolic compounds as an ingredient in nutraceuticals
3. Seaweeds and microalgae as potential marine sources for functional food ingredients

Q.4 a. Do as Directed: (Any Six) 96

1. What are Cosmeceuticals?
2. _____ is a multifunctional bioactive compound that is obtained from the polysaccharide chitin.
3. Give an example of a marine organism used as a source of proliferative drug for hair growth.
4. Give one example of a marine organism used as a source of Chitin.
5. Give one example of a lipid from a marine bioresource.
6. Give the application of marine proteins.
7. Name any one Emulsifier obtained from marine resources.
8. Name any one skin-firming agent obtained from marine resources.
9. State True or False: Eckol and Dieckol are phlorotannins.

Q.4 b. Give an account of the following questions: (Any Two) 14

1. General composition of cosmetics.
2. Therapies based on Marine resources.
3. Anti-allergic, anti-microbial, and anti-wrinkling activities of marine components in cosmetics.

Q.5 Write Short notes on the following: (Any Four) 20

a. Coral reefs.
b. Bioprospecting in marine environments.
c. Approved marine drugs as pharmaceuticals.
d. Fermentation and related research.
e. Nutraceutical potential of carotenoids.
f. Depigmenting activity of marine derived components of cosmetics.

88000096A7F2542DD6B57498F184AA92

Scan (10)

TYBSc BT. Sem - V

3 Hours

Total Marks: 100

1. Attempt **all** questions.
2. **All questions** carry **equal** marks.
3. Draw **neat labelled diagrams** wherever necessary.
4. Use of **log tables** and **non-programmable calculators** is **allowed**.

Q.1 a. Select the correct alternative: (Any Six) 06

1. Virion is defined as _____.
   a) Extracellular infectious virus particle
   b) Smallest virus
   c) A smallest particle similar to virus
   d) intracellular protein
2. Genetic material of the TMV virus is _____.
   a) d/s segmented DNA strand
   b) d/s unsegmented, positive RNA strand
   c) s/s unsegmented, positive RNA strand
   d) s/s segmented , positive RNA strand
3. Which of the following does the virus lack?
   a) Nucleic acid
   b) Ribosome
   c) Glycoprotein
   d) Phospholipid
4. Icosahedron symmetry of the capsid has _____.
   a) 20 sides and 12 corners
   b) 12 sides and 6 corners
   c) 8 sides and 4 corners
   d) 10 sides and 5 corners
5. Viruses lack metabolic machinery to synthesize
   a) Carbohydrate b) Alcohol c) Lipids d) Protein
6. In response to infection by herpes or measles virus results in formation of a multinucleated cell known as _____.
   a) Phagosome
   b) syncytium
   c) Negri bodies
   d) Inclusion bodies

X51Y30A953X51Y30A953X51Y30A953X51Y30A953

7. Which of the following is the first cell line derived from a human?
a) HEK 293 b) HeLa c) Sf9 d) Chinese hamster ovary cells
8. Which of the following phases determines the specificity of the virus?
a) Uncoating b) Release in c) Attachment d) Penetration
9. Which of the following RNA is present in most of the plant viruses?
a) ssDNA b) ssRNA c) dsRNA d) dsDNA

Q.1 b. Answer the following questions: (Any Two)

1. How are viruses classified? Indicate the characteristics used in identifying and naming viruses. 14
2. Elaborate on primary and secondary cell culture for virus cultivation.
3. Give an illustrated account of the structure of viruses.

Q.2 a. Select the correct alternative: (Any Six) 06

1. Sulfonamides inhibits
   a) Dihydrofolate synthase
   b) Dihydropterine Pyrophosphokinase
   c) Dihydrofolate reductase
   d) Dihydropteroate synthase
2. Which of the following is a side effect of aminoglycosides?
   a) Ototoxicity
   b) Nephrotoxicity
   c) allergic reaction
   d) all of these
3. Beta-lactamase are responsible for
   a) Enzymatic inactivation of penicillin
   b) PBP modification
   c) Reduce permeability
   d) Increase efflux
4. Patients with cephalosporins allergies are frequently allergic to another class of antibiotics. Which one?
   a) Macrolides
   b) Penicillins
   c) Aminoglycosides
   d) Fluoroquinolones

X51Y30A953X51Y30A953X51Y30A953X51Y30A953

(12)

5. Which of the following inhibits protein synthesis by combining with the 30S subunit ribosome?
   a) nalidixic acid
   b) Chloramphenicol
   c) Streptomycin
   d) Penicillin
6. Name the agent which, on addition to a media, inhibits the growth of organisms and on removal the colony regrows.
   a) Bacteriostatic
   b) Bactericidal
   c) Antibiotic
   d) Antiseptic
7. The following drug is used in the treatment of fungal infections
   a) Gentamicin
   b) Quinone
   c) Flucytosine
   d) Metronidazole
8. Which of the following drugs inhibit herpes viruses?
   a) Amantadine
   b) Acyclovir
   c) Oseltamivir
   d) Azidothymidine
9. Which of these is an antiviral drug?
   a) Acetazolamide
   b) Rifampin
   c) Zidovudine
   d) Tetracycline

Q.2 b. Give an account on the following questions: (Any Two) **14**

1. Explain the mode of action of Cell wall inhibitors giving suitable examples
2. Explain any two characteristics of a chemotherapeutic agent giving suitable example
3. What are anti metabolites? Explain their mode of action with one example

Q.3 a. Select the correct alternative: (Any Six) **06**

1. The quantitative analysis of a non-luminescent compound is done by
   a) Fluorescent quenching
   b) Formation of fluorescent reactive product
   c) Fluorescence labelling
   d) All of the above

X51Y30A953X51Y30A953X51Y30A953X51Y30A953

2. In Atomic fluorescence spectrophotometry [AFS] the atoms are required to be vaporized by
   a) Flame
   b) Electric
   c) ICP
   d) All of these

3. In order to determine the molecular mass from light scattering, the parameters measured must be
   a) The intensity of scattered light at different angles
   b) The concentration of the macromolecule
   c) The specific refractive index increment of the solvent
   d) All of these

4. The commonly used enzyme in bioluminescence is
   a) Amylase
   b) Luciferase
   c) Protease
   d) Hexokinase

5. Spectrofluorimetry can be used for
   a) Enzyme assay
   b) Energy transfer studies
   c) Protein structure studies
   d) All of these

6. Inductively coupled plasma is used to
   a) to obtain gaseous form of sample
   b) to preserve the sample
   c) to duplicate the sample
   d) neither of these

7. Elastic light scattering is also known as
   a) Radiation
   b) Anti Stokes line
   c) Compton effect
   d) Rayleigh scattering

8. When the incident light beam hits a molecule in its ground state, there is a low probability that the molecule is excited and occupies the
   a) Next higher vibrational state
   b) Next lower vibrational state
   c) Heat energy
   d) Neither of these

X51Y30A953X51Y30A953X51Y30A953X51Y30A953

9. Due to rotation and translation, macromolecules move into and out of a very small region in the solution this is called
   a) Brownian motion
   b) Inertia
   c) Forward motion
   d) Backward motion

Q.3 b. Discuss the following: (Any Two) **14**

1. What do you understand about elastic light scattering? Explain how molecular mass can be determined by multi-angle light scattering.
2. Discuss Atomic absorption spectroscopy.
3. What is luminometry? Explain the principle and applications of luminometry.

Q.4 a. Select the correct alternative: (Any Six) **06**

1. Chromatography is generally used for the separation of mixtures based on the differences in their
   a) Shape
   b) Size
   c) Structure
   d) All of these
2. The number of protons present in the nucleus is
   a. Atomic structure
   b. Atomic mass number
   c. Atomic weight
   d. Atomic number
3. Unstable isotopes are called
   a. Radioisotopes
   b. Neutrons
   c. Electrons
   d. None of these
4. HPLC is an abbreviation for
   a. High Profit Liquid Chromatography
   b. High Pressure Liquid Chromatography
   c. Higher Performance Low Chromatography
   d. Higher Profit Low Chromatography
5. If an analyte is stable below its isoionic point, then we use
   a. Cationic exchanger
   b. Anionic exchanger
   c. Both (a) and (b)
   d. Neither

X51Y30A953X51Y30A953X51Y30A953X51Y30A953

6. The ability of a method to obtain test results that are directly proportional to the sample concentration over a given range is
   a. Selectivity
   b. Linearity
   c. Precision
   d. None of these
7. Detectors used in HPLC
   a. Variable wavelength detector
   b. Scanning wavelength detector
   c. Fluorescence detector
   d. All of these
8. The polymer often used for matrix materials in Affinity chromatography
   a. Agarose
   b. Cellulose
   c. Dextrose
   d. All of these
9. The molecules that will be eluted last in Gel Permeation Chromatography are
   a. Small molecules
   b. Intermediate molecules
   c. Larger molecules
   d. All of these

Q.4 b. Answer the following questions: (Any Two) 14

1. Explain the principle, material and applications of Affinity chromatography.
2. What is scintillation? Explain types of scintillation counting.
3. What are radioisotopes? Explain types of radioactive decay.

Q.5 Write Short notes on the following: (Any Four) 20

a. Dilution susceptibility test.

b. Cell membrane inhibitors.

c. Cytocidal infections and cell damage.

d. Applications of Raman spectroscopy.

e. Applications of tracer techniques in biology.

f. Geiger- Muller counter.

X51Y30A953X51Y30A953X51Y30A953X51Y30A953

(16)

TYBSC sem V

6. After treatment with G418 and ganciclovir, only cells that have undergone homologous recombination with specific integration will _____.
   a) killed
   b) survive
   c) not survive
   d) not live
7. In the bacteriophage P1 genome, A lox P site consists of two 13-base-pair _____ that are separated from each other by an 8-bp spacer sequence.
   a) side repeats
   b) inverted repeats
   c) simple repeats
   d) central repeats
8. Transgenic _____fish is used as biosensors of environmental pollutants.
   a) Medaka
   b) Scoliodon
   c) Rohu
   d) Salmon
9. _____ is the last phase in the process of fusing two haploid eukaryotic cells together.
   a) Karyogamy
   b) Plasmogamy
   c) Xenogamy
   d) Cytogamy

Q.2 b. Give an account on the following questions: (Any Two) **14**

1. Explain the cloning of livestock by nuclear transfer method.
2. Discuss the embryonic stem cell methodology for the production of transgenic mice.
3. Discuss any one vector used for animal cells.

Q.3 a. Select the correct alternative: (Any Six) **06**

1. A cloning vector containing regulatory sequences is called
   a. shuttle vector
   b. expression vector
   c. cosmid
   d. M13 phage
2. When M 13 infects the host cell, the host cell
   a. is lysed
   b. continues growth at the same rate
   c. growth is arrested after a few generations
   d. growth is slowed down and viral particles are released

E8C6FFDFB4C489507D86F089739BC526

3 The enzyme that can convert staggered ends to blunt ends
   a DNA pol I
   b S1 nclease
   c both
   d neither

4 The transgene in pET vector is introduced in the
   a. Host genome
   b. pET vector
   c. Helper plasmid
   d. Any of them

5. To check the presence of gene product of an expression vector, we can perform
   a. Western blotting
   b. Northern blotting
   c. Southern blotting
   d. Eastern blotting

6. Problem of repetitive DNA being a part of the probe and creating a problem while identifying the overlapping fragment can be overcome in
   a. Chromosome walking
   b. Chromosome jumping
   c. Both
   d. Neither

7. Synthetic oligonucleotide probes are called
   a. heterologous probes
   b. guessmers
   c. DNA probes
   d. homologous probes

8. In Southern blotting, the specificity of the test lies in selection of
   a. source DNA
   b. radioisotope
   c. appropriate probe
   d. all three

9. Introducing the transgene in the MCS of the SUP 4 gene results in
   a. alpha complementation
   b. beta complementation
   c. suppressor mutation
   d. insertional inactivation

E8C6FFDEB4C489507D86F089739BC526

Q.3 b. **Discuss the following: (Any Two)** 14

1. Southern Blotting with a diagram
2. Describe a method to prepare a cDNA library
3. pUC as a cloning vector

Q.4 a. **Select the correct alternative: (Any Six)** 06

1. Why are ddNTPs used in DNA sequencing?
   A. because ddNTPs are fluorescent
   B. because ddNTPs are efficiently incorporated into DNA
   C. because ddNTPs cannot be incorporated into DNA-by-DNA polymerase
   D. because ddNTPs prevent further DNA synthesis once incorporated into the DNA
2. What is the fundamental principle underlying Sanger's method for DNA sequencing?
   A. Using chemicals for base-specific cleavage
   B. Using dNTPs for chain termination
   C. Using ddNTPs for chain termination
   D. Using 32P for chain termination
3. In RNAi-mediated gene silencing, what complex forms when siRNA binds to the target gene?
   A. RNA Associated Silencing Complex
   B. RNA Mediated Silencing Complex
   C. RNA Induced Silencing Complex
   D. RNA-DNA Silencing Complex
4. What is the term for synthetic short strands of double-stranded DNA with one blunt end and one staggered end?
   A. linkers
   B. tails
   C. adaptors
   D. probes
5. What is Cas9?
   A. Nuclease
   B. Polymerase
   C. Primer
   D. Probe
6. What is the term for the manipulation of a gene using engineered nucleases composed of sequence-specific DNA-binding domains fused to a Restriction endonuclease?
   A. DNA Sequencing
   B. RNAi
   C. Gene editing
   D. Gene shifting

E8C6FFDFB4C489807D86F0897398C526

7. What enzyme creates double-strand breaks at the target site for genome editing?
   A. ZFNs
   B. TALENs
   C. CRISPR Cas9
   D. all three
8. In the context of CRISPR, where are the repeated sequences located?
   A. Bacterial DNA
   B. Viral DNA
   C. Fungal DNA
   D. Plasmid DNA
9. In which DNA sequencing method does premature chain termination not occur?
   A. Automated sequencing
   B. Sanger's sequencing method
   C. Maxam-Gilbert method
   D. None of these

Q.4 b. Give an account of the following questions: (Any Two) 14

1. What are the principles and applications of pyrosequencing in DNA sequencing?
2. How do microRNAs (miRNAs) participate in regulating gene expression in eukaryotes?
3. What is TALEN, and how is it used in the context of gene editing?

Q.5 Write Short notes on the following: (Any Four) 20

a. Vir gene

b. Applications of transgenic mice

c. Non- radioactive labelling of DNA.

d. Shuttle vector.

e. Human genome mapping: Significance in health

f. Role of ZNF in genome editing?

E8C6FFDEB4C489507D86F089739BC526

3 Hours

Total Marks: 100

1. Attempt **all** questions.
2. **All questions** carry **equal** marks.
3. Draw **neat and labeled diagrams** wherever necessary.
4. The use of **log tables** and **non-programmable calculators** is **allowed**.

Q.1 a. **Do as directed: (Any Six)** **06**

1. What type of secondary structure does Fibroin have?
2. Name a chemical denaturant used for protein denaturation.
3. **Select the correct alternative:**
   If Protein A is more thermostable than Protein B, then the temperature denaturation curve of Protein A will be _____
   a) To the right of Protein B
   b) To the left of Protein B
   c) Overlapping that of Protein B
   d) Crossing that of Protein B
4. Which technique is used to separate soluble proteins from insoluble cellular debris?
5. Which law determines the concentration of a protein from its absorbance?
6. **Fill in the blank:** Protein shows absorbance at _____ nm
7. What does the 'G' in G-actin stand for?
8. **Select the correct alternative:**
   Native-PAGE separates proteins based on their _____
   a) Shape and function
   b) Shape and charge
   c) size and charge
   d) size and shape.
9. How many subunits is a myosin molecule made of?

Q.1 b. **Answer the following questions: (Any Two)** **14**

1. Discuss the significance of protein motifs as the structural foundation for protein classification.
2. Provide a rationale & graphical representation for the assertion that polypeptides fold rapidly through a step-wise process.
3. Elaborate on the concept of cooperative binding of hemoglobin with oxygen, including a graphical representation for clarity.

Q.2 a. **Do as instructed: (Any Six)** **06**

1. **Choose one correct answer:**
   What is the starting molecule of cholesterol synthesis?
   a) acetyl-CoA b) acyl-CoA c) glucose d) pyruvate
2. Define glycogenesis.
3. Name the glycogen–branching enzyme.
4. **Choose one correct answer:**
   How many carbons are present in HMC-CoA?
   a) 2 b) 4 c) 5 d) 6
5. **Choose one correct answer:**
   Peptidoglycan is made up of _____
   a) N-acetylglucosamine
   b) N-acetylmuramic acid
   c) N-acetylglucosamine, N-acetylmuramic acid
   d) N-acetylglucosamine, N-acetylmuramic acid, amino acids
6. Name the hormones that regulate cholesterol biosynthesis.
7. **State True or False:** In the daytime, starch synthesis takes place in the cytosol.

X51Y6E9A5DX51Y6E9A5DX51Y6E9A5DX51Y6E9A5D

8. What is bactoprenol?
9. **State True or False:** Cholesterol's carbon atoms come solely from acetate.

Q.2 b. Answer the following questions: (Any Two)

1. Give details on the synthesis of peptidoglycan in bacteria.
2. How cholesterol biosynthesis is regulated at the transcriptional level and by hormones?
3. Diagrammatically explain starch biosynthesis.

Q.3 a. Attempt the given questions: (Any Six)

1. Which gland controls the basal metabolic rate (BMR)?
2. Name a hormone of the anterior pituitary gland.
3. Which hormone is responsible for converting the glycogen to glucose?
4. Which of the following hormones maintains the integrity of the uterine wall during pregnancy?
5. Which cells are responsible for the secretion of testosterone?
6. Which gland/organ is responsible for the secretion of human chorionic gonadotropin?
7. What is the primary function of ADH?
8. Which hormone is produced when the adrenal cortex is stimulated?
9. **Fill in the blank:** Group I hormone binds to _____ receptors.

Q.3 b. Answer the following questions: (Any Two) 14

1. Explain the metabolic effects of insulin on carbohydrate and protein metabolism.
2. Discuss the biosynthesis, physiological, and biochemical functions of androgens.
3. Describe the metabolic fate of T_3 & T_4 & abnormalities in thyroid function.

Q.4 a. Do as directed: (Any Six) 06

1. Name the vitamin whose deficiency causes scurvy in humans.
2. Name the chief cation of extracellular fluid.
3. **Select the correct alternative:**
   Which of the following elements prevent the development of dental caries?
   a) Fluorine b) Calcium c) Phosphorus d) Sodium)
4. Name the fat-soluble vitamin that is regarded as the sunshine vitamin
5. Give any one example of an essential trace element concerning human nutrition.
6. Name the protein that transports iron in the plasma in a bound form.
7. Give any one example of a vitamer of vitamin A.
8. **State True or False:** Vitamin K helps in blood clotting.
9. Name the vitamin that is exclusively synthesized by microorganisms.

X51Y6E9A5DX51Y6E9A5DX51Y6E9A5DX51Y6E9A5D

Q.4 b. **Answer the following questions: (Any Two)** **14**

1. Discuss the biochemical functions, dietary requirements, sources, and absorption of calcium.
2. Give a brief account of vitamin C for its biochemical functions, dietary sources, dietary requirements, deficiency, and megadoses.
3. Describe obesity: its cause, classification based on BMI, and its treatment.

Q.5 **Write Short notes on the following: (Any Four)** **20**

a. ELISA
b. Insulin-associated disorders
c. Role of ADH & Diabetes insipidus
d. Ketogenesis
e. Marasmus
f. Justify - Vitamin D is a hormone

X51Y6E9A5DX51Y6E9A5DX51Y6E9A5DX51Y6E9A5D