3 Hours

Total Marks: 100

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

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

1. The gap between the end of mitosis and the beginning of a new cycle is called _____
   a. G1 b. G2 c. M d. S
2. Embryonic cell cycle _____.
   a. lacks GI and G2 phases b. lacks S phase c, lacks M phase
   d. lacks the G1 phase only
3. What will happen when a human cell undergoing Mitosis is fused with a cell in the 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
4. The exit from mitosis for a cell requires _____.
   a. synthesis of cyclin b. degradation of cyclin
   c. cdk activation d. cdk inactivation
5. MPF activity is high in every _____ and low in every _____, peaking every 30 minutes in a cleaving egg.
   a. Mitosis , interphase b. interphase , mitosis c. anaphase, cell cycle
   d. cell cycle, metaphase
6. All are targets of caspases EXCEPT_____.
   a. FAKs b. lamins c. Cytoskeletal proteins d. lipases
7. In a multicellular animal, the most probable reason for the cell to enter the G0 state is _____.
   a. lack of Nutrients b. lack of growth factor
   c. lack of environmental interaction d. lack of division
8. The enzyme responsible for the "Eat Me" signal is _____
   a. Scramblase b. caspase c. protease d. lipase
9. _____ is a cytoplasmic regulator composed of Mitotic Cyclins and cdks.
   a. MPF b. PPM c. Start point d. Cytochrome C

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

1. With reference to cell cycle controls in yeasts:
   a. Give the details of two yeasts used in the studies of cell cycle controls.
   b. Cell-Cycle Checkpoints and their significance in two yeasts.
2. Mitochondria-mediated pathway of apoptosis with a neat labelled diagram.

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3. With reference to the cell cycle:
   a. Define cell cycle.
   b. Differences between the standard cell cycle and embryonic cell cycle.
   c. Interphase is the longest process in a eukaryotic cell cycle -Justify

Q.2 a. Select the correct alternative (Any six) **06**

1. Transmembrane receptors are present on _____
   a. plasma membrane b. cytoplasm c. nucleus d. DNA
2. Hydrophilic ligands bind to the receptors present on _____
   a. plasma membrane b. nucleus c. DNA d. lysosome
3. G protein-coupled receptors belong to a family of _____ receptors.
   a. transmembrane b. cytosolic c. nuclear d. endoplasmic
4. The binding of _____ on G proteins causes the activation of GPCRs.
   a. GTP b. ATP c. GDP d. AMP
5. The binding of _____ on the endoplasmic reticulum opens IP3-gated Ca^{+2} release channels. a. IP 3 b. PIP3 c. PIP2 d. IP 4
6. _____ proteins belong to the superfamily of monomeric GTPase.
   a. ras b. G proteins c. adenylyl cyclase d. phosphodiesterase
7. _____ is one of the steps in the activation of receptor tyrosine kinases.
   a. phosphorylation of the tyrosine residues
   b. activation of G proteins
   c. dissociation of the alpha subunit of G proteins
   d. attachment of the GDP on the GEF.
8. _____ is one of the attractants towards which the bacteria moves during bacterial chemotaxis.
   a. high concentration of nutrients. b. high concentration of denatured nutrients.
   c. high concentration of hydrogen peroxide. d. high concentration of HCl.
9. A highly interconnected network of intracellular signaling reactions can be represented by _____ system.
   a. computer-based neural system. b. linear programming c. bioassays
   d. PHP

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

1. Steps involved in the activation of Receptor Tyrosine Kinases with suitable examples.
2. Activation of inositol phospholipid signalling pathway by G proteins.
3. Steroids as intracellular signaling molecules.

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

1. The 16-celled stage is called the developing embryo is _____.
   a. Gastrula b.Blastula c .Morula d. Zygote

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2. Which of the following statement is INCORRECT about zygote?
   a. Its totipotent cell b. It is diploid
   c. It has a genome set only from Ova d. It divides very rapidly

3. _____ is an artificial marking technique used in the construction of a fate map.
   a. Ziel Nielson carbol fuchsin staining b. Vital staining
   c. Grams staining d. Capsule staining

4. Which one of the following is a significant characteristic of blastula?
   a. Germ layer formation b. Zona pellucida hatching
   c. Morphogenetic Movement d. Regional specification

5. _____ is a derivative of the ectoderm germ layer.
   a. Heart b. blood c. Embryonic stem cell d. Epidermis of skin

6. Stem cells which can give rise to all cell types except the placenta are called:
   a. Totipotent b. Pluripotent c. Multipotent d. Omnipotent

7. Which of the following is the 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. In autonomous specification; the blastomere contains
   a. Positional information
   b. Pattern information.
   c. should be an easily available signal for concentration gradient.
   d. Competence to induce from neighboring cells.

9. Morphogenesis is concerned with
   a. Shape of tissue organs and entire organisms b.Cell growth
   c. Cell differentiation d.Cell mass

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

1. Significance of model organism in developmental biology.

2. With reference to developmental biology discuss
   (a) Embryonic stem cell (b) Zygote and blastula

3. Morphogen and types of morphogenetic movements.

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

1. The process where clusters of cancer cells dislodge from a tumor and invade the blood vessels is called _____.
   a. metastasis b.benign c. tumor d. apoptosis

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2. Many normal human cells will have a built-in ability to the number of times they can divide and this phenomenon is called _____.
   a. endocytosis c. replicative senescence
   b. apoptosis d. tumor progression
3. Rb gene is a _____ gene.
   a. apoptotic b. metastatic c. tumor stimulator d. tumor suppressor
4. _____ are genes in which a gain of function mutation that drives a cell towards cancer.
   a. proto-oncogenes b. pre-genes c. off-genes d.viral genes
5. Chondrosarcoma is a malignant tumor of _____.
   a. nervous tissue b. blood cells c. epithelial cells d. cartilage
6. _____ is used in the treatment of cancer.
   a. tamoxifen b. Penicillin c. Amoxicillin d. erythromycin
7. _____ is cancer derived from a pigment cell in the skin.
   a. basal cell carcinoma b. melanoma c. retinoblastoma d.CML
8. Mutation of a single copy of a proto-oncogene that converts it to an oncogene has a _____ growth-promoting effect on a cell.
   a. dominant b. recessive c. silent d. deleted
9. Many breast and ovarian cancer cells overexpress a receptor protein called _____.
   a. CA-125 b. PSA c. HER2 D. BCAR-1

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

1. How an increased cell division and decreased apoptosis can contribute to tumorigenesis?
2. How epigenetic changes in cancer cells contribute to the development of cancer?
3. What do you mean by chemotherapy? Elaborate on the various drugs used to treat cancer.

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

a. Programmed cell death – meaning and process.
b. Cell cycle in Prokaryotes.
c. Rapid adaptation
d. Germ layers and their lineages.
e. Fate maps.
f. Significance of p53 genes.

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