

**Time: 2 hours Max Marks: 50**

**This paper contains TWO printed pages and THREE parts**

**PART-A**

**Answer any SEVEN of the following 2m x 7 = 14 marks**

1. What is the scientific evidence behind the endosymbiotic theory?
2. List two caspase substrates.
3. Name any molecular adaptor with its function.
4. Why do stem cells obey the immortal strand hypothesis?
5. How will you test whether a cell is pluripotent?
6. On what amino acid does ubiquitination occur and in which part of the cell?
7. What are the readers, writers and erasers of acetylation?
8. How does a proto-oncogene become an oncogene?
9. What is the role of tight junctions in maintaining apico-basal polarity?

**PART B**

**Answer any FOUR of the following: 5m x 4 = 20 marks**

1. How are the intrinsic and extrinsic pathways of apoptosis linked? Describe one technique using which you can recognize cells in early stage of apoptosis.
2. Describe the clathrin-mediated endocytic pathway, highlighting the key players. How is the endo-lysosomal system subverted by *SARS-CoV-2*? Is it susceptible to autophagy?
3. Dynein is a molecular motor. What is its role in vesicular transport? What will be the characteristics of a hybrid protein containing half dynein and half kinesin?
4. How were the genes responsible for the cell cycle discovered?
5. How and when is the spindle-checkpoint triggered? Does this differ in embryonic stem cells?
6. Explain how polarity is established in *C.elegans* embryos.

**PART C**

**Answer any TWO of the following: 8m x 2 = 16 marks**

1. Illustrate the EGFR-MAPK signalling pathway culminating in the phosphorylation of Target X. How does this pathway achieve amplification? A new EGFR antagonist is being tested for breast cancer therapy. What could be its mode of action, explain using a dose-response curve.
2. p53 is one of the most well studied tumour suppressors and very frequently found mutated in colon cancer. How is its level regulated during a) cell division b) DNA damage? Explain the two-hit model of tumorigenesis using p53 as an example.
3. Adherence junctions are unique as they show both inside-out and outside-in signaling. How does inside-out signaling influence ligand-binding during cell movement. Gullu, a newly discovered pathogen, secretes a protease that specifically cleaves Talin. How will this affect the movement of Gullu-infected cells?