1. Please compare the differences of transport routes in COPI-, COPII-, and clathrin-coated vesicles. (7%)

2. Larger cargoes (>40kDa) bind nuclear transport receptors to enter the nucleus. Describe the mechanism for the nuclear import of larger cargo proteins. (6%)

3. Cell cycle progression is mainly regulated by cyclin-CDK complexes. Please specify the mammalian cyclin-CDK complexes at different stages of cell cycle. (6%)

4. List six major players promoting or suppressing the apoptotic pathway. (6%)

5. Explain why different tRNA molecules have both unique structural features and common structural features shared by all tRNA. (4%)

6. Compare the accuracy of DNA replication and protein synthesis. What mechanisms are used to guard the fidelity of each of these processes? (10%)

7. How does DNA replication in eukaryotes differ from the process in prokaryotes? (6%)

8. (a) What is the functional difference between regular PCR and qPCR? (2%) (b) Why can't you determine the final amino acid sequence of a mature protein just by knowing the DNA sequence of its corresponding gene? (3%)

9. Please define the following terms (8%): Epigenetics, iPSC (induced pluripotent stem cell)

10. A gene can be induced transcriptionally by dexamethasone (a glucocorticoid analog). (9%)
    (a) How does dexamethasone activate gene expression?
    (b) Please describe the method to identify the glucocorticoid responsive elements (GREs) in the regulatory region of this gene.
    (c) GREs usually can be recognized and controlled by glucocorticoid receptor

見背面

(GR). How do you characterize the interaction between DNA and proteins biochemically and functionally?

11. A recent study found only 20% of transcription across the human genome is associated with protein coding genes. Please write two kinds of non-coding RNA and briefly describe their functions. (4%)

12. Generally, the eukaryotic mRNA half-life is ranged from 15 minutes to 24 hours. What mechanisms are used to control this differential mRNA stability? (4%)

13. Calcium ions (Ca^{2+}) have an important role as secondary messengers in numerous signal transduction processes. Please describe how cytosolic Ca^{2+} concentration is elevated in cells in response to various stimuli. (6%)

14. Please describe the role of β-arrestin in the signaling of G-protein-coupled receptors. (6%)

15. Post-translational modifications are chemical modifications of amino acid residues on proteins after completion of translation. Please name one example each of reversible and irreversible post-translational modifications. (6%)

16. Please use epithelial cells as an example to explain cell polarity in terms of structure and function. (7%)

試題隨卷繳回