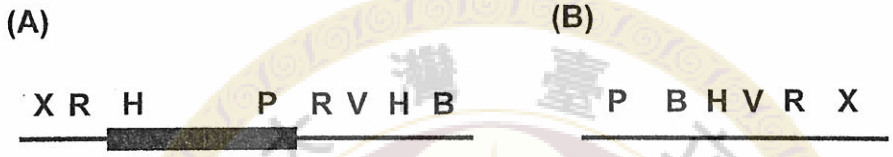
1. List four important model organisms for molecular biology research and indicate the well-known topics of which these organisms are suitable for studies. Among these four model organisms, please include one fungus, one insect, one nematode, and one fish. (16%)

2. Your advisor asks you to subclone a gene shown as the black box in (A) from a plasmid into another plasmid with the multiple cloning sites (MCS) shown as (B). The restriction sites in the MCS and the region around the gene in the original plasmid are indicated as P: PstI, B: BamHI, V: EcoRV, R: EcoRI, H: HindIII, X: XbaI. What will be the most efficient way to do the cloning? (10%)



3. There are three types of cytoskeletal fibers, and their basic structures are illustrated below. Please identify each structure, i.e., which types of fibers are they? (9%)

4. There are two types of adaptors involved in the process for translating nucleic acid sequences into amino acid sequences in proteins, what are they? (12%)

5. What are the differences between *topoisomerase I* and *topoisomerase II* in the mechanism and result of their action? (10%)

6. Use a diagram to describe regulation of the *lac* operon in bacteria. Please consider the presence or absence of glucose and lactose. (15%)

7. You are interested in studying the transcriptional regulation in the promoter of a particular gene, and you need to clone this gene first. What kind of library should be used for your purpose? (5%)

8. What property of DNA molecules allow it to be exactly replicated? (6%)

9. Describe the mechanism for co-translational translocation of polypeptide to the ER. (12%)

10. What is "systems biology"? (5%)

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