第一部分 (50%)

1. Please briefly explain the followings. Your answer should describe the function, application, or principle. Merely translating into the Chinese is not enough. (24%)

   a. yeast artificial chromosome

   b. fluorescence in situ hybridization

   c. telomerase

   d. snRNPs

   e. restriction fragment length polymorphism

   f. nick translation

   g. polymerase chain reaction

   h. nucleotide excision repair

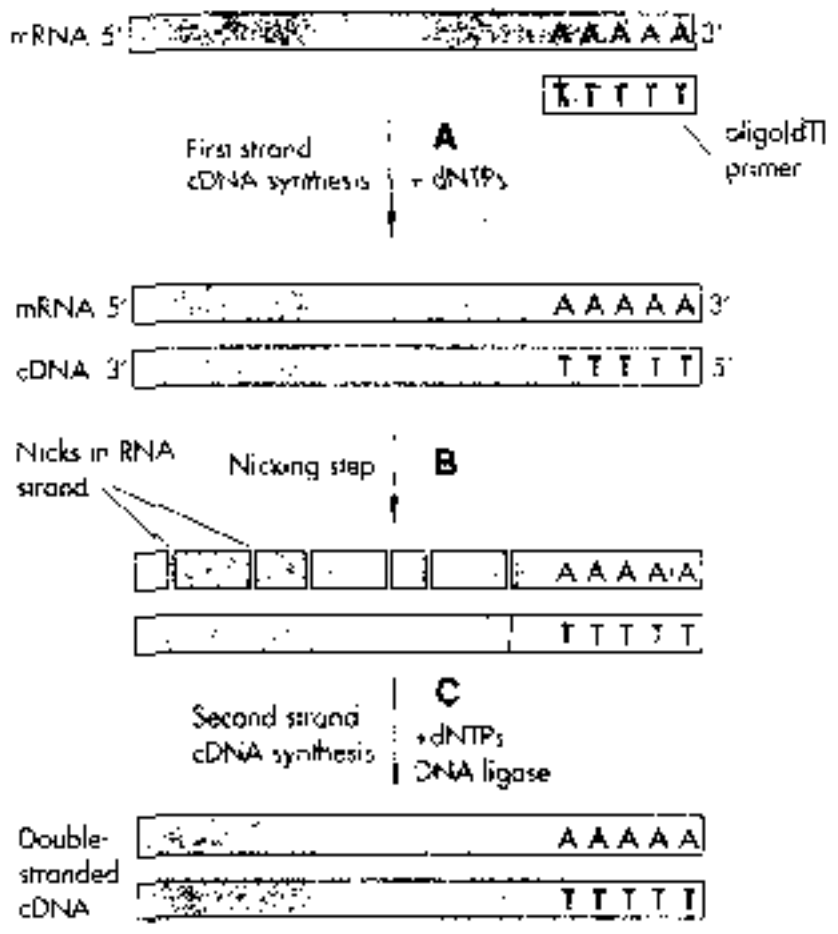
   i. primase

   j. ribozyme

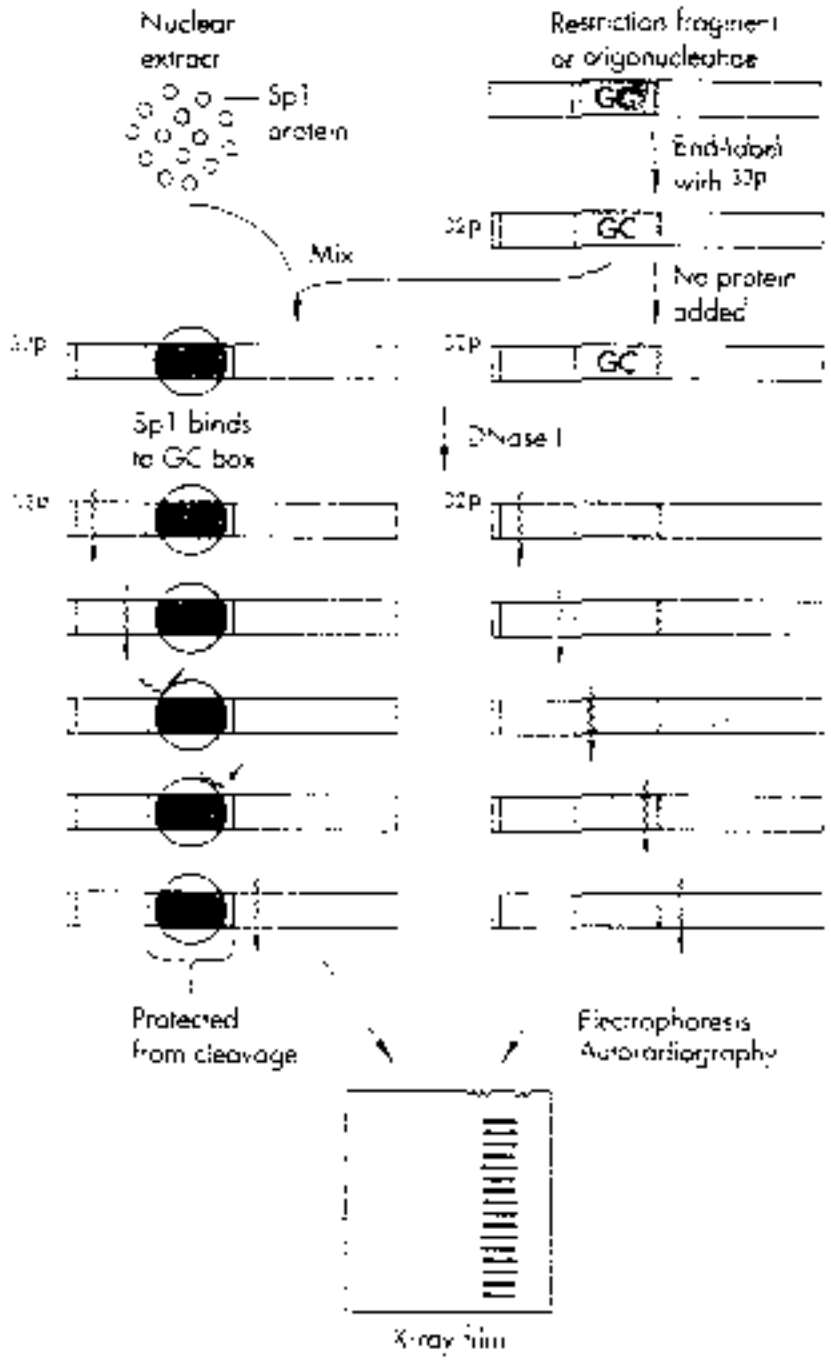
   k. polysome

   l. Okazaki fragments

2. The following figure outlines the synthesis of double-strand cDNA from mRNA. Please answer the enzymes used in step A, B, and C shown in the figure. (6%)



3. Protein-DNA interaction can be studied by the following experimental design.

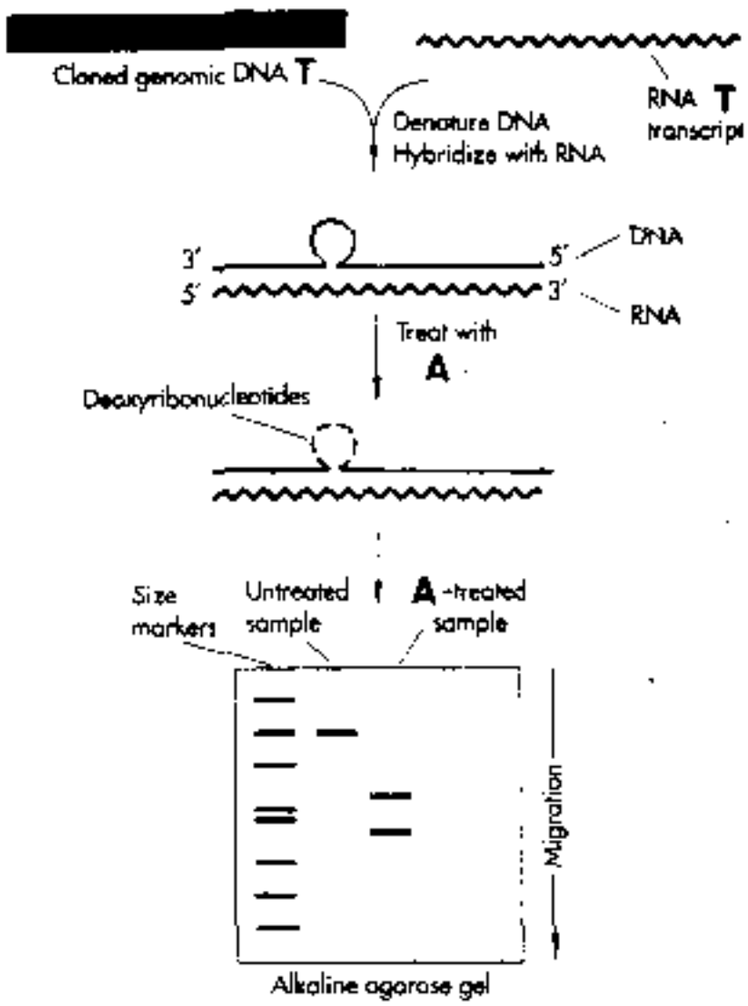


a. Assume SP1 protein can bind GC box present in the DNA, and SP1 protein is present in the nuclear extract, what will be the result on the left panel of the autoradiogram (the x-ray film). Show the pattern of the bands schematically. (4%)

b. What is this technique called ? (2%)

c. The first step of this experiment is to "end-label with P^{32}" as indicated in the figure. Please describe one method which can end-label DNA with P^{32} You should include the enzyme and the important P^{32} substrate in your answer. (4%)

4. RNA T was isolated and purified since it is very abundant in S cells. The genomic DNA containing the gene T was also isolated. The following figure describes an experimental protocol to study structure of gene T.



a. What is the enzyme used in step A in the figure ? (2%)

b. Why was alkaline instead neutral agarose gel used ? (3%)

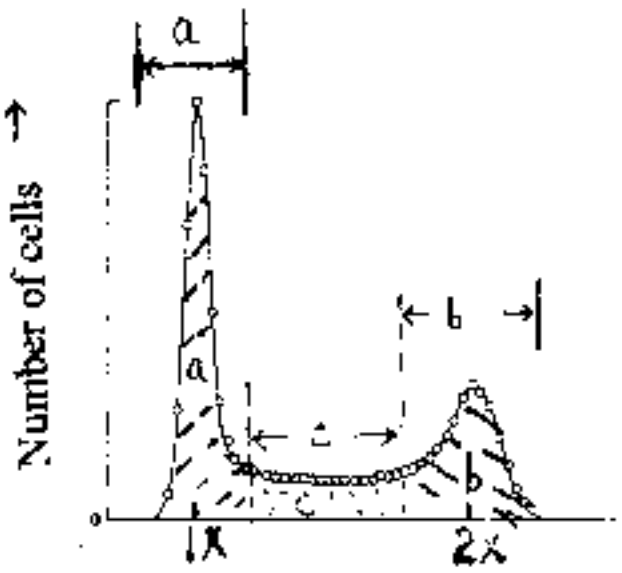
c. The results lead to an important discovery, what is it ? (5%)

第二部分（50%）

1. a) Please write down 5 classes of immunoglobulin.
   b) Pick up any two classes of the above and write down two major important functions for each class. 10%

2. Explanation of the following terms. 15%
   2.1) Integrin
   2.2) Interleukin
   2.3) Immunogen
   2.4) Western blot
   2.5) Mitogen

3. The fluorescence-activated cell sorter is used to make measurements on the fluorescent-staining cells from log stage. Place suitable phase of cell cycle in the following areas (a, b and c) and explain why? 9%



4. Choose right answers from questions related to cancer formation 8%

4.1) (a. Activation b. Inactivation c. Loss d. Recover) of tumor suppressor genes is believed to be responsible for the causation and the development of human malignancies.
4.2) Choose known tumor suppress genes from the followings (a. HNPCC b.APC c. myc d. p53 e. ras f. neu g. Rb)

**Abbreviation for question 4.2.
* HNPCC: hereditary non-polyposis colorectal cancer.
* APC: Adenomatous polyposis coli
* Rb: retinoblastoma

4.3). Program cell death occurs most frequently in (a. fibroblasts b. immature lymphocytes c. smooth muscle cells d. nerve cells e. cancer cells f. cells in embryonic stage).

5. Please fill in the blanks 8%

5.1. (a) animal or plant has stably incorporated one or more genes from another cell or organism and can pass them on to successive generations.

5.2 (b) cells forms the lining of all blood vessels. They regulates exchanges between the bloodstream and surrounding tissues and is usually surrounded by a basal lamina.

5.3 (c) is structural, beadlike unit of a eucaryotic chromosome. It composed of a short length of DNA wrapped around a core of histone proteins; the functional subunit of chromatin.

5.4 (d) is the stage of mitosis at which chromosomes are firmly attached to the mitotic spindle at its equator but have not yet segregated toward opposite poles.