

注意：所有答案務必按題號順序全部寫在制式空白試卷紙上。除規定須寫出英文名詞的題目，均可用中文（或英文）作答。務求用詞精準，先寫出關鍵答案之字句，再加闡述。

**1. Write down the full spellings of abbreviations shown as follows (answer in English, 以下各題簡稱 "AIE") (5%)**

(1) DNA; (2) mRNA; (3) cDNA; (4) PCR; (5) RNAi

**2. About "果蠅": (9%)**

- (1) Write down the species name of 果蠅 in English (AIE). (1%)
- (2) Write down two reasons about why 果蠅 becomes a powerful model organism for molecular and genetics studies. (3%)
- (3) 線蟲 is also a popular model organism in particular for the study of cell fate: (2%)
  - (a) Why?
  - (b) In comparison with 線蟲, why 果蠅 is not an ideal model for the study of cell fate?
- (4) Two genes called "*ntu*" and "*edu*" were cloned in 果蠅, 線蟲, and 蟑螂. After analysis, scientists called "*ntu*", rather "*edu*", an ortholog among 果蠅, 線蟲, and 蟑螂. Gene "*edu*" was called a homolog.
  - (a) Which gene, or both genes, has/have similar functions in these three species? (1%)
  - (b) Is "*ntu*" also a homolog? Why? (2%)

**3. About "central dogma" of molecular biology: (13%)**

- (1) Write down the flow chart of the central dogma. (3%)
- (2) In eukaryotes, which molecular event in the central dogma takes place in the cytoplasm? (AIE) (1%)
- (3) Is "DNA repair" also part of the central dogma? Where does "DNA repair" take place in a eukaryotic cell? (1%)
- (4) In prokaryotes, which enzyme takes charge of DNA replication? (AIE) (1%)
- (5) Is processing of mRNA mostly seen in prokaryotes or eukaryotes? (1%)
- (6) What are the differences before and after an mRNA is processed? (3%)
- (7) Is RNA or protein in the ribosome taking charge of protein synthesis? Also, please explain why ribosome is "ribozyme". (3%)

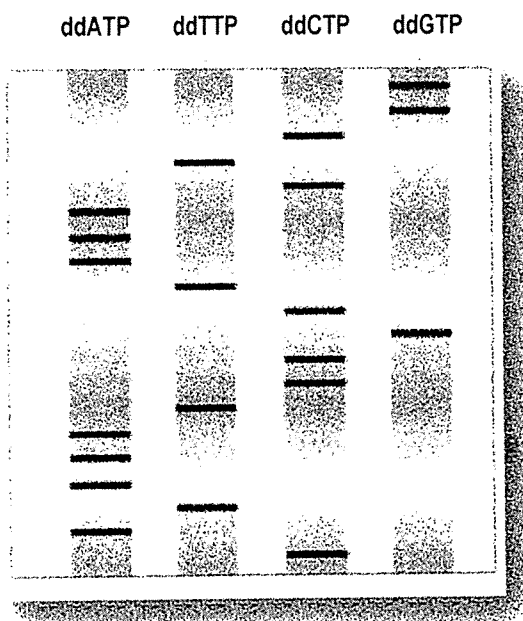
**4. About molecular cloning and biotechnology: (12%)**

- (1) Restrictions enzymes are applied to the experiments of recombinant (重組) DNA:
  - (a) What does "restriction" mean? (2%)
  - (b) Can restriction enzymes digest RNA? Why? (2%)
  - (c) Please explain why restriction enzymes are essential to an experiment of "recombinant DNA"? (2%)

(2) After a gene is cloned, it is usually sequenced:

(a) ddNTPs are chain-elongating inhibitors applied in the Sanger sequencing. Please draw a molecular structure of a ddNTP. (2%)

(b) According to the following autoradiography result performed by Sanger sequencing, write down the sequence of the target DNA fragment from the 5' end to the 3' end. (4%)



**5. About general concept of genes and gene structures: (11%)**

- (1) Please explain the relationship between DNA and genes. (2%)
- (2) Please explain the relationship between genes and genome. (2%)
- (3) Please explain the relationship between genome and chromosome. (2%)
- (4) Briefly describe functions of histones. (3%)
- (5) snRNAs are involved in splicing. What are the targets of snRNAs: (a) introns; (b) exons; (c) pre-mRNAs; (d) none of above. (2%)

6. 胞器 (organelles) 有哪些?核糖體 (ribosome) 是否為胞器?核糖體存在細胞的何處? 其功能為何? (10%)
7. 四種生物巨分子包含有醣類、脂質、核酸、蛋白質，請解釋其化學結構與特性，以及它們在生物細胞內的主要功能。(10%)
8. 請解釋內共生學說(endosymbiotic theory)的內容及其證據。(10%)
9. 模式生物(model organism)是指受到廣泛研究,對其生物現象有深入了解的物種。昆蟲當中有哪些被當作模式生物其特性為何。(10%)
10. 請說明何為入侵種生物?台灣有哪些入侵種生物請例舉三個!(10%)

試題隨卷繳回