

系所組別：臨床醫學研究所

考試科目：生命科學

考試日期：0224，節次：3

※ 考生請注意：本試題不可使用計算機

## 一. 簡答題

1. Please briefly describe the following terms

- (1) Programmed cell death (2%)
- (2) microRNA (2%)
- (3) frameshift (2%)
- (4) RNA interference (2%)
- (5) Blood brain barrier (2%)

2. Please briefly describe the following methods

- (1) In situ hybridization (3%)
- (2) Yeast two hybrid (3%)
- (3) Microarray (3%)
- (4) Gene knockout mice (3%)
- (5) Next generation sequencing (3%)

3. Domain or motif can form structure of proteins. Please describe their functions of at least three domains or motifs. (5%)

4. What is the structure of typical synapse? (5%)

What is the major function of synapse in nerve system? (5%)

5. What is autophagy? (5%)

What are the differences between autophagy and ubiquitin-proteasome system (UPS)? (5%)

6. The laws of inheritance were derived by Gregor Mendel, a 19th-century Austrian priest-monk conducting hybridization experiments in garden peas. Mendel discovered that when crossing purebred white flower and purple flower plants, the result is not a blend. Rather than being a mix of the two, the offspring was purple-flowered. Mendel made two innovations to the science of genetics: developed pure lines and counted his results and kept statistical notes. Mendel summarized his findings in two laws: the Law of Segregation and the Law of Independent Assortment.

(1) Why is Mendel's First Law of Genetics called the Law of Segregation? (5%)

(2) Why is Mendel's Second Law of Genetics called the Law of Independent Assortment? (5%)

(3) Define the following terms used in genetics. (5%)

Phenotype:

Backcross:

Recessive:

(背面仍有題目,請繼續作答)

Heterozygote:

Penetrance:

(4) How does a modifier gene influence the expression of a phenotype? (5%)

(5) What is Mendelian trait? Can you list a disease that falls into this category? (5%)

7. The Nobel Prize in Physiology or Medicine 2012 was jointly awarded to John B. Gurdon and Shinya Yamanaka. What did these two scientists discover? What are Yamanaka factors? What might be applied to medical use based on their findings? (10%)

二. For each question, choose the ONE BEST answer or completion (total 15%; 5% each)

1. The isotype specific antigenic determinants (epitopes) of immunoglobulins are associated with

- A) L chains.
- B) J chains.
- C) disulfide bonds.
- D) H chains.
- E) variable regions.

2. Injection into rabbits of a preparation of pooled human IgG could stimulate production of

- A) anti  $\gamma$  heavy-chain antibody.
- B) anti  $\kappa$  chain antibody.
- C) anti-L chain antibody.
- D) anti-Fc antibody.
- E) All are correct.

3. The primary and secondary antibody responses differ in

- A) the predominant isotype generated.
- B) the number of lymphocytes responding to antigen.
- C) the speed at which antibodies appear in the serum.
- D) the biologic functions manifested by the Ig isotypes produced.
- E) All of the above.