國立中央大學101學年度碩士班考試入學試題卷

所別：生命科學系碩士班 分子與環境生物學組(一般生)　科目：生物化學II(含分生)　共 2 頁 第 1 頁
生命科學系碩士班 分子與環境生物學組(在職生)

本科考試禁用計算器　　＊請在試卷答案卷（卡）內作答

I. 單選題（每題 2 分）

※For questions 1~4 match the term with the appropriate activity. All of the terms listed are involved in DNA repair, DNA expression, or viruses.

(A) Catabolite activator protein　(B) Lariat　(C) Pribnow box
(D) CAAT box　(E) Rec protein　(F) Reverse transcriptase
(G) Thymine dimers

1. Transcription initiation?

2. Splicing of mRNA?

3. SOS response?

4. Photoreactivation?

5. What is "epistasis"?
(A) A gene expressed in female or male.
(B) A heterozygous condition.
(C) A gene is only expressed if another one is also expressed.
(D) Two alleles the gene products of which are both expressed.
(E) Hereditary information not carried on chromosomal DNA.

6. What type of interaction occurs predominantly between DNA and histones?
(A) Ionic. (B) Hydrophilic. (C) Covalent. (D) Hydrogen bonding. (E) Hydrophobic.

7. Amino acids frequently found in proteins where there is a change in direction (β-turn of the polypeptide chain) are?
(A) Cys, Val. (B) His, Met. (C) Leu, Tyr. (D) Phe, Trp. (E) Pro, Gly.

8. What is the definition for a "transcriptome"?
(A) All the genes in an organism. (B) All the transcribed genes in an organism.
(C) All the exons in an organism. (D) All the mRNAs in an organism.
(E) All the proteins in an organism.

9. Each step in protein synthesis requires energy except?
(A) formation of the initiation complex. (B) charging of tRNA.
(C) movement of the mRNA on the ribosome. (D) termination.
(E) formation of the peptide bond.

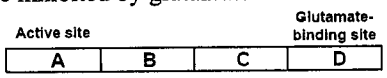
10. What is the first step in eukaryotic mRNA processing?
(A) Addition of the cap. (B) Addition of a poly A tail. (C) Methylation of the cap.
(D) Splicing. (E) Transport out of the nucleus.

II 單選題（每題 3 分）

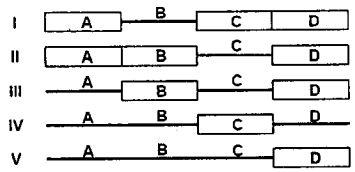
1. Which of the following correctly lists the compounds in order of decreasing free energy (under intracellular conditions)?
a. phosphoenolpyruvate. b. fructose-1,6-bisphosphate. c. glucose-6 phosphate.
d. pyruvate. e. 1,3 bisphosphoglycerate.
(A) c-b-a-e-d. (B) c-b-e-a-d. (C) c-b-e-d-a. (D) b-e-c-a-d. (E) b-c-e-a-d.

2. Which of the following is an intermediate in the oxidative phase of the pentose phosphate pathway?
(A) 2-oxoglutarate. (B) Gluconate-6-phosphate. (C) Fructose-6-phosphate.
(D) L-Gluconate. (E) Phosphoenolpyruvate.

※For questions 3~4. An enzyme A (W^+) is activated by fructose 6-phosphate (F6P). A mutant (*a*) lacks response to F6P. Both forms are inhibited by glutamate.



To investigate the location of the mutant F6P binding site, chimeras were constructed. Sections from the mutant are indicated by a thin line.



Construct I, phenotype W^+.
Construct II, phenotype mutant *a*.

注意：背面有試題

Construct III, phenotype mutant *a*.
Construct IV, phenotype W^+.
Construct V, phenotype mutant *a*.

3. In which segment of the gene does the mutation lie?

4. If there were a mutation in the wild-type active site and glutamate binding site, which construct would give activity and still be responsive to F6P?
(A) I. (B) II. (C) III. (D) IV. (E) V.

5. "Zinc finger" domains are important for the regulation of cellular response because they are
(A) structures with high redox potential.
(B) restricted to the cytoplasmic domains of growth-factor receptors.
(C) characteristics of homeobox genes.
(D) a structure motif in many DNA-binding proteins.
(E) at the catalytic site in many protein kinase.

6. In prokaryotes, environmental sensing is involved in two-component systems that sense and respond to changes in environment. These two-component systems involve which of the following?
I. Protein phosphorylation
II. Transcriptional regulation
III. Membrane proteins
(A) I only. (B) II only. (C) III only. (D) I and II. (E) I, II, and III.

7. Which of the following is not a characteristic of the SRP (mammalian signal recognition particle)?
(A) It temporarily arrests translation.
(B) It binds to the signal sequence of secretory proteins.
(C) It contains a signal peptidase activity.
(D) It targets nascent secretory proteins to the rough endoplasmic reticulum.
(E) It contains both RNA and several polypeptides.

8. An *E. coli* strain lacking DNA polymerase I would be deficient in DNA
(A) transcription. (B) replication. (C) degradation. (D) repair. (E) methylation.

9. A drug is tested to kill cells because it is found to inhibit oxidative phosphorylation. So this drug is supposed to create holes in the following sites EXCEPT
(A) cellular membrane of purple bacteria.
(B) inner mitochondria membrane.
(C) inner chloroplast membrane.
(D) thylakoid membrane.
(E) cristae.

10. Which of the following statements is CORRECT?
(A) The enzymes of the citric acid cycle are located in the intermembrane space of the mitochondrion
(B) The rate of electron transport chain in mitochondrion depends on [ATP]
(C) The electron transport chains of the light reaction are located in the stroma
(D) To produce one glucose, the Calvin cycle needs to be run through six times
(E) C4 and CAM plants can fix carbon more efficiently under conditions of low atmospheric CO_2

III 簡答題（每題 6 分）

Please describe and compare the following terms

1. Terminator & Stop codon

2. Organelle genome & Nuclear Genome

3. DNA binding proteins & Histones

4. RNA interference & Antisense therapy

5. Rubisco and Photorespiration

IV 問答題（每題 10 分）

1. Please describe "chromatin immunoprecipitation (ChIP)"?

2. Please describe yeast "one-hybrid screening system" and "yeast two-hybrid screening system"?

注意：背面有試題