※ 考生請注意：本試題 □可 ☑不可 使用計算機

請勿在本試題紙上作答，否則不予計分

一、SIMPLE-CHOICE QUESTIONS 單選題 (two points for each question.每題 2 分)(20%)
(以 A、B、C、D 四種選項作答，其餘一律不計分)

1. Which of the following description of yeast-one hybrid is true?
   (A) Identifying protein-protein interaction
   (B) Identifying protein-DNA interaction
   (C) Identifying DNA-DNA interaction
   (D) All of the above

2. Which statements are correct regarding NHEJ (non-homologous end joining)?
   (I) Involved in the recombination of immunoglobulin genes
   (II) It requires homologous recombination
   (III) It is a common system to repair single strand nick
   (IV) Mutations in NHEJ pathway cause human disease
   (V) Both animals and plants need NHEJ
   (VI) Phosphorylation is involved in NHEJ

   (A) (I), (II), (III), (IV), (VI)
   (B) (I), (III), (IV), (V), (VI)
   (C) (I), (IV), (V), (VI)
   (D) (I), (III), (IV), (V)

3. Which of the following factor involve in the transcription?
   (A) eIF-4B
   (B) SnRNPs
   (C) TBP
   (D) G protein

4. Which size (bp) is the *Arabidopsis* (a model plant) genome?
   (A) 5.12×10^{12}
   (B) 1.25×10^{8}
   (C) 4.73×10^{6}
   (D) 3.54×10^{5}

(背面仍有題目,請繼續作答)

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5. Which statement is correct regarding microsatellites?
   (A) A class of STSs
   (B) Highly polymorphic
   (C) Consist of a core sequence repeats
   (D) All of the above

6. O^6-methyl G pair with_____.
   (A) A
   (B) T
   (C) C
   (D) G

7. Which statements about the mRNA 3' polyadenylation are TRUE?
   (I) It protects against RNAase
   (II) It increases the efficiency of translation on the ribosome
   (III) Interacts with fMet-tRNA during translational initiation
   (IV) It increases the stability of mRNA molecules in the cytoplasm

   (A) Only (I), (II),(III)
   (B) Only (I) ,(II), (IV)
   (C) Only (I), (III), (IV)
   (D) All statements are right (I), (II), (III), (IV)

8. Which of the following is NOT required by DNA polymerase for *in vitro* synthesis of DNA?
   (I) dNTP
   (II) amino acid
   (III) primer
   (IV) template
   (V) restriction enzyme
   (VI) ATP

   (A) (II) and (VI)
   (B) (II) and (V)
   (C) (I) ,(II), (III)
   (D) (I),(II),(V)

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9. Which of the following DNA molecules has highest Tm value?
   (A) CCTAGGCGTAGCTCCAG
   (B) AATTCTTTAAGGTTTATC
   (C) TTTGCTGAATGAACCTT
   (D) TTAGCTTGGATTTAATCT

10. Which statement is NOT correct regarding telomeres and telomerase?
   (A) Telomerase is a "ribonucleoprotein complex" composed of a protein component and a DNA primer sequence which acts to protect the terminal ends of chromosomes.
   (B) Telomeres and TERT (Telomerase Reverse Transcriptases) that are involved in synthesis of telomeres in humans
   (C) Telomere length varies greatly between species, from approximately 300 to 600 base pairs in yeast to many kilobases in humans, and usually is composed of arrays of guanine-rich, six-to-eight base-pair-long repeats.
   (D) Telomeres shorten in part because of the end replication problem that is exhibited during DNA replication.

二、SHORT ESSAY 簡答題(Five points for each question.每題 5 分)(50%)

1. Please explain the regulation mechanism of the *lac* operon in presence and absence of lactose in *E. coli*.
2. Please describe the mechanism of Rho-dependent termination in transcription.
3. What is microRNA? Please explain the mechanism and its significance.
4. What is ChIP-Chip? Please explain the mechanism and how to apply it in biosciences or biotechnology.
5. What is heterochromatin? What is euchromatin? Please explain the relatively to gene activity.
6. Please describe the ubiquitin pathway of protein degradation in the cytosol.
7. What is the function of G protein in signal transduction?

(背面仍有題目,請繼續作答)

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8. What is transposons? Please explain the influence in plants.
9. What is next generation sequencing? Please explain the mechanism and how to apply it in biosciences or biotechnology.
10. If you want to identify a gene which is related to dehydration response in plants, how to design an experiment?

三、MATCHING 配合題(Three points for each. Use the letter for the best matching answer no more than once. 每題 3 分，用英文字母作答，選擇最好的選項，每題只有一個答案)(30%)

1. Zinc finger	A. Base excision repair
2. *cis*-acting element	B. Genomic library
3. AP endonuclease	C. Elizabeth H. Blackburn
4. Shine-Dalgarno sequence	D. promotes the phage lytic cycle
5. Bacteria Artificial Chrosome	E. transcription factor
6. RNAi	F. Holliday junction
7. transposable elements	G. knock-down
8. Cro protein	H. transcription factor binding site
9. *E. coli* RecBCD	I. promotes the phage lysogenic cycle
10. p53	J. translation
	k. apoptosis
	l. double strand break repair
	M. knock-out
	N. Barbara McClintock