

A、單選題：(40%，每題 2 分)

1. What protein ensures that bacterial RNA polymerase binds in a stable manner to DNA only at promoters?
  - A. core enzyme
  - B. sigma factor
  - C. beta factor
  - D. alpha factor
2. What region not includes in a control region of the *trp* operon?
  - A. promoter
  - B. leader peptide coding region
  - C. repressor
  - D. attenuator
3. What repressor binds at the operator  $O_L$  and  $O_R$  of lambda phage in the lysogenic maintenance stage?
  - A. N protein
  - B. Cro protein
  - C. CI protein
  - D. CII protein
4. The unit of DNA in which an individual act of replication occurs is called the \_\_\_\_\_.
  - A. replisome
  - B. chromosome
  - C. genome
  - D. replicon
5. Which of the following can the replication forks be created?
  - A. origin
  - B. promoter
  - C. operator
  - D. attenuator
6. The procedure for introducing exogenous donor DNA into recipient mammalian cells is called \_\_\_\_\_.
  - A. transfection
  - B. trnasformation
  - C. transduction
  - D. trnaslocation
7. What mechanism not occurs by which a transposon moves?
  - A. replicative transposition
  - B. nonreplicative transposition
  - C. conservative transposition
  - D. nonconservative transposition

(背面仍有題目,請繼續作答)

8. Which of the following match is incorrect for protein targeting?
- A. KDEL                      golgi apparatus
  - B. Asn-X-Ser                N-link glycosylation
  - C. Mannose-6-P            lysosome
  - D. v-SNARE/t-SNARE    vesicle transport
9. Which of the following statements of snRNP is correct?
- A. In their normal state, they exist in the nucleus.
  - B. Together with some additional proteins, they are called spliceosome.
  - C. Defect of snRNP cause a genetic disease of cystic fibrosis.
  - D. The snRNPs involved in splicing are U1, U2, U3, U4/U6 and U5.
10. What is the phenomenon of the expression actin genes in *C. elegans*?  
Three actin mRNAs share the same 22 bases leader sequence at the 5' terminus.  
The leader sequence is not coded in the actin gene, but is transcribed independently as part of a 100 base coded by a gene elsewhere?
- A. alternative splicing
  - B. cis-splicing
  - C. trans-splicing
  - D. self-splicing
11. Which of the following reaction is not catalyzed by RNA molecules?
- A. Removal of group I intron
  - B. Peptide formation in protein synthesis
  - C. Removal of group II intron
  - D. Removal of tRNA introns
12. A powerful technique for making transgenic mice takes advantage of embryonic stem (ES) cells which are derived from the mouse. Which statement NOT true?
- A. ES cells are transfected with DNA by microinjection or electroporation.
  - B. The ES cells carrying the marker then injected into a recipient blastocyst.
  - C. A chimeric mouse is developed in due course.
  - D. No homozygous offsprings can be obtained in the transgenic animals.
13. The Ras cascade is initiated by a series of activation events that occur on the cytoplasmic face of the plasma membrane. Which of the following statement is NOT true?
- A. A common signal transduction cascade passes from a receptor tyrosine kinase through an adaptor to activate Ras.
  - B. Ras can trigger a series of Tyr-phosphorylation event.
  - C. MAP kinases re activated and enter the nucleus.
  - D. Transcription factors are phosphorylated to initiate gene expression.
14. Which of the following cannot act as a second messenger?
- A. diacylglycerol
  - B.  $Ca^{2+}$
  - C. Acetylcholine
  - D. Inositol triphosphate

15. A cistron is  
(A) the smallest unit which, if altered, give rise to mutant phenotype.  
(B) the genetic unit of biochemical function.  
(C) the sole factor in genotypic determination.  
(D) the smallest unit that is interchangeable by recombination.
16. Restriction enzymes can usually recognize a sequence of \_\_\_ base pairs  
(A) 2 to 4 (B) 3 to 5 (C) 4 to 6 (D) 5 to 8
17. In order to calculate map distance of genes on a chromosome you must know the  
(A) number of mutant genes (B) crossover percentage  
(C) recombination frequency of each locus (D) A and C
18. Which statement is not correct about silent mutations?  
(A) neutral with regard to the protein  
(B) account for 75% of a coding sequence  
(C) can call for a different tRNA to respond  
(D) influence the efficiency of translation
19. Which statement is not correct about glutamate? (A) acidic (B) hydrophilic  
(C) can not form hydrogen bonds (D) can form salt bridge
20. Which molecule is not required for eukaryotic initiation complex of protein synthesis (A) 40S ribosome subunit (B) mRNA (C) Met-tRNA<sub>i</sub> (D) GTP

**B、複選題：(30%，每題3分，全對才給分)**

1. Which of the following statements are correct?
- A. Yeast can switch silent and active loci for mating type.
  - B. The cassette model for yeast mating type proposes that *MAT* has an active cassette of either type  $\alpha$  or type  $a$ .
  - C. The cassette model for yeast mating type proposes that *HML* and *HMR* have active cassettes.
  - D. The yeast mating pathway is triggered by signal transduction.
2. Ti plasmids can be divided into four groups, according to the type of opine that are made. What group names are correct?
- A. Nopaline plasmids
  - B. Agropine plasmids
  - C. Ri plasmids
  - D. Octopine plasmids
3. What repair systems can be found in *E. coli*?
- A. mismatch repair
  - B. incision repair
  - C. tolerance systems
  - D. retrieval systems

4. The homeotic genes contain the homeodomain that are
  - A. zinc-finger motif
  - B. helix-turn-helix
  - C. leucine zipper
  - D. responsible for protein-DNA interaction
  
5. Gene expression is associated with demethylation. In active genes,
  - A. the nucleosomes of a domain including the transcribed region become more sensitive to DNase I
  - B. the DNA of the same region is undermethylated.
  - C. a hypersensitive site is established near the transcription start site.
  - D. the presence of CpG- island in the 5' regions of some genes is connected with the effect of methylation on gene expression.
  
6. For nuclear splicing,
  - A. excision of certain introns is an autonomous property of the RNA itself.
  - B. all 5' splicing sites may be functionally equivalent and all 3' sites may be similarly indistinguishable.
  - C. nuclear splice sites are generic, they do not have specificity for individual RNA precursors.
  - D. the apparatus for splicing is tissue specific.
  
7. Choose the true statements.
  - (A) Eukaryotic genes are often interrupted.
  - (B) Most organelle genomes are circular DNAs.
  - (C) One DNA sequence code for only one protein.
  - (D) Most structural genes lie in nonrepetitive DNA.
  
8. Choose the true statements.
  - (A) Most of the DNA in a cell is found in the nucleus.
  - (B) DNA is readily hydrolyzed by alkali.
  - (C) The sum of the bases thymine and adenine in a strand of DNA never equals the sum in the complementary strands.
  - (D) genes for rRNA form a repeated tandem unit.
  
9. Choose the true statements.
  - (A) in order to do human gene mapping, many test crosses must be performed.
  - (B) neighboring genes are less loosely linked than more distant ones.
  - (C) gene clusters are formed by duplication and divergence.
  - (D) satellite DNAs often lie in heterochromatin.
  
10. Choose the false statements.
  - (A) Proteins that are actively transported into the nucleus require specific NES sequences.
  - (B) A tRNA that recognizes a termination codon provide a missense suppressor.
  - (C) Mutations induced by base substitution often are leaky.
  - (D) A trans-acting mutation in a protein controls the adjacent DNA but does not influence the other allele

C、簡答題：(30%，每題 5 分)

1. Please draw and explain the gene organization on the *lac* operon.
2. Please draw and explain the common transposition of insertion sequences.
3. What are the connections between DNA transcription and DNA repair?
4. What are the differences between the promoters of RNA polymerase I, II and III?
5. How is protein synthesis terminated?
6. One of the features of prokariotic RNA, is its very short life (minutes). In contrast, more stable mRNAs are found in eukaryotes. For example, the mRNA for haemoglobin in the red cell, is active for hours and even days, after the loss of the nucleus. RNA is stable after a few modification steps. What are these modification steps?