國立成功大學 107 學年度碩士班招生考試試題

系　　所：化學系

考試科目：生物技術

考試日期：0206，節次：4

※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

一、選擇題: (100 分，每題 5 分)

1) Protein amino acid side chains can hydrogen bond in the major groove of DNA, and discriminate between each of the four possible base pairs. In which one of the following groups of amino acids can all three members potentially be used in such DNA-protein recognition? (A) Ala, Asn, Glu (B) Arg, Gln, Leu (C) Asn, Gln, Trp (D) Asn, Glu, Lys (E) Glu, Lys, Pr.

2) Which of the following is a DNA sequence? (A) Coactivator (B) Corepressor (C) Enhancer (D) Inducer (E) Transactivator.

3) Gene silencing by RNA interference acts by _____ of the target gene. (A) inhibiting transcription (B) inhibiting translation (C) inhibiting splicing (D) degradation of the mRNA (E) inhibiting polyadenylation.

4) Protein structural motifs often have general functions in common. Which one of the following motifs is known to be involved in protein dimer formation, but not in direct protein-DNA interactions? (A) β-barrel (B) helix-turn-helix (C) homeodomain (D) leucine zipper (E) zinc finger.

5) The large structure consisting of an mRNA molecule being translated by multiple copies of the macromolecular complexes that carry out protein synthesis is called a: (A) lysosome. (B) polysome. (C) proteasome. (D) ribosome. (E) synthosome.

6) Which of the following is *not* true of tRNA molecules? (A) The 3′-terminal sequence is —CCA. (B) Their anticodons are complementary to the triplet codon in the mRNA. (C) They contain more than four different bases. (D) They contain several short regions of double helix. (E) With the right enzyme, any given tRNA molecule will accept any of the 20 amino acids.

7) Which one of the following statements about ribosomes is true? (A) The large subunit contains rRNA molecules, the small subunit does not. (B) The RNA in ribosomes plays a structural, not catalytic, role. (C) There are about 25 of them in an *E. coli* cell. (D) There are two major subunits, each with multiple proteins. (E) They are relatively small, with molecular weights less than 10,000.

8) Which one of the following is true about the genetic code? (A) All codons recognized by a given tRNA encode different amino acids. (B) It is absolutely identical in all living things. (C) Several different codons may encode the same amino acid. (D) The base in the middle position of the tRNA anticodon sometimes permits "wobble" base pairing with 2 or 3 different codons. (E) The first position of the tRNA anticodon is always adenosine.

9) A certain bacterial mRNA is known to represent only one gene and to contain about 800 nucleotides. If you assume that the average amino acid residue contributes 110 to the peptide molecular weight, the largest polypeptide that this mRNA could code for would have a molecular weight of about: (A) 800 (B) 5,000 (C) 30,000 (D) 80,000 (E) An upper limit cannot be determined from the data given.

10) Splicing of introns in nuclear mRNA primary transcripts requires: (A) a guanine nucleoside or nucleotide. (B) endoribonucleases. (C) polynucleotide phosphorylase. (D) RNA polymerase II. (E) small nuclear ribonucleoproteins (snurps).

11) Differential RNA processing may result in: (A) a shift in the ratio of mRNA produced from two adjacent

genes. (B) attachment of the poly(A) tail to the 5′ end of an mRNA. (C) inversion of certain exons in the final mRNA. (D) the production of the same protein from two different genes. (E) the production of two distinct proteins from a single gene.

12) Which of the following is *not* usually essential for the catalytic activity of ribozymes? (A) Correct base pairing. (B) Correct base sequence. (C) Correct interaction with protein. (D) Correct secondary structure (E) Correct three-dimensional structure.

13) Which one of the following statements about mRNA stability is true? (A) Degradation always proceeds in the 5′ to 3′ direction. (B) Degradation of mRNA by polynucleotide phosphorylase yields 5′-nucleoside monophosphates. (C) In general, bacterial mRNAs have longer half-lives than do eukaryotic mRNAs. (D) Rates of mRNA degradation are always at least ten-fold slower than rates of mRNA synthesis. (E) Secondary structure in mRNA (hairpins, for example) slows the rate of degradation.

14) Reverse transcriptase: (A) can utilize only RNA templates. (B) has a 3′→ 5′ proofreading exonuclease but not a 5′→ 3′ exonuclease. (C) is activated by AZT. (D) is encoded by retroviruses. (E) synthesizes DNA with the same fidelity as a typical DNA polymerase.

15) Compared with DNA polymerase, reverse transcriptase: (A) does not require a primer to initiate synthesis. (B) introduces no errors into genetic material because it synthesizes RNA, not DNA. (C) makes fewer errors in synthesizing a complementary polynucleotide. (D) makes more errors because it lacks the 3′ → 5′ proofreading exonuclease activity. (E) synthesizes complementary strands in the opposite direction — from 3′→ 5′.

16) Which of these polymerases does not require a template? (A) RNA pol I (B) RNA pol II (C) Reverse transcriptase (D) Polyadenylate polymerase (E) RNA replicase.

17) When a DNA molecule is described as replicating bidirectionally, that means that it has two: (A) chains (B) independently replicating segment. (C) origins. (D) replication forks. (E) termination points.

18) The proofreading function of DNA polymerase involves all of the following *except:* (A) a 3′ → 5′ exonuclease. (B) base pairing. (C) detection of mismatched base pairs. (D) phosphodiester bond hydrolysis. (E) reversal of the polymerization reaction.

19) The Ames test is used to: (A) detect bacterial viruses. (B) determine the rate of DNA replication. (C) examine the potency of antibiotics. (D) measure the mutagenic effects of various chemical compounds. (E) quantify the damaging effects of UV light on DNA molecules.

20) In base-excision repair, the first enzyme to act is: (A) AP endonuclease. (B) Dam methylase. (C) DNA glycosylase. (D) DNA ligase. (E) DNA polymerase.