

一. 選擇題二十題，每題二分，所有考題務必在答案卷上作答。

1. How many genes are estimated to be in the human genome?
  - A. 20,000
  - B. 35,000
  - C. 50,000
  - D. 75,000
  - E. 100,000
  
2. Conserved portions of mammalian genomes are assumed to be \_\_\_\_\_.
  - A. important
  - B. repeated
  - C. unimportant
  - D. long
  - E. extraordinary
  
3. \_\_\_\_\_ plays a key role in replicating DNA at the ends of chromosomes.
  - A. PolyA polymerase
  - B. DNA polymerase
  - C. Telomerase
  - D. Protein kinase
  - E. Reverse transcriptase
  
4. The site on DNA to which RNA polymerases bind before initiating transcription is called the \_\_\_\_\_.
  - A. terminator
  - B. operator
  - C. promoter
  - D. enhancer
  - E. silencer
  
5. What is the theoretical progression limit of nucleic acid amplification by PCR (polymerase chain reaction)?
  - A. 1, 2, 3, 4, 5, 6, ...
  - B. 2, 4, 6, 8, 10, 12, ...
  - C. 1, 10, 100, 1000, 10000, 1000000, ...
  - D. 1, 2, 4, 8, 16, 32, ...
  - E. 2, 4, 24, 96, 384, 1024, ...
  
6. What do transcriptional activators do?
  - A. They bind to specific DNA sequences and help assemble the transcription complex.
  - B. They stimulate translation.
  - C. They direct RNA splicing.
  - D. They remodel chromatin into a 30 nm repressive fiber.
  - E. They have both helicase and kinase activity, which is essential for transcription.

(背面仍有題目,請繼續作答)

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7. A polyclonal antibody is to a Western blot, as a \_\_\_\_\_ is to a Northern blot.
- monoclonal antibody
  - mRNA
  - oligonucleotide probe
  - chromosome
  - tRNA
8. Translation is carried out by what specific complex?
- Ribozyme
  - Translationase
  - Telomerase
  - Ribosome
  - Nucleosome
9. Rb is a tumor-suppressor gene. How would you go about determining whether or not Rb is expressed in tumor cells and healthy cells?
- Perform a Southern blot on chromosomal DNA from these cells.
  - Perform a Northern blot on mRNA isolated from these cells.
  - Perform an Eastern blot using the yeast two hybrid assay.
  - Clone the Rb gene.
  - Perform a co-immunoprecipitation of the Rb protein and look for associated proteins.
10. Proteins that help RNA polymerase recognize promoters are called \_\_\_\_\_.
- transcription factors
  - translation factors
  - elongation factors
  - proteases
  - A and C
11. A tRNA<sup>Cys</sup> is charged with cysteine and then the attached amino acid is converted to alanine by removing its sulfhydryl group. The altered, charged tRNAs are used in a cell-free protein synthesis system. What is the result of this experiment?
- Cysteine was inserted in the proteins where alanine was supposed to be.
  - Alanine was inserted in the proteins where cysteine was supposed to be.
  - Nothing unusual happens.
  - Phenylalanine was inserted in the proteins where cysteine was supposed to be.
  - B and D
12. What fact does the experiment in question #11 above demonstrate?
- Protein synthesis requires ATP.
  - The anticodon plays no direct role in determining where an amino acid is incorporated in a polypeptide.
  - The amino acid plays no direct role in determining where it is incorporated in a polypeptide.
  - Protein synthesis requires cysteine.
  - tRNAs cannot be altered chemically and still work appropriately.

13. What is always the first amino acid incorporated at the N-terminus of a nascent polypeptide chain?
- Cysteine
  - Cystine
  - Methionine
  - Asparagine
  - Glycine
14. What happens if a single nucleotide is removed or added from DNA in the coding region of a gene?
- A single amino acid in the protein is changed; it is a point mutation.
  - A frameshift mutation occurs.
  - The incorrect sequence is read from the site of the mutation through the remainder of the coding sequence.
  - It results in an entirely abnormal amino acid sequence from the point of the mutation to the end of the protein.
  - B, C and D
15. All of the following can be found in chromatin except
- DNA
  - histones
  - RNA
  - transcription factors
  - B and C
16. Splice sites in pre-mRNA are marked by two universally conserved sequences contained:
- in the middle of the intron
  - at the ends of the exons
  - in the middle of the exons
  - at the ends of the introns
  - none of the above
17. During times of moderate stress (e.g., heat shock) proteins can denature or unfold. What kind of genes might be turned on under such stress conditions that would help the cell survive?
- Genes coding for glycolysis enzymes
  - Genes coding for molecular chaperones
  - Genes coding for RNA polymerase II
  - Genes coding for ribosomal subunits
  - Genes coding for cell differentiation molecules
18. What is the purpose of the yeast two hybrid assay?
- Measure protein-protein interactions in vivo
  - Perform Southern blots on chromosomal DNA
  - Identify open reading frames (ORFs)
  - Measure the growth rate of yeast cells.
  - Propagate recombinant plasmids using an ampicillin resistance gene.

(背面仍有題目,請繼續作答)

19. You are studying two strands of DNA. They have exactly the same length but the first one has a very high G + C/A + T ratio of 3.4. The second DNA strand has a G + C/A + T ratio of 2.3. Which of the two strands will have the lowest melting temperature and why?
- the first strand because it contains more H bonds
  - the second strand because it contains more H bonds
  - the first strand because it contains fewer H bonds
  - the second strand because it contains fewer H bonds
  - neither since their melting temperatures are the same
20. Which of the following reasons explains why a single-stranded DNA circle cannot serve as a DNA polymerase template?
- DNA polymerase cannot initiate DNA strand formation.
  - DNA polymerase can only add nucleotides to the 3'-hydroxyl end of an existing strand.
  - DNA polymerase can only add nucleotides to the 5'-hydroxyl end of an existing strand.
  - DNA polymerase requires a primer.
  - A, B and D

二. 簡答下列問題，每題十分共六題，所有考題務必在答案卷上作答。

- Briefly describe the following terms
  - p53
  - Site-directed mutagenesis
  - Reverse transcriptase
  - Histone
  - Polymerase chain reaction
- What is RNA? How does it differ from DNA? What are the bases that are in RNA? How do they pair with the bases of DNA?
- Describe the activity of transcription factors. What are transcription factors? If transcription factors regulate transcription, what regulates transcription factors?
- Describe post-translational processing of proteins.
- How can alternative splicing effectively increase the number of genes in the genome? Describe an example of alternative splicing and its value to a cell of this type of control.
- What is a DNA microarray? How can DNA microarrays be used to determine the type of cancer a patient suffers from? How might they be used to optimize cancer treatment?