單複選擇題： 共 100 分
答對一個答案得一分， 答錯一個答案倒扣 0.5 分。

1. The active region of a chromosome involved in replication is a Y-shaped structure called a _____.
   A. Replication fork
   B. Primosome
   C. Promoter region
   D. Replication origin

2. The reason why RNA primer is used rather than DNA in DNA synthesis is due to
   A. RNA polymerase can synthesis without 3'-OH
   B. DNA polymerase cannot initiate synthesis without proceeding 3'-OH
   C. The proofreading activity of the DNA polymerase
   D. RNA primase is more abundant

3. DNA gyrase is the type II topoisomerase of *E. coli*.
   A. It breaks single-strand DNA for unwinding.
   B. It breaks double-strand DNA for unwinding.
   C. Its location is in front of the replication fork.
   D. Its location is right in the replication fork.

For items 4-6, use the following answers.
   A. Watson and Crick
   B. Meselson and Stahl
   C. Chargaff and Avery
   D. Hershey and Chase

4. Who were the scientists that identified the bacteria genetic material is the DNA molecule?

5. Who were the scientists that identified the viral genetic material is the DNA molecule in ^{32}P and ^{35}S labeling experiments?

6. Who showed evidences of the semiconservative replication model of DNA using ^{14}N and ^{15}N isotopes?

7. Please indicate which of the following statements is/are false.
   A. If a signal molecule binds to a gene activator protein and increases its affinity for its operator, the gene will be turned on, provided that any other requirements for transcription are met.
   B. The *lac* operon is controlled by CAP and negatively by the *lac* repressor.
   C. When the tryptophan repressor has bound two molecules of the amino acid tryptophan, its helix-turn-helix motif is distorted so that it can no longer bind to its operator DNA.
   D. Most gene regulatory proteins in eukaryotes can act even when they are bound to DNA thousands of nucleotide pairs away from the promoter that they influence.

8. Which of the following statements are correct?
   A. Restriction endonucleases cut DNA at specific sites that are always located between genes.
   B. DNA migrates toward the positive electrode during electrophoresis.
   C. Clones isolated from cDNA libraries contain promoter sequences.
   D. PCR utilizes a heat-stable DNA polymerase because for each amplification step, double-stranded DNA must be heat denatured.

9. Please indicate the correct statements.
   A. Although alternative splicing can generate several different versions of the protein by a gene, the different versions are always made in different cells.
   B. The modern definition of a gene is any DNA sequence that is transcribed as a single unit and encodes one polypeptide chain or a set of closely related ones.
   C. A change in the site of RNA transcript cleavage and poly-A addition can change the carboxyl terminus of a protein only by adding amino acids to it or removing amino acids from it.
   D. The observation that maturing oocytes cannot translate mRNAs with short poly-A tails, but can translate them once the poly-A tail has been lengthened, suggest that some critical interaction between proteins at the 5' and 3' ends of the mRNA must occur for initiation of protein synthesis.

(背面仍有題目,請繼續作答)

10. The human genome has almost been sequenced and the draft has been completed. How many total genes are contained in the human 3 x 10^9 bp genome?
    A. 140,000
    B. 100,000
    C. 70,000
    D. 37,000

11. The CpG island of a promoter region of a can be modified by _____ and affect the gene expression.
    A. glycosylation
    B. phosphorylation
    C. methylation
    D. acetylation

12. The DNA repair molecules are also involved in DNA activities of
    A. transcription
    B. replication
    C. recombination
    D. translation

13. Which of the following are actual protein producers?
    A. DNA B. tRNA C. mRNA D. rRNA

14. The complete ribosome has ___ spots for tRNA molecules
    A. 1 B. 2 C. 3 D. 4

15. Which one of the following codons cannot signal the beginning or end of a polypeptide chain?
    A. GAU B. UAA C. UGA D. AUG

16. If an mRNA molecule synthesized in the laboratory consists only of adenine and guanine in an approximate 2:1 ratio, what possible amino acids could include in the polypeptide to be produced?
    A. Lys (codons AAA, AAG)
    B. Arg (codons AGA, AGG)
    C. Glu (codons GAA, GAG)
    D. Gly (codons GGA, GGG)

17. Which of the following statements are true?
    A. A translation mutation alone in a DNA strand can result in the formation of a new amino acid
    B. tRNA from the cells of cows is not similar to that from human cells
    C. mRNA molecules are short lived and are broken down after only a few translations
    D. A single base substitution on a chromosome can cause a sequence to stop rather just alter the amino acids produced

18. In transformation,
    A. the recipient gins a full strand of DNA.
    B. the recipient gains the DNA in fragments.
    C. the newly obtained DNA is transcribed, then lysed.
    D. DNA is transferred both ways.

19. Which of the following statements are false?
    A. Spontaneous mutation in a bacteria chromosome cannot cause antibiotic resistance
    B. The only way to get genetic variance is as a result of mutation
    C. A cancerous state may be produced when incomplete genomes are incorporated into host's genome
    D. An increased use of antibiotics would prevent the spread of resistant pathogenic bacteria

20. Which of the following statements are true?
    A. Positive gene control utilizes component such as hormones and special proteins to augment gene activity
    B. Negative gene control involves the production of repressor molecules which interact with the enzyme produced by a given gene
    C. Heat shock is a response found in eukaryotic cells, which results in a rise in temperature stimulation the cells to transcribe faster
    D. The intermediates of a biosynthetic pathway are converted stepwise by specific enzymes until a final product is obtained.

21. One possible hazard of molecular cloning is
    A. formation of a new dominant species.
    B. widespread disease due to human infection.
    C. A and B
    D. none of above

22. Which of the following statements are true?
   A. DNA fragments are inserted into shuttle vectors using recombinant techniques.
   B. Plasmids cannot self-replicate.
   C. Phages can self replicate.
   D. Restriction enzymes that recognize four nucleotides work more often than those that recognize six nucleotides.

23. Which of the following statements are false?
   A. Each chain of an antibody, whether light or heavy, has either a constant portion or a variable portion.
   B. Antibody molecules consist of four polypeptide chains.
   C. Recombination between heavy and light chains of an antibody is common.
   D. Four recombination events are needed in order for immunoglobin G to be produced.

24. In which of the following ways can a mutation cause an organism to be resistant to an antibiotiotic?
   A. by changing the shape of the receptor molecule
   B. by acting on the drugs intracellular targets
   C. by creating an enzyme that inactivates the drug
   D. only A and B

25. Any gene can be introduced into a mammalian cell by ____
   A. Ca^{+2} uptake
   B. transformation
   C. cotransformation
   D. any vector method

26. Plasmids are found _____
   A. on selected chromosomes.
   B. on every chromosome.
   C. in plant cells.
   D. extrachromosomally.

27. Which of the following statements are false?
   A. Oncogenes were first observed in bacteria.
   B. True cell fusion take place in bacteria.
   C. The lysogenic cycle leads to the immediate deterioration of the host cell.
   D. Transduction is phage mediated.

Match the amino acid on the left with its main property on the right.

28. phenylalanine	A. basic
29. lysine	B. can form disulfide bond
30. threonine	C. hydrophobic
31. cysteine	D. can form hydrogen bonds

Match the terms appropriately.

32. DNA library	A. mutation, crossing over
33. plasmid	B. extra bacteria genes
34. nature's genetic experiments	C. cut DNA fragments incorporated into plasmids
35. polymerase chain reaction	D. raise social, legal, and ethical questions
36. human gene therapy	E. rapid DNA amplication

Match the terms appropriately.

37. Germline hypothesis	A. actual number of initial antibodies is small
38. Somatic mutation theory	B. millions of specific lymphocytes exist in the body
39. Rearrangement theory	C. separate sequences come together in all possible combinations via recombination
40. Clonal selection theory	D. all possible sequence are carried on the DNA
	E. upon activation, specific antibodies begin to reproduce mitotically

41. Which of the following statements are true?
   A. R plasmids can pick up additional transposons.
   B. Interferon is virus specific.
   C. Lysogenic phages can cause beneficial mutations.
   D. The lambda phage has a system of regulatory lipids which determines whether the cell will undergo lysis of lysogeny.

(背面仍有題目,請繼續作答)

42. Which of the following statements are true?
   A. In human cells, surface antigens are alike in all people.
   B. In a specific strain of mouse that is homozygous for almost all traits, any skin transplant between mice is readily accepted.
   C. A mouse and a human can be histocompatible for a certain trait.
   D. Patients with multiple myelomas produce multiple types of antibodies.

43. Which of the following statements are true?
   A. Transcription often is controlled at the stage of initiation.
   B. Transcription often is controlled at the stage of elongation.
   C. Translation is controlled at the stages of initiation.
   D. Translation is controlled at the stages of termination.

44. Which of the following statements are true?
   A. A gene is a sequence that codes for a a diffusible product.
   B. The product diffuses away from its site of synthesis and acts elsewhere.
   C. The free diffuse product is cis-element.
   D. The free diffuse product is trans-element.

45. Which of the following statements are true about an operon?
   A. The entire system including structural genes and the elements that control their expression forms a common unit of regulation is an operon.
   B. The *lac* operon is controlled by a positive regulation with lactose.
   C. The *lac* operon is controlled by a positive regulation with inducer.
   D. The *lac* operon is controlled by a negative regulation with *lac* repressor.

46. Which of the following statements are true about genome size?
   A. DNA content of the haploid genome is related to the morphological complexity eukaryotes.
   B. The minimal genome size found in each phylum increases from prokaryotes to mammals.
   C. Nonrepetitive DNA complexity can estimate the genome size.
   D. Repetitive DNA complexity can estimate the genome size.

47. Which of the following statements are false about a T_m value?
   A. When denature nonrepetitive DNA, the duplex molecules melt sharply.
   B. When denature repetitive DNA, the duplex molecules melt sharply.
   C. When denature nonrepetitive DNA, the lower the T_m value.
   D. When denature repetitive DNA, thelower the T_m value.

48. Which of the scientists have great contribution in the research on RNA splicing?
   A. J. Watson
   B. P. Sharp
   C. T. Cech
   D. J. Steitz

49. Which of the following statements are true?
   A. Most genes are discontinuous in flies and mammals.
   B. Exons are conserved, but introns cary.
   C. A gene may code for different RNA products by changing initiation, termination or splicing.
   D. Mammal genes are much larger than the corresponding mRNAs.

50. Which of the following statements are true about gene numbers?
   A. Disruption analysis of *S. cerevisiae* suggests that more than half the genome is essential.
   B. Globin genes organized in two cluster are found in vertebrates.
   C. Gene clusters suffer continuous reorganization.
   D. Gene number can be changed by unequal crossing-over.

51. Which of the following statements are true?
   A. Sequence divergence is the basis for the evolution clock.
   B. Pseudogenes are dead ends of evolution.
   C. The presence in the population of two allelic variants is called a polymorphism.
   D. Few mutations are advantageous and spread through population and replaced the former sequence.