單選題 (Simple Choice Questions):共 25 題，每題 2 分

1. The three essential tools for genetic engineering are
   a. DNA, RNA and tRNA
   b. DNA polymerase, RNA polymerase and replicase
   c. Restriction enzyme, ligase and vector

2. The function of SDS in PAGE is
   a. To inactivate the protein
   b. To make the gel running faster
   c. To neutralize the charge of protein so that protein can be separated by its molecular weight

3. Which one of the following PCRs is the most sensitive
   a. RT-PCR
   b. PCR
   c. Nested PCR

4. The major components of a RT-PCR are
   a. DNA, *Taq* polymerase, primer and NTPs
   b. cDNA, *Taq* polymerase, primer and NTPs
   c. mRNA, *Taq* polymerase, primer and NTPs

5. *Taq* polymerase is used in the PCR because
   a. It has the best kinetic of all DNA polymerases
   b. It is resistant to high temperature
   c. It is the most inexpensive among all DNA polymerases

6. The most important element of an ideal expression vector for high level synthesis of a protein is
   a. A well-characterized, regulated promoter
   b. Operator
   c. Antibiotic resistance selection marker

（背面仍有題目,請繼續作答）

7. Which of the buffer is most temperature sensitive
   a. Tris-buffer
   b. Phosphate buffer
   c. PIPES buffer
8. The most suitable chromatography to separate two proteins of different PI is
   a. Ion exchange column
   b. Gel filtration column
   c. Affinity column

9. If you have to purify a protein of molecular weight of 150 Kdalton, which of the following Sephadex you will select as column medium.

	Molecular weight range (Kdal)
a. Sephadex G-100	40-120
b. Sephadex G-150	40-150
c. Sephadex G-200	40-200

10. Which of the following method you will select to analyze mRNA expression
    a. Southern hybridization
    b. Northern hybridization
    c. Western hybridization

11. A promoters is
    a. Where RNA polymerase binds
    b. Where transcription starts
    c. Where DNA polymerase binds

12. The Pribnow box (also known as the Pribnow-Schaller box) is located at
    a. -10 bp
    b. -15 bp
    c. -35 bp

13. An operon in a prokaryote should contain
    a. promoter, operator, structure genes and terminator
    b. DNA polymerase binding site, replication site
    c. Ribosome, tRNA binding sites

14. The general term of a GMO in biotechnology is
    a. A genetic modified organism
    b. A genetic mutation
    c. A genetic modified food

15. Microinjection is referred to the process
    a. Using a micro needle to insert substances at a microscopic level into a single living cell.
    b. Using a micro needle to immunize a small animal
    c. Surgery under microscope

16. If you have to separate bacterial cells from a suspension of mammalian cell culture, you will use
    a. Filtration using regular filter paper
    b. Centrifugation using a table top centrifuge
    c. High speed centrifugation

17. If you have a bacterial suspension with 10^8 bacteria/ ml, what is the most accurate method to count the number of bacterium
    a. Directly under microscope
    b. Grow on agar plate after series dilution
    c. Centrifuge to pellet the bacteria then weight

（背面仍有題目,請繼續作答）

18. Which phase when bacterium is actively growing
    a. the lag phase
    b. the log phase
    c. the stationary phase

19. The orchid farm in Taiwan is an important floral industry, because the propagation of a plant is by
    a. transgenic technology
    b. tissue culture technology
    c. regular seed planting

20. DNA vaccine differs from traditional immunization is the animal is immunized with
    a. a protein antigen
    b. a nucleic acid
    c. a mixture of protein and DNA

21. The recombinant hepatitis B viral (HBV) vaccine is
    a. A inactivated HBV particle
    b. A purified HBV antigen produced in yeast
    c. A inactivated recombinant E. coli containing HBV surface antigen

22. Ti plasmid from *Agrobacterium* can be used as shuttle vector to transfer DNA
    a. between bacterium to plant
    b. from bacterium to animal
    c. from animal to animal

23. Stem cell research has been advanced rapidly, which of the following stem cells are most commonly used
    a. embryonic stem cells and adult stem cells
    b. blood cells and bone marrow cells
    c. cells from fertilized egg

24. Ethdium bromide staining of DNA after agarose gel electrophoresis and observed under UV light can cause
    a. Fragmentation of DNA
    b. Methylation of DNA
    c. No effect

25. Which of the following is not considered as a defect of the expression of foreign protein in *E. coli*
    a. Glycosylation
    b. Amount of expression
    c. Solubility

簡答題 (Short Essay): 共 10 題, 每題 5 分

1. Describe the difference between life science(生命科學) and biotechnology(生物技術).

2. According to Wikipedia, Biotechnology refers to modern genetic engineering technology, however, before 1971, the term Biotechnology could be defined as, "The application of indigenous and/or scientific knowledge to the management of (parts of) microorganisms, or of cells and tissues of higher organisms to supply goods and services of use for human. Please give three products that were made by traditional biotechnology.

（背面仍有題目,請繼續作答）

3. And three commercial products that were developed by modern biotechnology (genetic engineering).

4. What is the basic concept of molecular biology that helps the development of modern biotechnology, especially genetic engineering?

5. From 1996 to 2001, herbicide tolerance and insect resistance traits were introduced to commercial transgenic crops. In 2001, herbicide tolerance deployed in soybean, corn and cotton accounted for 77% of the 626,000 square kilometers planted to transgenic crops. Please describe the mechanism of a transgenic corn that could be resistant to insect.

6. Please describe the mechanism of transgenic cotton that could be tolerance to herbicide.

7. What is the use of antibiotic marker in genetic engineering technology?

8. Please explain the purpose of the following methods:

   a. SDS Polyacrylamide gel electrophoresis

   b. Native Polyacrylamide gel electrophoresis

   c. Agarose gel electrophoresis

   d. Sucrose gradient Cesium chloride gradient

   e. Cesium chloride gradient centrifugation

9. What is RNAi, and its potential application?

10. Described at least three methods that can be used to introduce foreign DNA into eukaryotic cells.