

系所組別： 生物科技研究所甲、乙組

考試科目： 生物技術

考試日期：0226 · 節次：3

## 一、單選題 (Simple choice question)：25 題，每題 2 分

1. The function of polyacrylamide in SDS-PAGE is
  - a. to inactivate proteins
  - b. to separate proteins with different molecular weights
  - c. to neutralize the charged proteins
  - d. to make the proteins separation faster
  
2. The most suitable chromatography method for separating proteins with different molecular weights is
  - a. affinity chromatography
  - b. gel permeation chromatography
  - c. ion exchange chromatography
  - d. hydrophobic interaction chromatography
  
3. Which of the following methods is used to detect gene expression level in biological samples?
  - a. RT-PCR
  - b. Real-time-PCR
  - c. Nested-PCR
  - d. Multiplex-PCR
  
4. Which of the following is **not** eukaryotic expression system?
  - a. *Chlamydomonas reinhardtii*
  - b. *Thermus thermophilus*
  - c. *Pichia pastoris*
  - d. *Aspergillus nidulans*
  
5. If you cultivate transformed *E. coli* to produce recombinant protein, the host cells should be harvested in which stages in order to get the maximal amount of recombinant protein?
  - a. Lag phase
  - b. Log phase
  - c. Stationary phase
  - d. Death phase
  
6. If you want to express a 15-kb gene with *E. coli* expression system, which vector is **not** appropriate?
  - a. Plasmid
  - b. Cosmid

(背面仍有題目,請繼續作答)

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- c. BAC  
d. Bacteriophage  $\lambda$
7. For the following descriptions related to TATA box, which one is correct?  
a. The synonym of Pribnow box  
b. The binding site on DNA specific for DNA polymerase  
c. The binding site of TFIIA transcriptional factor  
d. Located about 45 bp reversely from the site of initiation of transcription
8. Which of the following dye is **not** used for protein staining?  
a. CYPRO Ruby  
b. Coomassie blue  
c. Cy3  
d. EtBr
9. An operon in prokaryotes should contains  
a. Antibiotic selectable marker gene  
b. Origin of replication and DNA polymerase binding site  
c. Promoter, operator, structure genes and terminator  
d. GC box, CCAAT box and TATA box
10. If you want to detect a specific gene in genome, which technique will you use?  
a. Southern blotting  
b. northern blotting  
c. western blotting  
d. eastern blotting
11. Which is **not** the basic element in yeast artificial chromosome?  
a. *Amp<sup>r</sup>*, an *E. coli* selectable marker gene  
b. *ori<sup>E</sup>*, origin of replication that functions in *E. coli*  
c. CEN which provides centromere function in yeast  
d. TRP1, a functional gene of methionine biosynthesis pathway
12. Which is **not** the target for plant transformation?  
a. Plastid  
b. Nucleus

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考試日期： 0226 · 節次： 3

- c. Mitochondria  
d. Ribosome
13. If you want to transform *E. coli* by using plasmid as vector, which of the following enzyme will **not** be used?  
a. Restriction enzyme  
b. T4 DNA ligase  
c. Alkaline phosphatase  
d. Reverse transcriptase
14. Which of the following method is **not** used for protein analysis?  
a. GC/MS  
b. ELISA  
c. SDS-PAGE + silver stain  
d. Capillary electrophoresis + UV detection
15. Which component on a plasmid is necessary for inserting foreign gene?  
a. Antibiotic selectable marker gene  
b. Origin of replication  
c. Multiple cloning sites  
d. DNA polymerase binding site
16. What is **not** the key factor of the recombinant protein expressed in *E. coli*?  
a. Inducible promoter  
b. Post translational modification  
c. Gene copy number  
d. Codon usage
17. If you want to cultivate *Penicillium*, a fungus, to produce penicillin, which method is more likely to get the highest production?  
a. Batch fermentation  
b. Fed-batch fermentation  
c. Continuous fermentation  
d. Anaerobic fermentation
18. The genome size of human is approximate:

(背面仍有題目,請繼續作答)

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考試日期： 0226 · 節次： 3

- a. 3 Mbp
- b. 30 Mbp
- c. 300 Mbp
- d. 3,000 Mbp

19. Which of the following enzymes is **not** used for cDNA synthesis?

- a. Klenow fragment
- b. T4 DNA ligase
- c. RNase H
- d. S1 nuclease

20. If you have to treat plant tissue to get cell content, which method is the least favorite?

- a. Add lysozyme only
- b. Freeze dry + grind
- c. Liquid nitrogen + grind
- d. Homogenizer + cellulase

21 Which of the following virus is used to transform mammalian cells?

- a. Baculovirus
- b. Retrovirus
- c.  $\lambda$  phage
- d. Picornavirus

22. Which antibiotic is served as selective agent in mammalian cell expression system?

- a. G-418
- b. Neomycin
- c. Ampicillin
- d. Kanamycin

23. For the following description about PEST sequence, which one is **not** true?

- a. The amino acid sequence rich in proline, glutamic acid, serine, and threonine
- b. Always flanked by cluster of positive charged amino acids
- c. Can enhance protein stability
- d. The protein stability would be enhanced if its PEST regions are altered by genetic manipulation.

24. What is the major immunoglobulin in birds?

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- a. IgM
- b. IgG
- c. IgA
- d. IgY

25. Which of the following methods is seldom used in rice transformation?

- a. Gene gun
- b. Electroporation
- c. *Agrobacterium*-mediated transformation
- d. Viral transduction

二、簡答題 (Short essay)：共 10 題，每題 5 分

1. What is subunit vaccine?

What are the pros and cons of it compared to other vaccines?

2. Please give 5 examples of biotechnological products made by genetic engineering.

3. What is codon usage?

If you produced a foreign protein using *E. coli* expression system and found the production of your target protein is very low due to codon usage, how could you figure out the problem?

4. Please give an example of practical application of bioremediation.

5. Please give five examples of bio-energy products made by microorganisms.

6. Please describe the whole procedures how to generate functional antibodies in plants.

7. What are mesenchymal stem cells and their potential applications?

8. Please explain how to do oligonucleotide-directed mutagenesis by PCR.

9. Please describe what the functional genomics is.

10. What is open reading frame?