國立成功大學 104 學年度碩士班招生考試試題

系所組別：生物科學與科技學院-生科聯招

考試科目：生物化學

考試日期：0212，節次：1

※ 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、Single Choice Questions(10題，每題2分)

1. Recombinant DNA technology plays an important role in biotechnology. The discovery of restriction endonuclease is especially important for it. Which type of restriction endonucleases is most commonly used in the gene cloning?
   (a) Type I
   (b) Type II
   (c) Type III
   (d) Type IV

2. In standard molecular cloning experiments, cutting and annealing are two important procedures. Which components will **not** be used during these two procedures?
   (a) T4 ligase
   (b) DNase I
   (c) Insert DNA
   (d) Vector DNA

3. The symbol Amp^r in the gene cloning process usually indicates that the E. coli can become resistant for which of the following chemicals?
   (a) Adenosine 5'-monophosphate
   (b) Amine
   (c) Ampicillin
   (d) Cyclic AMP

4. During the synthesis of the complementary DNA (cDNA), which of the following enzymes will **not** be used?
   (a) DNAse I
   (b) RNase H
   (c) Reverse transcriptase
   (d) RNA polymerase

(背後仍有題目，請繼續作答)

5. Which of the following techniques is used for detecting mRNA expression?
   (a) Southern blot
   (b) Western blot
   (c) Whole mount *in situ* hybridization
   (d) Immunohistochemistry

6. Which of the following methods **cannot** be used for transporting DNA into bacteria or animals?
   (a) Electrophoresis
   (b) Conjugation
   (c) Microinjection
   (d) Gene gun

7. If you want to engineer cells to produce quantitative signal, you may use the biofluorescent and bioluminescent systems. Which of the following molecules **cannot** be used for such systems?
   (a) beta-galactosidase
   (b) Red Fluorescence Protein (RFP)
   (c) Luciferase
   (d) Green Fluorescence Protein (GFP)

8. Which of the following statements is **not true** for DNA microarray?
   (a) Can be used to detect the expression changes in response to a particular biological condition
   (b) Only two-dye system is available nowadays
   (c) The coupling fluorescence dyes can be Cy3 and Cy5
   (d) It needs to synthesize cDNA

9. In order to separate and identify the proteins in the mixture, two-dimensional polyacrylamide gel electrophoresis (2D PAGE) is frequently used. What are the properties used in order to separate proteins?
   (a) PH gradient
   (b) Molecular weight
   (c) Conformational change
   (d) Both PH gradient and Molecular weight

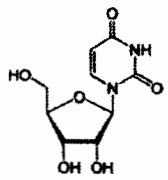
(背後仍有題目，請繼續作答)

10. In order to get the sequences information on a specific gene from new species of animal, 3' Rapid Amplification of cDNA Ends (RACE) is commonly used to clone the gene. Which of the following materials is **not** used for this experiment?
    (a) DNase I
    (b) Gene-specific primer
    (c) Reverse transcriptase
    (d) Taq DNA polymerase

二、Multiple Choice Questions (答案包含 1 個或大於 1 個選項，10 題，每題 2 分)

1. Which amino acid does contain an acidic side chain at neutral pH?
    (a) Asp
    (b) Tyr
    (c) His
    (d) Glu

2. Which one of the following descriptions is **true** for nucleic acid?
    (a) Polymerase synthesizes new strand *in vivo* in the 5' to 3'direction.
    (b) Adjacent nucleotides in RNA are linked by 2'-5' phosphodiester bond.
    (c) The following molecule is commonly incorporated into DNA



    (d) The only chemical difference between DNA and RNA is that DNA contains 2-deoxyribose instead of ribose.

3. Which one is saturated fatty acid?
    (a) Oleic acid
    (b) Palmitic acid
    (c) Myristic acid
    (d) Palmitoleic acid

(背後仍有題目，請繼續作答)

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4. Which one of the following descriptions for protein translocation is **not true?**
   (a) Proteins destined for secretion or for targeting to membranous organelles are synthesized in precursors carrying a C-terminal signal sequence.
   (b) Signal receptor (SR) recognizes the signal sequences of nascent protein.
   (c) After nascent peptide enters the ER lumen, the signal peptide is clipped by signal peptidase.
   (d) Nuclear localization sequence tags a protein for nuclear export.

5. Which one of the followings is true?
   (a) Lysosomes are vesicle 0.2-0.5 μm in diameter composed of double membranes.
   (b) The internal pH of mitochondria is about 5.
   (c) Chloroplast is a double membrane organelle for photosynthesis.
   (d) The vacuole is the most obvious compartment in plant cells for nutrients and cellular waste storage.

6. Which description is true for glycolysis?
   (a) The initial reaction to prime glycolysis is Glucose phosphorylation by Hexokinase.
   (b) Two molecules of ATP are generated per glucose in glycolytic pathway.
   (c) In addition to ATP, the products of glycolysis include pyruvate and NADH
   (d) Otto Warburg found that cancer cells tend to convert glucose into lactate, even in sufficient oxygen.

7. Which one of the following descriptions is true?
   (a) The nucleosome core particle is wrapped by 300 bp DNA (1.65 turns).
   (b) The proteins of chromatin include histones and non-histone proteins.
   (c) The modification of histone is required for chromatin dynamics and translation.
   (d) Linking number (L) is the basic parameter characterizing supercoiled DNA.
   $L=T+W$ (T: twist is the number of helical turns. W: writhe is the number of supercoils)

8. Which enzyme is not commonly used in recombinant DNA technology?
   (a) HMG-CoA reductase
   (b) Alkaline phosphatase
   (c) Taq DNA polymerase
   (d) HindIII restriction enzyme

(背後仍有題目，請繼續作答)

9. Which one of the following compounds is derived from cholesterol?
   (a) Estrogen
   (b) Cortisol
   (c) Androgen
   (d) Prostaglandin

10. Which one of the following components is required to regulate splicing?
   (a) miRNA
   (b) tRNA
   (c) mRNA
   (d) SnRNP

三、Essay (11 題共 60 分，1-6 題每題 5 分，7-11 題每題 6 分)

1. What is TCA cycle (tricarboxylic acid cycle)?(5 分)

2. Please describe the difference between paracrine, autocrine and endocrine. (5 分)

3. Explain the function of following enzymes. (5 分)
   (a) Topoisomerase
   (b) Pyruvate dehydrogenase
   (c) Acetyl-CoA carboxylase
   (d) DNA polymerase
   (e) Reverse transcriptase

4. Describe how post-translational modification regulates protein function. (5 分)

5. Please explain what the telomerase is. (5 分)

6. Please draw a diagram to explain how repression works in the *lac* operon. What inducers can activate *lac* operon to trigger β-galactosidase synthesis? (5 分)

7. How to use soil bacterium (*Agrobacterium tumefaciens*) in the biotechnology?(6 分)

8. Please explain what is Chromatin Immunoprecipitation (ChIP) ? (6 分)

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9. What is the principle and how to perform real-time PCR? (6 分)

10. What is DNA fingerprinting (DNA typing) and why to use it? (6 分)

11. Please describe an example of how to create a transgenic animal? (6 分)