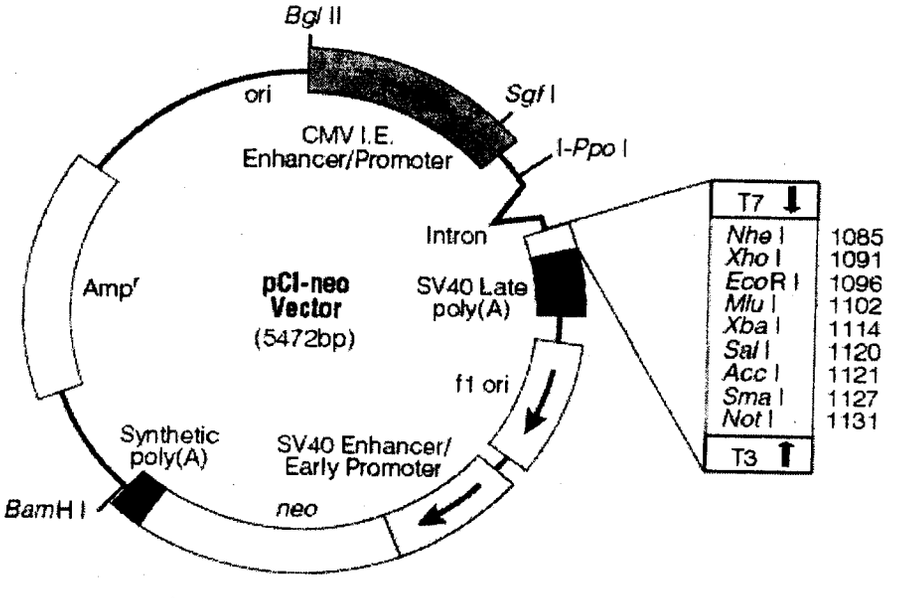
本試題是否可以使用計算機：☐可使用　，☑不可使用　（請命題老師勾選）

1. Describe briefly what is "methylation-specific PCR (MSP)" ? And how researchers can apply MSP in their study ? (15%)

2. Please list three DNA- or protein-related databases. Describe briefly the feature of each listed databases. (15%)

3. A DNA vaccine project requires you to clone a viral gene into the plasmid below. The gene is approximately 1kb in length (gene sequence: 5'-ATGTTCGATGGAACCTTAACC.....GGCCAATTGCGCTTATCGTAA-3') and contains NheI (5'-G/CTAGC-3'), EcoRI (5'-G/AATTC-3'), MluI (5'A/CGCGT-3'), XbaI (5'-T/CTAGA-3'), ACCI (5'GT/MKAC-3'), and SmaI (5'-CCC/GGG-3') sites, but lacks XhoI (5'C/TCGAG-3'), Sal I (5'-G/TCGAC-3'), and NotI (GC/GGCCGC-3') sites.

   (A) Please describe the full cloning procedures including all the experimental designs and relevant details/concerns critical to the success of the cloning process. (7%).
   (B) Try your best to give the rationale to deliver the vaccine in either mucosal or intramuscular region to protect from the viral infection (4%)
   (C) Hypothesize the possible types of immune responses raised against the gene product if it is secretary (4%).



（背面仍有題目，請繼續作答）

4. The project also encourages you to identify the host protein factor(s) that interacts with the gene product. Assuming that your lab has several specific and non-specific host cell lines, many types of affinity tag sequences on protein expression plasmids (i.e., Flag, His, CBP, and SBP tags in any combinations), and unlimited resources, describe a detailed experimental approach you would take to complete the proteomic project. (15%)

5. Please describe three methods used to deliver exogenous genetic materials into a mammalian cell. Compare the features of each listed techniques. (15%)

6. Virus X, a newly emerging pathogen, can not grow in any cultivated cell system by conventional infection route. Please design your method which can be applied to evaluate the pathogenesis of this virus. (hint: moledular biology techniques) (15%)

7. Which of the following methods can be used to measure cellular functions at a single cell level ? (選擇題 2.5%)
   (A) Enzyme linked immunosorbant assay
   (B) Immunoelectrophoresis
   (C) Flow cytometry
   (D) Chromium release cytotoxic assay
   (E) Thymidine incorporation proliferation assay

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8. Which of the following statement is correct for monoclonal antibodies ? (選擇題 2.5%)

(A) When subject to SDS-PAGE analysis, 2 light chains and 2 heavy chains can be visualized.

(B) They are often derived from horse B cells.

(C) A monoclonal antibody often recognizes different epitopes on the target molecule and hence has high binding affinity

(D) Humanized monoclonal antibodies are used to treat diseases in patients

(E) Monoclonal antibodies always block the function of their target molecules

9. Regarding autoimmunity, which of the following statements is incorrect ? (選擇題 2.5%)

(A) Deposition of immune complex in the kidney tissue is an essential mechanism to clear waste from the body.

(B) T cell tolerance is conferred both in the thymus and in the peripheral tissues.

(C) Autoantibodies can fix complements on red blood cell surface and cause destruction of cells.

(D) Both increase and decrease of cytokine production can lead to autoimmunity

(E) Some microorganisms can produce antigens which stimulate host immune cells and lead to immune responses that destroy host tissues.

10. A boy has a DNA mutation which prevents the development of phagocytes (granulocytes and monocytes) in his body but other types of cells appear to be normal in numbers. Which of the following regarding his immune system is most likely to be true ? (選擇題 2.5%)

(A) He will have malnutrition due to the lack of phagocytosis.

(B) He will be easily infected by intracellular bacteria but not by extracellular bacteria.

(C) Cytokine production will be normal in this body.

(D) Defects in antigen presentation may lead to functional defects in T cells

(E) Antibody cannot bind to antigens in the absence of phagocytes