

一、單選題 (每題 2 分) 請於試卷內之「選擇題作答區」依序作答。

1. 以下關於抗體產生之 class switch 與 V(D)J 重組的比較何者正確：
  - A. 皆需要 RAGs;
  - B. 皆發生在 antigen stimulation 之後;
  - C. 皆為產生 antibody diversity 所需;
  - D. 以上皆非。
2. 下列哪一種免疫細胞屬於吞噬細胞 (phagocyte) 的一種：
  - A. neutrophil;
  - B. NK cell ;
  - C. mast cell;
  - D. platelet 。
3. 下列哪一種因素不會影響疫苗誘發免疫反應的強弱：
  - A. adjuvant;
  - B. immunization route;
  - C. sleeping ;
  - D. antigen dose 。
4. 下列哪一種物質不參與在先天免疫 (innate immunity) 的反應中：
  - A. mucus;
  - B. proteasome;
  - C. defensin ;
  - D. normal flora 。
5. 下列哪一種生物技術沒有應用到單株抗體 (monoclonal antibody) ：
  - A. ELISA;
  - B. FACS;
  - C. western blot;
  - D. 以上皆非。
6. Elie Metchnikoff (1845-1916), a Russian zoologist and bacteriologist in France is Nobel Prize winner for Medicine in 1908. He observed that a sharp introduced into a body of starfish larva was soon surrounded by some mobile cells which were able to ingest the invading microorganisms. The mobile cells are likely to be \_\_\_ which is \_\_\_ against a pathogen.
  - A. B cells, specific
  - B. Phagocytes, specific
  - C. T cells, nonspecific
  - D. Phagocytes, nonspecific
7. Infection of young teenagers with Epstein Barr virus (EBV) develops a disease called mononucleosis. In this disease, lymph nodes swell painfully as our immune system produces large numbers of lymphocytes to eliminate virus-producing cells. These lymphocytes are probably: (2 分)
  - A. B cells which produce antibody eliminating virus-infected cells
  - B. Cytotoxic T cells to destroy virus-containing cells
  - C. Helper T cells which stimulate B cell clonal selection
  - D. Granulocytes which invade areas of virus production

8. If a B cell clone began to produce antibody with altered binding strength and specificity for antigen, you would expect the mutation of the antibody gene to involve: (2 分)
- A. The CDR3 of the heavy chain or the constant region of the light chain
  - B. The CDR3 of the light chain or the constant region of the heavy chain
  - C. The CDR3 of the light or heavy chains
  - D. The constant regions of the light or heavy chains
9. The epitope is defined as the part of the antigen that is recognized by antibody. The structural studies using hen egg white lysozyme as an antigen show that the epitope is: (2 分)
- A. a single amino acid
  - B. continuous, or limited to a single stretch of amino acids
  - C. discontinuous, or can include amino acids from non-adjacent stretches of antigen amino acids
  - D. the entire antigen

二、複選題 (每題 3 分) 請於試卷內之「選擇題作答區」依序作答。

10. The significance of the major histocompatibility complex (MHC) in the immune response:
- A. Serves to minimize autoimmunity or "self-reactivity" of the immune system
  - B. Serves to present fragments of antigens to T cells
  - C. Used by helper T cells to regulate the expansion of antibody producing B cells
  - D. Accepts organ transplantation.
11. A variety of germs carry molecular patterns (also called pathogen associated molecular pattern, PAMP) which can be recognized by the immune system. Which ones of the followings are correct?
- A. PAMPs are ligands for both IL-1R and Toll-like receptors (TLRs).
  - B. Ligation of PAMP to corresponding receptor activates NF- $\kappa$ B signaling pathway.
  - C. Ligation of PAMP to corresponding receptor activates IL-2 production.
  - D. Receptors for PAMPs are highly diversified.
  - E. Receptors for PAMPs are non-clonal and germ-line encoded.
12. What outcome consequences would be predicted for tumors that lose expression of all MHC class I molecules in experimental animal studies?
- A. Regression of transplanted tumors in normal mice
  - B. Growth of transplanted tumors in normal mice
  - C. Highly sensitive to natural killer cells in normal mice
  - D. Transfection of MHC Class I genes can restore resistance to NK cells.

三、解釋名詞 (每題 3 分)

- 1. neutrophil
- 2. CD25
- 3. IL-6
- 4. chemokines
- 5. opsonization
- 6. flow cytometry
- 7. thymus

- 8. tolerance
- 9. apoptosis
- 10. Class switch

四、簡答題：

1. (1) What cells should be harvested from the cord blood to best treat patients with blood diseases? (1 分)
  - A. Erythrocytes (red blood cells)
  - B. Leukocytes (granulocytes, monocytes and lymphocytes)
  - C. Stem cells(2) Why the cells can treat the patient? Please discuss. (2 分)
2. (1) What does the clonal selection theory of antibody diversity say? (3 分)  
(2) Please explain why humans have the ability to produce billions of different antibodies which bind a wide array of antigens (2 分)?
3. 請簡述外來抗原如何被 MHC class II 途徑呈現在樹突細胞 (dendritic cell) 的表面。(5 分)
4. 請簡述三種引發補體 (complement) 活化的途徑。(5 分)
5. 陳偉殷在投球後被打出的球擦傷了右手臂，回到休息室後開始腫漲發熱。這時防護員看到之後說：你受傷的部分已經開始發炎 (inflammation) 了。請簡述防護員所說的發炎反應的過程。(5 分)
6. 請回答下列有關疫苗的問題：1) 天花 (Small pox) 病毒曾經是導致人類死亡的一個重要傳染疾病，但是由於詹納 (Jenner) 博士發現種牛痘 (cow pox) 後可以有效地預防天花的傳染後，世界衛生組織已於 1980 年宣布天花絕跡。請簡單說明為何種牛痘可以預防天花？(5 分)；2) 最近美國流感大流行，導致許多人死亡，你是否知道流感疫苗是死毒疫苗 (killed virus vaccine) 或是減毒疫苗 (attenuated virus vaccine)？死毒疫苗和減毒疫苗有何差別？(5 分)
7. 在對抗外來的感染時免疫反應有時會導致過度免疫反應 (hypersensitivity)，造成疾病。請說明這四型過度免疫反應的異同點。(10 分)

試題隨卷繳回