

※ 注意：請於答案卷上依序作答，並應註明作答之大題及其題號。

- 一、後基因體時代，國際上許多非營利研究單位乃至於生物科技公司投入了相當多的心力在建立 Single Nucleotide Polymorphisms (SNPs) 資料庫，請解釋何謂 Single Nucleotide Polymorphisms (SNPs)？(5%) 這些資料庫在未來醫療與人類生活上的可能應用優點及爭議為何？(10%)
- 二、真核細胞的一個重要特徵是在細胞內由單位膜所形成的眾多胞器，這些胞器的功能及組成物各不相同，目前有許多生化、細胞、及遺傳學技術可以用來研究細胞內胞器間的聯繫與功能。如果將不親水的非專一性螢光染劑放入細胞培養液中作短時間的細胞標定，之後將細胞外多餘染劑洗去並以螢光顯微鏡觀察細胞，請說明隨時間增加，染劑在細胞中各胞器間所出現的次序為何？(8%) 請設計一套實驗來證明你指出的先後次序為正確。(12%)
- 三、請由下列選項中，選出符合各小題的項目。

- | | |
|--|----------------------------|
| A. acoelomate | B. pseudocoelomate |
| C. coelomate | D. protostome |
| E. deuterostome | F. radial symmetry |
| G. bilateral symmetry | H. hydrostatic skeleton |
| I. exoskeleton | J. endoskeleton |
| K. extracellular digestion | L. intracellular digestion |
| M. single-open gastrovascular cavity | |
| N. digestive tract with mouth and anus | |

- (1) Sponges (5%)
 (2) Flatworm (5%)
 (3) Echinoderm (5%)

- 四、假設某人的下列分子有缺陷，無法產生正常作用，試問他的生理機能可能會發生哪些問題？(20%)
 a. aquaporin b. Na^+ -glucose cotransporter c. enterokinase d. vasopressin
- 五、試比較 cAMP 在細菌 *Escherichia coli* 對葡萄糖的利用與人類肝細胞在 epinephrine 刺激下產生葡萄糖的反應中所扮演的角色。(10%)

- 六、選擇題 (Selected the one that is best in each case)(20%)

- Suppose that all the calcium could be removed from the extracellular fluid surrounding a neuron. Such removal would inhibit the ability of a neuron to
 - produce action potentials.
 - release neurotransmitter.
 - produce synaptic potentials
 - degrade neurotransmitters.
- Which of the following statements about kidney function is correct?
 - The loop of Henle acts as countercurrent multiplier system.
 - The descending limb of loop of Henle is highly permeable to salt.
 - The movement of water and solutes is entirely passively.
 - Reabsorption of water and solutes takes place primarily in the distal tubule.

3. Our ability to perceive the world around us depends on the presence of sensory receptors and specific neural pathways to communicate information to the cerebral cortex. Sensory systems must code for different qualities of the stimulus. Stimulus intensity is not coded by
- A) the size of the receptor potential. D) the number of activated receptors
B) the size of the action potential. E) B & D
C) the frequency of the action potentials F) A, B & D
4. Cells in the ovaries secrete all of the following hormones except
- A) estrogens B) progesterone C) androgens D) luteinizing hormone
5. Which of the following events can result in lifelong immunity?
- A) passage of maternal antibodies to a developing fetus
B) an inflammatory response to a splinter
C) phagocytosis of a bacteria by a neutrophil
D) administration of polio vaccine
E) administration of antibodies against the rabies virus
6. Using the genetic code in the following figure, identify a possible 5'→3' sequence of nucleotides in the DNA template strand for an mRNA coding for the polypeptide sequence Phe-Pro-Lys.
- | Phe | Pro | | Lys |
|-----|-----|-----|-----|
| UUU | CCU | CCC | AAA |
| UUC | CCA | CCG | AAG |
- A) AAG-GGC-TTA D) AAA-CCC-UUU
B) AAA-ACC-TTT E) GAA-CGG-CTT
C) CTT-CGG-GAA
7. Which of the following statements about circulatory function is incorrect?
- A) Plasma oncotic pressure is the osmotic pressure due to all solutes dissolved in plasma.
B) Most total blood volume is contained in the veins.
C) Action of the skeletal muscle pump tends to decrease venous pooling.
D) An increase in the radius of a blood vessel decreases its resistance.
E) A drop in arterial blood pressure triggers an increase in sympathetic nervous activities.
8. What distinguishes a keystone predator?
- A) It is extremely abundant.
B) It regulates its prey below the carrying capacity of the habitat.
C) It is a specialist, meaning that it preys on only one species.
D) It has a large impact on the community, even though it is not particularly abundant.
9. According to the dynamic stability hypothesis for food-chain length, food chains will be shorter in which kind of environment?
- A) cold B) constant C) variable D) low nutrient availability
10. Which of the following contributes most to the rate of chemical cycling in an ecosystem?
- A) the rate of primary production
B) the rate of decomposition
C) the trophic efficiency of the ecosystem
D) the location of available nutrients in organic or inorganic compartment