

注意：考試開始鈴響前，不得翻閱試題，
並不得書寫、畫記、作答。


國立清華大學 109 學年度碩士班考試入學試題

系所班組別：分析與環境科學研究所

科目代碼：2906

考試科目：普通生物學

—作答注意事項—

1. 請核對答案卷(卡)上之准考證號、科目名稱是否正確。
2. 作答中如有發現試題印刷不清，得舉手請監試人員處理，但不得要求解釋題意。
3. 考生限在答案卷上標記「由此開始作答」區內作答，且不可書寫姓名、准考證號或與作答無關之其他文字或符號。
4. 答案卷用盡不得要求加頁。
5. 答案卷可用任何書寫工具作答，惟為方便閱卷辨識，請儘量使用藍色或黑色書寫；答案卡限用 2B 鉛筆畫記；如畫記不清(含未依範例畫記)致光學閱讀機無法辨識答案者，其後果一律由考生自行負責。
6. 其他應考規則、違規處理及扣分方式，請自行詳閱准考證明上「國立清華大學試場規則及違規處理辦法」，無法因本試題封面作答注意事項中未列明而稱未知悉。

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共 4 頁，第 1 頁

*請在【答案卡】作答

Part 1 單選題 (每題二分，共二十分，答錯不倒扣。請在【答案卡】作答)

1) One mole (mol) of glucose (molecular mass = 180 daltons) is

- A) 180×10^{23} molecules of glucose.
- B) both 180 grams of glucose and 6.02×10^{23} molecules of glucose.
- C) the largest amount of glucose that can be dissolved in 1 L of solution.
- D) 180 kilograms of glucose.

2) Which of the following is a characteristic feature of a carrier protein in a plasma membrane?

- A) It is a peripheral membrane protein.
- B) It exhibits a specificity for a particular type of molecule.
- C) It requires the expenditure of cellular energy to function.
- D) It works against diffusion.

3) The mathematical expression for the change in free energy of a system is $\Delta G = \Delta H - T\Delta S$. Which of the following is (are) correct?

- A) ΔS is the change in enthalpy, a measure of randomness.
- B) ΔH is the change in entropy, the energy available to do work.
- C) ΔG is the change in free energy.
- D) T is the temperature in degrees Celsius.

4) The ATP made during glycolysis is generated by

- A) substrate-level phosphorylation.
- B) electron transport.
- C) photophosphorylation.
- D) chemiosmosis.

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共 4 頁，第 2 頁 *請在【答案卡】作答

- 5) What does the chemiosmotic process in chloroplasts involve?
- A) establishment of a proton gradient across the thylakoid membrane
 - B) diffusion of electrons through the thylakoid membrane
 - C) reduction of water to produce ATP energy
 - D) movement of water by osmosis into the thylakoid space from the stroma
- 6) A lack of which molecule would result in the cell's inability to "turn off" genes?
- A) operon
 - B) inducer
 - C) corepressor
 - D) ubiquitin
- 7) Which of the following is the correct sequence of events in the origin of life?
- I. formation of protobionts
 - II. synthesis of organic monomers
 - III. synthesis of organic polymers
 - IV. formation of DNA-based genetic systems
- A) I, II, III, IV
 - B) I, III, II, IV
 - C) II, III, I, IV
 - D) II, III, IV, I
- 8) To increase the effectiveness of exchange surfaces lining the lungs and the intestines, evolutionary pressures have
- A) increased the exchange surface area with folds and branches.
 - B) increased the thickness of the membranes in these linings.
 - C) increased the number of cell layers in these linings.
 - D) decreased the metabolic rate of the cells in these linings.

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共 4 頁，第 3 頁

*請在【答案卡】作答

9) Which of the following were probably factors that permitted early plants to successfully colonize land?

1. the relative number of potential predators (herbivores)
2. the relative number of competitors
3. the relative availability of symbiotic partners
4. air's relative lack of support, compared to water's support

- A) 1 and 2
B) 2 and 3
C) 3 and 4
D) 1, 2, and 3

10) Acidity in human urine is an example of

- A) cell-mediated immune responses.
B) antibody activation.
C) acquired immunity.
D) innate immunity.

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共 4 頁，第 4 頁 *請在【答案卷】作答

Part 2 問答題 (每題十分，共八十分。請在【答案卷】作答)

- 1) Please imagine how climate might change if Earth was 75% land and 25% water?
- 2) Please explain the role of PM_{2.5} in the physiological control of cell functions.
- 3) Please write down your evidence points to the existence of cancer stem cells.
- 4) Please select one representative character to describe its meaning for environmental issues in Taiwan.
- 5) Please explain the secret of how life on Earth began.
- 6) Please give an example to explain the complicated relationship, war and peace, between microbes and human beings.
- 7) In your point of view, what is the possible human next stage of evolution?
- 8) How has analytical chemistry affected biological research?