

國立清華大學 102 學年度碩士班考試入學試題

系所班組別：生命科學院甲組(0504)、醫學生物科技學程(0507)

考試科目 (代碼)：生物學(0402、0702)

共 4 頁，第 1 頁 *請在【答案卷】作答

1. A DNA sequence to which RNA polymerase binds prior to initiation of transcription is called _____ (2%)
 - (A) Enhancer
 - (B) Riboswitch
 - (C) Promoter
 - (D) Operator
 - (E) Suppressor
2. Select the correct statement about Up elements? (2%)
 - (A) They are proteins that promote transcription of RNA.
 - (B) They stimulate the binding of repressor to DNA.
 - (C) They are nonpromoter DNA elements.
 - (D) They are recognized by the α -subunit C-terminal domain and allow extra strong interaction between polymerase and promoter.
 - (E) They are usually found downstream of the genes they influence
3. Which statement is true for eukaryotic RNA polymerases? (2%)
 - (A) RNA polymerase III is found in nucleolus to make precursor to tRNAs.
 - (B) RNA polymerase II is insensitive to the toxin alpha-amanitin.
 - (C) Yeast Rpb1, Rpb2 and Rpb7 are core subunits of RNA polymerase II, and are absolutely required for the enzyme activity.
 - (D) In yeast, Rpb5 and Rpb6 are two of the common subunits that are found in all three RNA polymerases.
 - (E) RNA polymerase I is responsible for making heterogeneous nuclear RNA (hnRNA).
4. Which of the following methods can be used to quantify the level of gene expression? (2%)
 - (A) S1 mapping
 - (B) Yeast one-hybrid analysis
 - (C) Southern blot
 - (D) Far western
 - (E) Phage display

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共__4__頁，第__2__頁 *請在【答案卷】作答

5. Which of the following is associated with silent genes in eukaryotic cells? (2%)
 - (A) Euchromatin
 - (B) Heterochromatin
 - (C) DNA hypersensitivity sites
 - (D) Histone tail acetylation
 - (E) Nucleosome-free zones
6. Eukaryotic mRNA splicing requires the presence of splicing signals in the intron. Which of the following is not true about the splicing signals? (2%)
 - (A) The first two are GU (at the 5'-splice site)
 - (B) The last two are AG (at the 3'-splice site)
 - (C) A branch-point sequence is near the 3' end of an intron
 - (D) A lariat branched intermediate forms by connecting GU and AG
 - (E) A lariat branched intermediate forms by connecting G at 5'-splice site and A in the branch-point sequence
7. A disadvantage of using a prokaryotic expression system for eukaryotic proteins is that the proteins are_____ (2%)
 - (A) Highly phosphorylated after translation
 - (B) Highly soluble
 - (C) Heavily glycosylated
 - (D) Improperly folded
 - (E) Over expressed
8. The Shine-Dalgarno sequence can be found in_____ (2%)
 - (A) tRNA.
 - (B) 5S rRNA.
 - (C) 16S rRNA.
 - (D) 30S ribosome.
 - (E) mRNA.

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9. Meiotic recombination is initiated at _____ (2%)
 - (A) Late interphase
 - (B) Early to mid prophase
 - (C) Mid to late prophase
 - (D) The appearance of chiasmata
 - (E) All but (A)
10. Given the following cell types, which do you propose would have the highest levels of telomerase activity? (2%)
 - (A) Monkey liver cell
 - (B) Macrophage
 - (C) Colon cancer cell
 - (D) Schwann cell
 - (E) Osteoclast
11. Viruses (3%)
12. Killed virus vaccine (3%)
13. Inflammation (3%)
14. Virus-like particle (3%)
15. Describe the benefits of using subunit vaccines rather than live or inactivated virus vaccines. (5%)
16. Most animal influenza viruses do not infect humans. Why? (3%)
17. How is the role of hormones similar to that of the nervous system? How is it different? (10%)
18. By what processes do materials enter and leave cells? How do these processes work? Which of these processes require the most cellular energy? Which is the least? (10%)
19. Define “homeostasis”, and draw an example to illustrate a negative feedback for thermoregulation. (5%)
20. Describe the relationship between stress and the adrenal gland. (5%)
21. Describe Pavlov’s classic conditioning experiment, and define CS (conditioning stimulus) and US (unconditioning stimulus)? (5%)

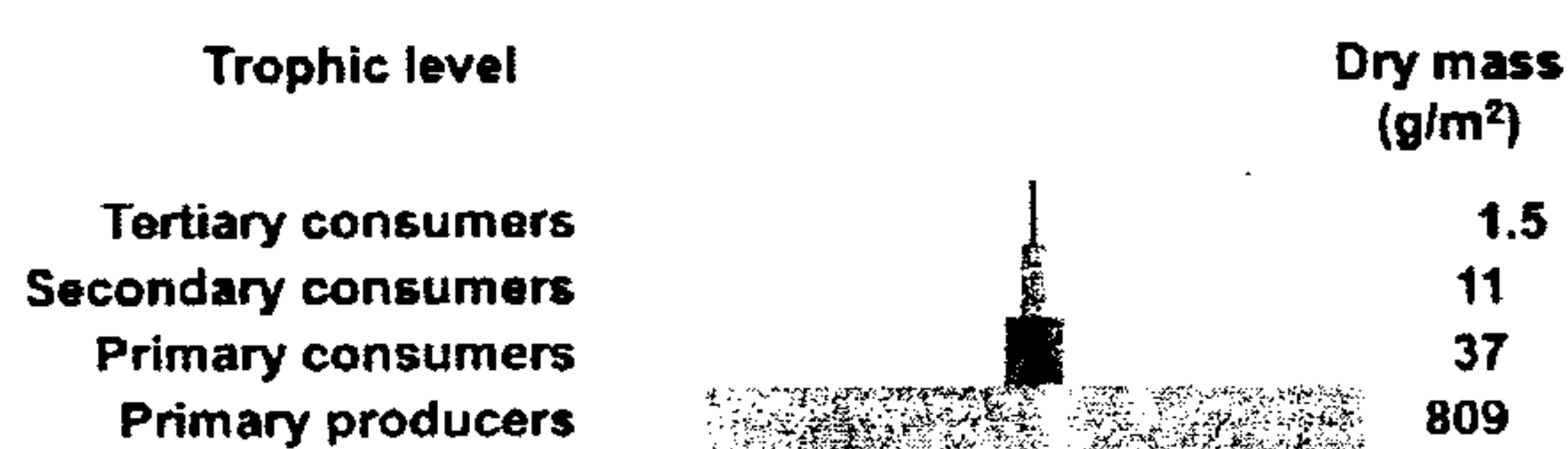
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22. What are EPSP and IPSP? Use them to explain summation of postsynaptic potentials. (5%)
23. How do mammals detect different tastes? (5%)
24. Give an example of the clumped dispersion, and explain why they have such a dispersion pattern. (5%)
25. Why do some aquatic ecosystems (see panel B) have an inverse pyramid of biomass? (5%)



(a) Most ecosystems (data from a Florida bog)



(b) Some aquatic ecosystems (data from the English Channel)

26. Name one of “ecosystem services”, and give an example. (5%)