國立政治大學　106 學年度碩士班招生考試試題

考試科目	細胞生物學與分子生物學 #0151A	系所別	神經科學所	考試時間	2 月 18 日(六) 第 1 節

一、單選題（每題 3 分）

1. In a sample of double-stranded DNA containing 34% cytosine, the percentage of adenosine would be
(A) 34%　(B) 68%　(C) 16%　(D) 32%
(E) Insufficient information to answer

2. Which of the following techniques can be used to measure the amount of a specific mRNA in a sample?
(A) Chromatin immunoprecipitation
(B) RT Real-time quantitative PCR
(C) Southern blot
(D) Western blot
(E) None of above

3. Which of the following statements is NOT correct?
(A) DNA serves as a template for DNA synthesis
(B) DNA serves as a template for miRNA synthesis
(C) DNA serves as a template for mRNA synthesis
(D) RNA serves as a template for protein synthesis
(E) None of above

4. Which of the following statements about DNA agarose electrophoresis is correct?
(A) Low percentage agarose gel provides better resolution for small DNA.
(B) DNA carries negative charges and run to anode.
(C) Large DNA runs faster because it carries more negative charges.
(D) All of above
(E) None of above

5. Eukaryotic messenger RNA is modified during or after its transcription and is exported from the nucleus to the cytoplasm only after all modifications have been completed. Which of the following processes are included in these mRNA modifications?
(A) 3' capping
(B) addition of 5' poly A tail
(C) splicing
(D) formation of hairpin structure
(E) All of above

6. The post-transcriptional modification includes
(A) ubiquitination　(B) phosphorylation　(C) methylation
(D) sumoylation　(E) All of above

7. About microtubules, which of the following description is NOT correct?
(A) In the most of the cases, the (-) ends of microtubules point away from the center of the cells
(B) Kinesins are microtubule-(+)-end-oriented motors
(C) Microtubules go through alternating rescue (growing phase) and catastrophe (shrinking phase), a process known as the dynamic instability
(D) Microtubules determine both the shape and polarity of a cell
(E) None of above

8. BrdU is an analog of thymidine that can be incorporated into double stranded DNA during DNA polymerization in S phase. Unsynchronized cells at various stages of cell cycle are first

備註	一、作答於試題上者，不予計分。 二、試題請隨卷繳交。

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treated with BrdU for 2 hours and then cultured in the absence of BrdU for another 4 hours. What would happen to those unsynchronized cells exposure to BrdU?
(A) BrdU is incorporated into all the unsynchronized cells
(B) In a cell labeled by BrdU, both strands of DNA are labeled
(C) In the 2-hour BrdU pulse, only mitotic cells are labeled
(D) All of above
(E) None of above

9. Protein phosphorylation by kinases are important in signal transduction. Which amino acids of the target proteins can NOT be phosphorylated?
(A) Threonine (B) Serine (C) Tyrosine (D) Alanine
(E) All of above

10. Which of the following statements about "actin" is correct?
(A) It constitutes intermediate filaments and is one of the major components of cytoskeleton
(B) Branching of actin filaments is mainly mediated by the Arp2/3 complex
(C) The growth rate of actin filaments is faster at the (+) end, which contains GDP-bound actin
(D) Transportation along the actin filaments is mediated by dynein motors
(E) All of above

二、配合題 (每題 3 分)：

1. Endoplasmic reticulum	(A) ATP synthesis
2. Lysosome	(B) Component of chromatin
3. Golgi apparatus	(C) Synthesis of protein
4. Mitochondria	(D) Intracellular protein degradation
5. Histone	(E) Modification and packing of proteins for secretion

三、解釋名詞 (每題 5 分)：

1. Apoptosis　2. Cell adhesion molecules　3. Alternative splicing

四、問答題 (每題 10 分)

1. Please explain how a protein complex formed to initiate transcription of a gene.

2. Please describe the detail molecular mechanism of epigenetic control (including gene activation and silencing) of gene expression.

3. How does calcium modulate muscle contraction? Please compare the action of calcium in contraction of smooth muscle versus skeletal muscle.

4. How do extracellular signals regulate cell movement? Please explain the sequential activation of molecular switches that change cytoskeleton in a migrating fibroblast.

試題請隨卷繳回

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國立政治大學 106 學年度 碩士班 招生考試試題

考試科目	生理學 8151B	系所別	神科所	考試時間	2月18日(六) 第一節

問答題

1. Explain the following terms (30pts)
   (a) receptor antagonist
   (b) hypothalamus-pituitary-adrenal axis
   (c) long-term potentiation
   (d) basal ganglia
   (e) neurotrophic factors
   (f) somatosensation

2. Describe the biological functions of renal glomeruli how they perform these functions (10pts)

3. Depict and explain the propagation of action potential along the axon, including the ion flows, the membrane potential changes and the activities of ion channels (15pts).

4. Explain how leptin and insulin maintain metabolism homeostasis (10pts)

5. Explain how the cardiac conduction system controls the heart rate (10pts)

6. Describe the functions of the following blood cell types (15pts)
   (a) helper T cell
   (b) macrophage
   (c) B cell

7. Draw an excitatory synapse and describe the biochemical events during neurotransmission in presynaptic and postsynaptic parts (10pts)

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