

考 試 科 目	細胞生物學	所 別	神經科學研究所	考 試 時 間	3 月 15 日 星期日	第 3 節
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A. 選擇 (2% each)

1. Which of the following is a noncovalent interaction?

- a. hydrophobic effect
- b. ionic interactions
- c. Van der Waals interactions
- d. b and c
- e. all of the above

2. Adenosine is a

- a. component of RNA.
- b. nucleotide.
- c. pyrimidine.
- d. a and b
- e. all of the above

3. Which of the following modification marks a protein for degradation in proteasomes?

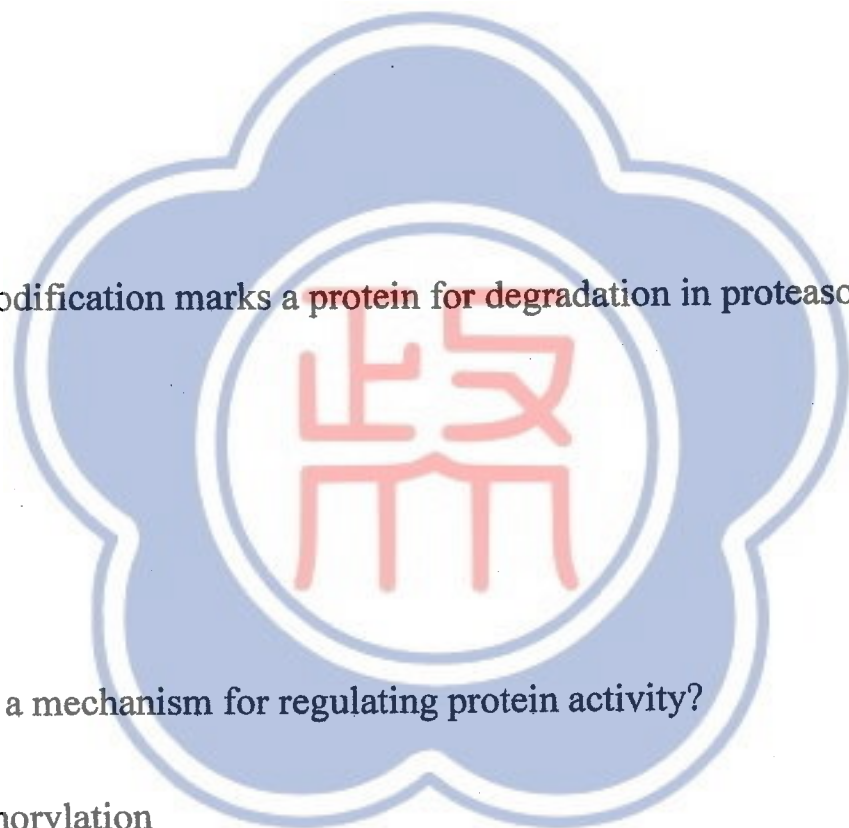
- a. phosphorylation
- b. ubiquitinylation
- c. acetylation
- d. glycosylation
- e. all of the above

4. Which of the following is a mechanism for regulating protein activity?

- a. proteolytic processing
- b. phosphorylation/dephosphorylation
- c. ligand binding
- d. b and c
- e. all of the above

5. In eukaryotic cells, protein synthesis in the cytoplasm utilizes three types of RNA molecules. Which of the following contains a three nucleotide sequence called the anticodon?

- a. mRNA
- b. tRNA
- c. rRNA



備 考 試 題 隨 卷 繳 交

命 題 委 員 :

( 簽 章 )

日

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d. all of the above

6. An enzyme that breaks DNA, dispels the tension, and reseals the strand ahead of a DNA replication growing fork is called a(n)

- a. topoisomerase.
- b. DNA polymerase.
- c. phosphodiesterase.
- d. aminoacyl-tRNA synthetase.

7. Which of the following lead(s) to a point mutation?

- a. deamination of a cytosine base into a uracil base
- b. benzo(a)pyrene conversion of guanine to a thymine base
- c. deamination of 5-methyl cytosine into thymine
- d. all of the above

8. An enhancer

- a. is a DNA element that stimulates transcription of eukaryotic promoters.
- b. binds to RNA polymerase and stimulates transcription.
- c. acts as a binding site for RNA polymerase.
- d. interacts with repressor proteins to enhance transcriptional repression.

9. The TATA box

- a. serves as a promoter sequence for genes transcribed by RNA polymerase III.
- b. is located approximately 100 base pairs upstream of the start site for mRNAs.
- c. is present in all eukaryotic genes.
- d. acts to position RNA polymerase II for transcription initiation.

10. Splice sites in pre-mRNA are marked by two universally conserved sequences contained

- a. in the middle of the intron.
- b. at the ends of the exons.
- c. at the ends of the introns.
- d. none of the above

11. Indicate the order in which the following steps occur in the production of a mature mRNA.

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- a. initiation of transcription, splicing, addition of 5' cap, addition of poly(A) tail, transport to cytoplasm
- b. initiation of transcription, addition of 5' cap, splicing, addition of poly(A) tail, transport to cytoplasm
- c. initiation of transcription, addition of poly(A) tail, addition of 5' cap, splicing, transport to cytoplasm
- d. initiation of transcription, addition of 5' cap, addition of poly(A) tail, splicing, transport to cytoplasm

12. microRNAs play a key role in which of the following?

- a. translational repression
- b. viral RNA degradation
- c. RNA interference
- d. all of the above

13. Which of the following classes of lipids is (are) present in biomembranes?

- a. phosphoglycerides
- b. sphingolipids
- c. steroids
- d. all of the above

14. When computing the osmotic pressure that must be placed across the membrane to stop the flow of water, what is the glucose osmotic equivalent of 1 M  $\text{CaCl}_2$ ?

- a. 1 M
- b. 2 M
- c. 3 M
- d. 4 M

15. Electron transport from NADH and  $\text{FADH}_2$  to  $\text{O}_2$  occurs in the

- a. mitochondrial matrix.
- b. cytosol.
- c. mitochondrial inner membrane.
- d. mitochondrial outer membrane.

**B. Short Answers**

1. (5%) What is the basis for separation of proteins by two-dimensional gel electrophoresis? Why is this better for resolving a mixture of proteins?

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2. (5%) A double-stranded piece of DNA containing the sequence GCATGGCCACTACCG has a higher  $T_m$  than one containing the sequence GAATGGTAACAACCTG. Describe the properties of DNA that make this true.
3. (5%) Describe how lipid soluble hormones, glucocorticoid for example, regulate gene transcription acting through nuclear hormone receptors.
4. (5%) What are hnRNP proteins? How were they identified?
5. (5%) Propose a rationale for why the coupling of the import of amino acids or sugars into cells is typically to  $Na^+$  ion import.
6. (5%) How can a uniporter, GLUT2, be sufficient to support the entry of glucose from intestinal epithelial cells into the bloodstream?
7. (5%) What stimulus is required for quiescent cells to reenter the cell cycle? What events occur after stimulation?
8. (5%) In the absence of targeting information, what is the default location of proteins synthesized on cytosolic ribosomes?
9. (5%) In multipass membrane proteins synthesized in association with membrane-bounded ribosomes of the rough ER, signal-anchor and stop-transfer anchor sequences alternate. What do these sequences do?
10. (5%) What are the functions of the myosin head domain and tail domain, respectively?
11. (5%) What happens to a microtubule that loses its GTP cap?
12. (5%) Why would neuronal vesicles probably contain both kinesin and cytosolic dynein?
13. (4%) EDTA is a divalent cation (eg.  $Ca^{2+}$ ) chelator (will capture  $Ca^{2+}$ ). Propose an explanation for how EDTA promotes the dissociation of animal cell tissue?
14. (6%) A molecule to be considered a true natural mesoderm inducer, it has to meet 3 criteria. Please describe them.

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