(103)輔仁大學碩士班招生考試試題	考試日期：103 年 3 月 7 日第 3 節
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科目： 分子生物學　　系所組：營養科學

I. Explain the following terms: (5 points for each sentence, 20 points)

(a) RNA editing
(b) MicroRNA
(c) Chromatin remodeling
(d) Wobble hypothesis

II. What are three mechanisms of translational repression that are known to exist in eukaryotes? (15 points)

III. Name four general types of postsynthetic processing reactions that are observed in RNA. (10 points)
Briefly (one sentence or less) point out an example of each type. In your example, identify the type of RNA molecule involved (tRNA, mRNA, rRNA, etc.), the type of "processing" involved, and whether the example is characteristic of eukaryotes or prokaryotes, or both. Do not describe specific genes, sequences, complicated structures, or enzymes.

IV. Choice questions (3 points for each question, 45 points)

(1) An mRNA whose translation is controlled by binding of a metabolic end product such as flavin adenine dinucleotide or adenosylcobalamin is called a_____.
(a) Ribozyme
(b) miRNA
(c) riboswitch
(d) regulatory RNA

(2) DNA methylation in eukaryotes plays a role in _____.
(a) protection of restriction sites
(b) cancerous cell growth
(c) gene silencing
(d) methyl-directed mismatch repair

(3) In a histone protein, what modification to lysine marks the nucleosome as a transcription target?
(a) physical separation of transcription from translation
(b) the presence of chromatin instead of naked DNA
(c) the larger size of the chromosomes
(d) the presence of introns

(4) What mRNA modification, just 5′ to the start codon, is used by the eukaryotic cell to enable location of the first AUG codon?
(a) a sequence of UAUAUA
(b) a GC "box" that is recognized by eIFI
(c) 7-methylguanine cap on the 5′ end of the mRNA
(d) a short sequence that forms a hairpin loop

※ 注意：1.考生須在「彌封答案卷」上作答。
2.本試題紙空白部份可當稿紙使用。
3.考生於作答時可否使用計算機、法典、字典或其他資料或工具，以簡章之規定為準。

(5) What role do the Hsp70 proteins play in delivering proteins to their site of action such as the mitochondria?

(a) aids in proper folding to allow protein to properly traverse membranes
(b) prevents proteolysis of the unfolded protein
(c) keeps the protein in an unfolded state to allow transfer across membranes
(d) aids in formation of an intermediate folded protein that is present only during membrane transport

(6) In vivo, which of the following transcription initiation factors is required for binding to a TATA box?

(a) TFIID
(b) TFIIE
(c) TFIIF
(d) TFIIH

(7) In eukaryotic cells, RNA polymerase ____ transcribes most of the ribosomal RNA, RNA polymerase ____ transcribes the major structural genes and RNA polymerase ____ transcribes tRNAs.

(a) I; III; II
(b) II; I; III
(c) III; II; I
(d) I; II; III

(8) A pseudogene is a _____.

(a) nonexpressed gene
(b) gene with multiple promoter regions that causes the start of transcription to be mistaken
(c) mutated gene
(d) gene that codes for a non-functional protein

(9) *Bam*HI has a restriction site of G↓GATCC while *Hpa*I has a restriction site of GTT↓ACC. Based upon this, *Bam*HI produces _____ and *Hpa*I produces _____.

(a) a 3′ overhang; a 5′ overhang
(b) a 5′ overhang; a 3′ overhang
(c) a 5′ overhang; blunt ends
(d) a 3′ overhang; blunt ends

(10) What is a polyribosome?

(a) ribosomes that synthesize different subunits of the same protein
(b) several ribosomes all attached to the same mRNA
(c) ribosomes that are covalently bonded to each other in a polymer fashion
(d) a ribosome that only produces proteins that will be excreted by the cell

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(11) What technique is used to amplify portions of DNA, usually about 500 base pairs in size?
(a) DNA sequencing
(b) restriction digestion
(c) polymerase chain reaction
(d) electrophoresis

(12) What is the term used to describe genetic variation that occurs among individuals of the same species resulting in gain or loss of restriction sites that can be detected by Southern analysis?
(a) hybridization
(b) polymorphism
(c) epigenetic variant
(d) clone

(13) The repair of cyclobutane pyrimidine dimers involves bacterial _____ and the cofactors _____ and _____.
(a) DNA methylase; S-adenosyl methionine; ATP
(b) DNA polymerase I; flavin; TPP
(c) photolyase; flavin; NADH
(d) photolyase; flavin; pterin

(14) An Okazaki fragment is a:
(a) fragment of DNA resulting from endonuclease action.
(b) segment of DNA that is an intermediate in the synthesis of the lagging strand.
(c) segment of mRNA synthesized by RNA polymerase.
(d) fragment of RNA that is a subunit of the 30S ribosome.

(15) "Footprinting" or DNase protection is a technique used to identify:
(a) a region of DNA that has been damaged by mutation.
(b) the specific binding site of a repressor, polymerase, or other protein on the DNA.
(c) the position of internally double-stranded regions in a single-stranded DNA molecule.
(d) the position of a particular gene of a chromosome.

V. Match the protein or structural feature on the left with one appropriate description on the right. (2 points for each question, 10 points)

_____ activator	(a) a positive regulator
_____ helix-turn-helix	(b) a negative regulator
_____ leucine zipper	(c) facilitates transcription only when bound to a signal molecule
_____ repressor	(d) a DNA-binding structural motif found in many prokaryotic regulatory proteins
_____ zinc finger	(e) a structural feature involved in protein-protein interactions between some regulatory protein monomers
	(f) a protein that dissociates from DNA when bound to a signal molecule
	(g) a DNA-binding structural motif found in many eukaryotic regulatory proteins