QUIZ 3
GENETICS, PCB 3063-U02
March 28, 2011

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1. RNA molecules have the same 5′ to 3′ orientation as the DNA template strands to which they are complementary.

a. True
b. False

2. An *in vitro* transcription system that contains a bacterial gene initiates transcription, but from random points on the DNA. Which of the following proteins most likely is missing from the reaction?

a. sigma factor
b. rho factor
c. RNA polymerase II
d. TATA-binding protein

3. During transcription, all parts of the DNA molecule are transcribed into RNA

a. True
b. False

4. Small nuclear RNAs (snRNAs) play role in the

a. protein modification
b. DNA processing
c. RNA processing
d. all of the above

5. A promoter is a sequence where transcription is initiated.

a. True
b. False

6. Initiation of transcription does not require a primer

a. True
b. False

7. If the DNA strand 5'-GTACCGTC-3' was used as a template, what would the sequence of RNA be?

a. 5′-GACGGUAC-3′
b. 5′-GACGGTAC-3′
c. 5′-CAUGGCAG-3′
d. 5′-GAGGGCAC-3′
e. 5′-GUCGGUAC-3′

8. An *in vitro* transcription system transcribes a bacterial gene but terminates inefficiently. What is one possible problem?

a. There is a mutation in the –10 consensus sequence, which is required for efficient termination.
b. Rho factor has not been added.
c. Sigma factor has not been added.
d. A hairpin secondary structure has formed at the 3′ end of the mRNA, interfering with termination.

9. In all organisms, all genes are transcribed from the same strand

a True
b. False

10. In both prokaryotes and eukaryotes, transcription of an mRNA terminates precisely at the end of the protein-coding sequence

a. True
b. False

11. The transcription unit is a stretch of DNA that contains

a. Promoter, RNA-coding sequence, and enhancer
b. Promoter, RNA-coding sequence, activator, and terminator
c. Promoter, RNA-coding sequence, enhancer, and extender
d. Promoter, RNA-coding sequence, and terminator

12. What is the difference between eukaryotic core promoter and regulatory promoter?

a. Only the core promoter has consensus sequences
b. The core promoter is upstream and regulatory promoter is downstream of the gene
c. Transcription factors bind to the core promoter and transcriptional activator proteins bind to the regulatory promoter
d. All of the above

13. Over time, DNA replaced RNA as the primary carrier of genetic information, and the chemical stability of DNA is believed to be the key reason for this. Which attribute of DNA is the reason behind its chemical stability?

a. DNA lacks a free hydroxyl group on the 2′-carbon atom of its sugar.
b. Unlike RNA, DNA is usually double stranded.
c. DNA does not usually form hairpin loops.
d. One of the two pyrimidines found in DNA does not involve uracil

14. Eukaryotic gene and protein sequences are generally collinear

a. True
b. False

15. Alternative 3' cleavage sites result in

a. Multiple genes of different lengths
b. multiple pre-mRNA of different lengths
c. multiple mRNA of different lengths'
d. all of the above

16. The poly(A) tails found in the 3′ end of an mRNA are important for all the processes listed below except for:

a. mRNA stability
b. translation
c. intron splicing

17. With the rare exception of RNA editing, every nucleotide contained in a processed mRNA molecule is derived from exon sequences.

a. True
b. False

18. Introns are

a. coding sequences
b. coding reading frames
c. alternative reading frames
d. non-coding sequences

19. During RNA editing, the coding sequence of an mRNA molecule is altered after transcription

a. True
b. False

20. All tRNA molecules contain _____

a. intron
b. anticodon
c. splice site
e. UTR

21. The genetic code is made of

a. 64 sense codons
b. 62 sense codons
c. 61 sense codons
d. 60 sense codons
e. 50 sense codons

22. What is the minimum number of different aminoacyl-tRNA synthetases required by a cell?

a. 64, one for each codon
b. 61, one for each sense codon
c. 30, one for each different tRNA
d. 50, one for each different tRNA
e. 20, one for each amino acid

23. The genetic code is said to be "degenerate" because

a. there are more codons than amino acids.
b. there are more amino acids than codons.
c. different organisms use different codons to encode the same amino acid.
d. some codons specify more than one amino acid.

24. Pairing between codon and anticodon follows strict pairing rule if first 5' base of anticodon is:

a. C or U
b. G or U
c. G or A
d. C or A

25. Wobble hypothesis states that

a. pairing at the third codon position is always strict
b. pairing at the first codon position is relaxed
c. pairing at the third codon position is relaxed
~~d. pairing at the first codon position is relaxed~~

26. Reading frame can be set by any codon

a. True
b. False

27. Amino acids are assembled into a protein through the mechanism of

a. transcription
b. translation
c. transversion
d. multiplication

28. Ribosomes move along an mRNA in the 5' to 3' direction

a. True
b. False

29. A special tRNA that does not have an attached amino acid binds to stop codons to terminate translation

a. True
b. False

30. The function of aminoacyl-tRNA synthetases is to

a. transcribe tRNA genes
b. match tRNA anticodons and mRNA codons at the ribosome
c. attach amino acids to tRNAs
d. form the peptide bond between amino acids at the ribosome
e. release tRNA from ribosome

31. An mRNA has the codon 5′ UAC 3′. What tRNA anticodon will bind to it?

a. 5′ AUG 3′
b. 3′ AUG 5′
c. 5′ ATC 3′
d. 3′ ATC 5′

32. An mRNA can be translated by only one ribosome at a time

a. True
b. False

33. Release factors bind to the ribosome during _____ of translation

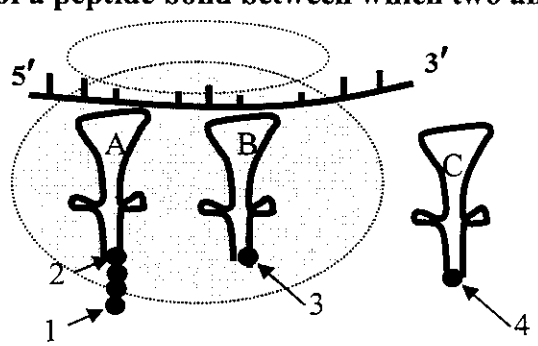
a. initiation
b. elongation
c. tRNA charging
d. termination

34. An mRNA has the stop codon 5′ UAA 3′. What tRNA anticodon will bind to it?

a. 5′ AUU 3′
b. 5′ AUC 3’
c. 5’ UUA 3′
d. none

35. Use diagram below (solid circles represent amino acids) and answer the question. The next step in the translation of this mRNA will be the formation of a peptide bond between which two amino acids?

a. amino acid 2 and amino acid 4
b. amino acid 1 and amino acid 3
c. amino acid 1 and amino acid 2
d. amino acid 2 and amino acid 3



36. Use the above diagram and answer the question. After the peptide bond forms, what will happen?

a. tRNA A will be carrying the polypeptide and it will shift to the P site.
b. tRNA A will be carrying the polypeptide and it will shift to the A site.
c. tRNA B will be carrying the polypeptide and it will shift to the P site.
d. tRNA B will be carrying the polypeptide and it will shift to the A site.

37. Structural genes encodes proteins

a. True
b. False

38. Regulatory genes

a. are not transcribed
b. are transcribed only partially
c. encode products that interact with other sequences and affect the transcription
d. encode products that have structural role in the cell

39. "Housekeeping" genes are

a. under negative control
b. under positive control
c. discontinuously expressed
d. constitutively expressed

40. An operon in bacteria includes

a. promoter and structural genes
b. promoter, structural genes, and regulator
c. promoter, operator, and structural genes
d. promoter, operator, structural genes, and regulator

41. An example of a gene product encoded by a regulatory gene is
a. beta-galactosidase enzyme.
b. allolactose.
c. repressor protein.
d. operator

42. A repressible gene is controlled by a regulatory protein that inhibits transcription
a. True
b. False

43. In eukaryotes, most structural genes are found within operons
a. True
b. False

prokaryotes

44. Addition of acetyl groups to the tails of histone proteins results in
a. histone degradation
b. activation of apoptosis
c. activation of transcription
d. repression of transcription

45. What is the function of allolactose in regulation of the *lac* operon?
a. inducer
b. repressor
c. activator
d. promoter
e. regulatory protein

46. The lac operon of E.coli is
a. positive inducible operon
b. positive repressible operon
c. negative inducible operon
d. negative repressible operon

47. siRNAs and miRNAs are produced by
a. the cleavage of RISCs by endonucleases.
b. the cleavage of functional mRNA within the cytoplasm.
c. the cleavage of pre-mRNA in the nucleus.
d. the cutting and processing of double-stranded RNA by Dicer enzymes.

48. Separation of transcription and translation by the nuclear membrane allowed the evolution of additional mechanisms of gene regulation.
a. True
b. False

49. In a general sense, highly condensed DNA bound with histone proteins
a. activates gene expression
b. enhances gene expression
c. represses gene expression
d. does not affect gene expression

50. Transcriptional repression by methylation of DNA is most common in sequences called CpG islands.
a. True
b. False