DNA & Molecular Genetics (Prokaryotes & Eukaryotes)

1. The essence of heredity is the ability of cells to use the information in their DNA to bring about the production of particular _____, thereby affecting what the cells will be like.

2. The expression of a gene involves two phases, _____ and translation.

3. Messenger RNA molecules are copies of DNA; they travel to the ribosomes to direct the assembly of _____.

4. Transcription begins at RNA polymerase-binding sites called _____ sites.

5. The strand of DNA that is not transcribed is called the _____ strand.

6. In _____, a ribosome assembles a polypeptide, whose amino acid sequence is specified by the nucleotide sequence in the mRNA (which itself is a copy of the template DNA).

7. The coded order of nucleotides in a DNA specifies the order of specific amino acids to be assembled into a polypeptide chain. This code is therefore called the _____ code.

8. Crick and his colleagues proposed that the genetic code consisted of a series of blocks of information, called _____, each corresponding to an amino acid in the encoded protein.

9. Gene _____ refers to the combined processes of transcription and translation.

10. Following transcription, the intron sequences are cut out of the primary transcript and the ends are joined again prior to its use in protein synthesis. This processing of the RNA is called RNA _____.

11. Most eukaryotic genes contain coding sequences called _____ that are interspersed with noncoding sequences.

12. The polypeptide making organelles residing in the cytoplasm are themselves large protein aggregates. These are called

    A. ribosomes
    B. Golgi bodies
    C. lysosomes
    D. the endoplasmic reticulium
    E. mitochondria

13. Amino acids are transported to the ribosome for use in building the polypeptide by

    A. mRNA molecules
    B. tRNA molecules
    C. DNA polymerase molecules
    D. rRNA molecules
    E. DNA ligase molecules

14. The process in which an RNA polymerase molecule assembles an mRNA molecule whose nucleotide sequence is complementary to the DNA sequence is called

    A. gene amplification
    B. translation
    C. transcription
    D. polypeptide sequencing
    E. complementary base pairing

15. Similar to the complementary purine-pyrimidine relationship observed in DNA, which of the following choices pairs with adenine in RNA?

    A. thymine
    B. cytosine
    C. guanine
    D. uracil

16. The nucleotide sequence of a mRNA codon is composed of how many bases?

    A. one
    B. two
    C. three
    D. sixteen
    E. sixty-four

17. The many different functions and behaviors of living organisms are essentially based on the performance of their cells. The cells' performance in turn is dependent upon the

    A. production of many varieties of polypeptides and proteins
    B. production of correct membranes
    C. proper conformation for water in the cells
    D. production of steroids and hormones
    E. ability to reproduce

18. The hereditary information in DNA is conveyed through the

    A. production of all three kinds of RNA molecules
    B. production of a lipid bilayer
    C. production of DNA copies
    D. production of many proteins and polypeptides
    E. production of all of the codons

19. The basic mechanism of gene expression often referred to as the “central dogma” consists of which two steps?

    A. gene information is transferred to an RNA copy
    B. the RNA copy directs the sequential assembly of amino acids
    C. the chain of amino acids assume a specific three dimensional shape to become functional according to the type of genetic information
    D. a and b
    E. a and c

20. The classes of RNA molecules made in cells include all of the following except

    A. mRNA
    B. tRNA
    C. rRNA
    D. all of the above

21. Protein synthesis takes place on

    A. the plasma membrane
    B. the nucleus
    C. ribosomes
    D. lysosomes
    E. microbodies

22. Ribosomes are complex arrangements of

    A. RNA and DNA
    B. RNA and large proteins
    C. RNA and sugars
    D. DNA and proteins
    E. nucleosomes and RNA

23. The sites A, P, and E are progressively occupied by amino acids being assembled into a chain in protein synthesis. These sites are part of

    A. small ribosomal subunit
    B. large ribosomal subunit
    C. mRNA
    D. tRNA
    E. DNA (the gene itself)

24. Each amino acid has a specific tRNA molecule that can transport it to the site of protein synthesis. Therefore, in humans the number of different tRNA molecules would be

    A. 3
    B. 20
    C. 40
    D. 80
    E. thousands

25. In eukaryotic cells, mRNA is made as a copy of the DNA coding information in the

A. cytoplasm
B. mitochondria
C. ER
D. nucleus
E. plasma membrane

26. Gene expression includes which two of the following processes?

A. transcription and replication
B. replication and repression
C. protein synthesis and replication
D. mutation and cell division
E. transcription and translation

27. The enzyme that initiates transcription is

A. RNA polymerase
B. DNA polymerase
C. carbonic anhydrase
D. ATP synthetase
E. transformation principle

28. Because nucleic acid sequence information is changed into amino acid sequence information, polypeptide synthesis is known as

A. breaking the code
B. decoding
C. transcription
D. translocation
E. translation

29. The number of nucleotides required to specify an amino acid is

A. 1
B. 2
C. 3
D. 4
E. a variable number

30. The genetic code operates on which two of the following principles?

A. All four of the nucleotide bases must be used.
B. Each combination of any three nucleotides can act as a codon.
C. The first nucleotide in every codon is always the same.
D. a and b
E. b and c

31. How many unique mRNA codons can be constructed from the four different RNA nucleotides?

A. 4
B. 8
C. 16
D. 32
E. 64

32. The 3-nucleotide sequence of an mRNA is called the

A. codon
B. anticodon
C. amino acid
D. transcript
E. template

33. Besides the triplet nature of the genetic code, the other major piece of information that was provided by Crick and his coworkers is that

A. each codon specified a different amino acid
B. the code of all DNA molecules is the same
C. the proteins made from the coded information are always the same
D. the reading of the code occurs without any punctuation
E. the genetic code is the same in all organisms with no exceptions

34. The tRNA nucleotide sequence that lines up on the mRNA is

A. an intron
B. an exon
C. a release factor
D. an initiation factor
E. an anticodon

35. Protein synthesis proceeds by the ribosome

A. alternating between many chains
B. moving three nucleotides at a time on the mRNA
C. attaching amino acids in a random fashion
D. selecting the tRNA molecule that fits
E. attaching amino acids to the growing chain without charged tRNAs

36. Ribosome movement on the mRNA transcript is called

A. transcription
B. translation
C. replication
D. translocation
E. mutation

37. Specific amino acids are attached to tRNA molecules by

A. activating enzymes
B. codons
C. anticodons
D. ribosomes
E. initiation factors

38. The codons that serve as “stop” signals for the protein synthesis are called

A. anticodons
B. release codons
C. nonsense codons
D. amino acid codons
E. tRNA codons

39. The bond that forms between the newly added amino acid and the previous amino acid on the chain is called a

A. hydrogen bond
B. hydrophobic bond
C. hydrophilic bond
D. phosphodiester bond
E. peptide bond

40. The initiation complex for protein synthesis contains all of the following except

A. a small ribosomal subunit
B. mRNA
C. tRNA with methionine
D. a release factor
E. an initiation factor

41. The different components of the protein synthesizing machinery are

A. mRNA
B. tRNA
C. ribosomes
D. amino acids
E. all of the above

42. Eukaryotic mRNA molecules are occasionally interspersed with non-coding sequences that must be removed before protein synthesis. These are called

A. anticodons
B. introns
C. exons
D. nucleosomes
E. chromomeres

43. The location of protein synthesis in eukaryotic cells is the

A. nucleus
B. cytoplasm
C. plasma membrane
D. Golgi apparatus
E. vacuole

44. In eukaryotes, mRNA processing involves which of the following two events?

A. Elongation factors must first make the molecule longer.
B. A cap is added to the 5' end.
C. A poly A tail is added to the 3' end.
D. a and b
E. b and c

45. The site from where the empty RNA molecules exit the ribosome is the

A. E site
B. P site
C. A site
D. active site
E. allosteric site

46. The Central Dogma of biology is stated as

A. proteins→ RNA→ DNA
B. RNA→ DNA→ proteins
C. DNA→ proteins→ RNA
D. DNA→ RNA→ proteins

47. Which of the following answers best identifies the types of RNA associated with ribosomes during protein synthesis?

A. mRNA and rRNA
B. tRNA and rRNA
C. tRNA and mRNA
D. rRNA, tRNA, and mRNA

48. The process of transfer of information that codes a protein from DNA to mRNA is referred to as

A. transcription
B. translation
C. transformation
D. transference
E. translocation

49. If the sequence of bases in a section of DNA is ATCGCTCC, what is the corresponding sequence of bases in mRNA?

A. ATCCGATT
B. TAGGCUGG
C. UAGCGAGG
D. TATCGGCC
E. AUCCGAUU

50. If the DNA triplet code were ATG-CGT, the tRNA anticodons would be

A. AUGCGU
B. ATGCGT
C. UACGCA
D. UAGCGU

51. Humans and a bacterium make human insulin. How is this possible?

A. The human insulin gene appears naturally in the bacteria.
B. The human insulin gene is a mutated form of a bacterial gene for bacterial insulin.
C. The human insulin gene was inserted into a bacterium's genome, and since the genetic code is nearly universal, the bacterium is able to produce human insulin.
D. The human insulin gene appears in bacteria that have been exposed to radiation treatments for diabetes.
E. The human insulin gene appears naturally in the bacteria that is an inhabitant of the GI tract of diabetic patients.

52. There are 45 different kinds tRNA (anticodons) available to serve as amino acid carriers, but there are 64 mRNA condons. Why aren't the tRNA anticodons and mRNA codons equal in number?

A. The reason is that the third base pair on the tRNA allows some flexibility (wobble); thus, some tRNA anticodons can recognize more than one mRNA codon.
B. The reason is that some tRNA anticodons can misread some of the mRNA codons, which creates a "wobble" in the tRNA anticodons that can be repaired by RNA repair enzymes.
C. The reason is that the third base pair on the mRNA codon allows some flexibility (wobble); thus, some tRNA anticodons can recognize more than one mRNA codon.
D. The reason is that the tRNA has the flexibility to choose which mRNA codons are necessary for building the polypeptide chain.

53. Eukaryotic organisms and prokaryotic organisms differ in how gene information is processed. Select the statement that best explains this difference.

A. Prokaryote genes are transcribed into mRNA, which is translated immediately. Eukaryote genes contain long sequences of nucleotides that do not code for amino acids and have to be removed from the primary transcript.
B. Prokaryote genes are transcribed directly into a polypeptide, while eukaryote genes have mRNA and tRNA involved in polypeptide assembly.
C. Prokaryote genes are translated before being transcribed into mRNA. Eukaryotic genes are transcribed into mRNA and then translated.
D. Prokaryote genes are edited of all introns before being transcribed into mRNA, while eukaryotic genes are edited after mRNA formation.

54. Transcription is the first stage in the Central Dogma. Transcription is initiated by

A. DNA polymerase binding to a site known as the promoter
B. RNA polymerase binding to a site known as the promoter
C. mRNA polymerase binding to a site known as the promoter
D. tRNA polymerase binding to a site known as the promoter

55. The process that occurs when a ribosome moves three more nucleotides along the mRNA molecule in the 5' to 3' direction is referred to as

A. transduction
B. translation
C. translocation
D. transposon

56. Prokaryotes differ from eukaryotes during their transcription of the mRNA molecule. Their mRNA molecule

A. does not require ATP

B. not require any enzymes
C. not require a primer
D. not require the DNA template strand

57. Transcription in prokaryotes is carried out by the enzyme _____, which unwinds and transcribes the gene.

A. DNA polymerase
B. DNA helixase
C. DNA gyrase
D. RNA ligase
E. RNA polymerase

58. Prokaryotes have one type of RNA polymerase. Eukaryotes have ____ types of RNA polymerase.

A. 2
B. 3
C. 4
D. 16
E. 64

59. Of the types of RNA polymerase that are known, which one is the most complex?

A. I
B. II
C. III
D. IV

60. Eukaryotic mRNA molecules are modified

A. in the cytoplasm
B. at the ribosome
C. in the nucleus
D. at the Golgi complex
E. at the initiation of transcription

61. The 3' Poly-A tail is attached to

A. the Poly-A polymerase enzyme
B. the mRNA
C. the tRNA
D. the coding strand of the DNA molecule
E. the template strand of the DNA molecule

62. Why are there only 45 different tRNA anticodons rather than 64 to match each of the mRNA codons?

A. The first nucleotide of a tRNA anticodon allows some flexibility or "wobble."
B. The second nucleotide of a tRNA anticodon allows some flexibility or "wobble."
C. The third nucleotide of a tRNA anticodon allows some flexibility or "wobble."
D. The remaining 19 tRNA anticodons are used for initiation and termination of protein synthesis.

63. Translocation is a process that involves

A. moving of mRNA molecules
B. moving of the aminoacyl-tRNA synthetases
C. the actual moving of the amino acids to the ribosomes by the tRNA molecules
D. the ribosome moving one more nucleotide along the mRNA molecule
E. the ribosome moving three more nucleotides along the mRNA molecule

64. RNA splicing in eukaryotic cell protein synthesis means

A. that the product of translation, called the primary transcript is cut and put back together to produce the mature mRNA transcript

B. that the product of transcription, called the secondary transcript is cut and put back together to produce the mature tRNA transcript

C. that the product of translation, called the primary transcript is cut and put back together to produce the mature tRNA transcript

D. that the product of transcription, called the primary transcript is cut and put back together to produce the mature mRNA transcript

65. Noncoding DNA that interrupts the nucleotide sequence of a gene are called

A. exons
B. introns
C. axons
D. anRNPs (snurps)
E. spliceosome

66. Match each of the following.

_____A. Smallest of the RNA molecules; 45 different kinds.	1. DNA
_____B. Single long strand that passes from the nucleus to the cytoplasm in eukaryotes; contains information for polypeptide assembly.	2. RNA polymerase
_____C. The basic genetic information of the cell; contained in chromosomes.	3. mRNA
_____D. ___An enzyme that synthesizes all three forms of RNA; present in the nucleus of eukaryotes.	4. rRNA
_____E. Exists as a complex with many large proteins in ribosomes; many different kinds of molecules.	5. tRNA

Answer Key

No. on Test	Correct Answer
1	proteins
2	transcription
3	polypeptides
4	promoter
5	coding
6	translation
7	genetic
8	codons
9	expression
10	splicing
11	exons
12	A
13	B
14	C
15	D
16	C
17	A
18	D
19	D
20	D
21	C
22	B
23	B
24	B
25	D
26	E
27	A
28	E
29	C
30	D
31	E
32	A
33	D
34	E

35	B
36	D
37	A
38	C
39	E
40	D
41	E
42	B
43	B
44	E
45	A
46	D
47	D
48	A
49	C
50	A
51	C
52	A
53	A
54	B
55	C
56	C
57	E
58	B
59	B
60	C
61	B
62	C
63	E
64	D
65	B
66	1-E, 2-C, 3-A, 4-B, 5-D