1. The following DNA sequences represents the transcription template strand
   5′ CGATTGTACCGTTCTC 3′
   Which is the sequence of the RNA that is transcribed from this strand?
   a. 5′ GAGAACGGUACAAUCG 3′
   b. 5′ CGAUUGUACCGUUCUC 3′
   c. 3′ CGAUUGUACCGUUCUC 5′
   d. 3′ GAGAACGGUACAAUCG 5′

2. Which of the following is not required for translation initiation?
   a. methionine
   b. ribosome
   c. AUG triplet codon
   d. mRNA

3. Eukaryotic DNA-dependent RNA polymerase is involved directly in
   a. binding to the promoter
   b. binding to specialized sequences called introns and exons
   c. serves to protect proteins from degradation
   d. makes proteins more stable

4. The eukaryotic primary transcript is transcribed
   a. beginning at the DNA base corresponding to the so-called +1 nucleotide
   b. beginning at the TATA promoter element
   c. in disconnected parts called exons and introns
   d. beginning at the sequences AUG the ultimately from the first triplet of the mRNA

5. Protein amino acid sequences is
   a. the determination of protein secondary structure
   b. the primary determinate of the ribosomes interaction with the mRNA
   c. directly related to the DNA sequences corresponding to the DNA +1 base through to the transcription termination site
   d. none of the above answers are correct

6. Where in the DNA sequences of a gene can nonsense mutation occur?
   a. in exon encoding sequences
   b. in intron encoding sequences
   c. in promoter regions
   d. all the above answers are correct

7. Which of the following processes are necessary for generation of mature mRNA?
   a. all the answers below are correct
   b. transcription initiation

c. capping
d. polyadenylation

8. Based on the following mRNA sequences what is the length of the 5' untranslated region in RNA bases?
   5' 7mGCAUCCUACCGGCAGAUGAAAUUUCGCCGAU 3'
   a. 10
   b. 0
   c. 31
   d. can't be determined

9. The concept of collinearity in eukaryotic gene expression
   a. is not consistent with relationship between the primary RNA transcript and mature mRNA
   b. is well supported by the evidence from the relationship between the product of transcription and translation
   c. is well documented in the relationship between the DNA sequences and the mature mRNA sequences
   d. None of the above answers are correct

10. The mutation that changes the sequences of a promoter element can
    a. determine whether DNA-dependent RNA polymerase will bind to the promoter
    b. control RNA splicing capping
    c. control RNA capping
    d. control the transcription termination site

11. How many possible triplet codons can the four base DNA code specify?
    a. 64
    b. 20
    c. 21
    d. 1000 or the same number of genes in the genome

12. After the RNA transcript is transported out of the nucleus what happens to it?
    a. it is bound by the 405 subunit of the ribosomes
    b. it is capped at it's 5' end to prepare it for binding to the ribosomes
    c. it is spliced to create a mature mRNA that can be translated
    d. none of the above question are correct

13. Based on the following mRNA sequence what is the length of the sequence that the ribosome must scan before it can begin translation?
    5' 7mGCAUCCUACCGGCAGAUGAAAUUUCGCCGAU 3'
    a. ribosomes does not scan the mRNA sequences before it begins translation
    b. 0
    c.15
    d. can't be determined with info. given

19. During splicing, following components are removed from primary transcript?

(A.) Intron
B.) DNA
C.) Protein
D.) Exon
E.) Sugar

20. Which of the following is least related to transcription?

(A.) Translatin
B.) TATA box
C.) Template strand
D.) RNA polymerase II
E.) CAT box

21. The following structure are name of the common biological forms(s) of DNA EXCEPT:

A.) A-form DNA
B.) B-form DNA
C.) Z-form DNA
(D.) C-form DNA

22. A codon is present in the following type of RNA

A.) rRNA
B.) tRNA
(C.) mRNA
D.) MicroRNA

23. If the size of an mRNA is 1512 bases long. Assuming that all bases are used as codon, the size of the translation product would be:

A.) 405 amino acids
B.) 1512 amino acids
C.) 1200 amino acids
D.) 512 amino acids
(E.) 504 amino acids

24. A codon, CCC code for proline in E. coli. In human, proline will be coded by:

A.) AAA
B.) GGG
(C.) UUU
D.) TTT

35. Which of the following is involved in the regulation of gene expression?
A. mRNA
B. rRNA
C. Small noncoding RNA
D. tRNA
E. All of the above

36. Which of the following is NOT true of RNA interference (RNAi)?
A. A natural regulatory mechanism to prevent the synthesis of proteins
B. Found in both prokaryotes and eukaryotic cells
C. Includes antisense RNA molecules
D. Protects from viral invasion
E. All of the above are true

37. small interfering RNAs (siRNAs) are completely complementary to the mRNA transcript of a specific gene of interest while microRNAs (miRNAs) are mostly complementary.
A. True
B. False

38. Which of the following is NOT involved in gene silencing?
A. DICER
B. miRNAs
C. mRNA
D. siRNAs
E. All of the above are involved

39. Which of the following is NOT true of gene therapy?
A. A clinical application of genetic engineering
B. Attempts to correct genetic abnormalities by introducing a nonmutated, functional gene
C. Involves so many risks
D. Is currently under the most extensive federal and local review
E. Poses a number of ethical issues

40. Because those impacted by germ-line gene therapy are unborn and therefore unable to choose whether they receive the therapy, the U.S. government does not currently fund research projects investigating germ-line gene therapies in humans.
A. True
B. False

50. Which is responsible for the transcription of structural genes in eukaryotes?
    a. RNA polymerase I
    b. RNA polymerase II
    c. RNA polymerase III
    d. DNA polymerase
    e. RNA synthetase

51. The eukaryotic TATA box is directly bound by a basal transcription factor known as:
    a. TBF
    b. TBP
    c. TAF
    d. TPP
    e. TAT

52. Most transcriptional activator proteins in eukaryotes function in the cell as:
    a. monomers
    b. dimers
    c. trimers
    d. tetramers
    e. pentamers

53. The basal level of transcription of eukaryotic genes is quite high in *in vitro* systems. This is because:
    a. activators are present
    b. formation of chromatin does not occur *in vitro*
    c. basal transcription factors are present
    d. a and c
    e. none of the above

54. Transcriptional repression by methylation of DNA involves:
    a. methylation of adenine (A) bases of the sequence GATC
    b. methylation of cytosine (C) bases of the sequence GATC
    c. methylation of cytosine (C) bases in CpG nucleotides
    d. methylation of guanosine (G) bases in CpG nucleotides
    e. acetylation of histone proteins

55. A eukaryotic DNA sequence that can increase the level of transcription is called:
    a. a transcription factor
    b. a transcriptional activator
    c. TATA box
    d. an enhancer
    e. a co-activator

56. Which is generally true of eukaryotic transcriptional regulation?
    a. activators and repressors bind to the promoter while basal factors bind to the enhancers
    b. basal factors bind to the promoter, while activators bind to the enhancers
    c. activators bind to the promoter while basal factors and repressors bind to the enhancers
    d. repressors bind to the promoter while basal factors and activators bind to the enhancers
    e. activators and basal factors bind to the promoter while repressors bind to the enhancers

57. The correct steps involved in steroid hormonal activation of transcription are:
    a. hormone forms a homodimer then binds the receptor and can now bind the enhancer element
    b. hormone forms a homodimer then binds the receptor and can now bind the activator
    c. hormone binds to its receptor. This complex now forms a dimer that can bind the activator
    d. hormone binds to its receptor. This complex now forms a dimer that can bind the enhancer element
    e. a and d are correct

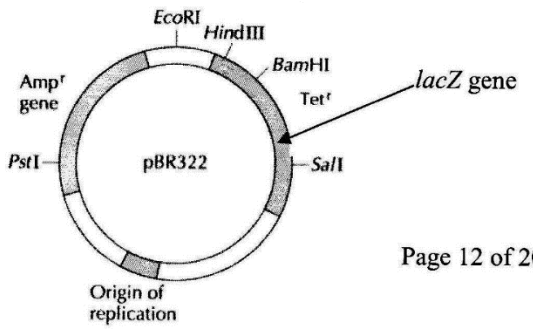
58. Repression of eukaryotic transcription occurs when:
    a. a repressor and activator compete for the binding of the same enhancer sequence
    b. a repressor binds to and blocks the enhancer-binding domain of an activator
    c. a repressor binds the promoter region and prevents the basal factors from binding
    d. both a and b
    e. all of the above

59. Which of the following is true regarding epigenetic changes?
    a. the methylation that occurs subsequently changes the nucleotide sequence
    b. can change gene expression without a change in nucleotide sequence
    c. can not be passed on or inherited by offspring
    d. can only be inherited and cannot develop in an individuals lifetime
    e. all of the above

60. Which of the following could not be a type II restriction endonuclease site?
    a. 5' GAATTC
    b. 5' CATG
    c. 5' GGCATGCC
    d. 5' ACCACC
    e. 5' CTTAAG

61. Selectable marker genes, such as antibiotic resistance genes, are included in plasmids used for cloning in order to:
    a. distinguish cells carrying insert from those without
    b. prevent contamination
    c. prevent the growth of cells not carrying vector sequence
    d. prevent the growth of cells not carrying insert
    e. to restrict cell growth to clearly see the colonies

62. If the restriction enzyme BamHI was used for cloning an insert into the vector shown below, the resulting recombinant cells carrying the insert, grown on medium containing ampicillin and X-gal would be:
    a. white and ampicillin sensitive
    b. white and ampicillin resistant
    c. blue and ampicillin sensitive
    d. blue and ampicillin resistant
    e. none of the above



71. Transcription is carried out by an enzyme called _____ and a number of accessory _____ called transcription factors.
    a. RNA polymerase; lipids
    b. DNA polymerase; proteins
    c. RNA polypeptidase; proteins
    d. DNA polymerase; lipids
    e. RNA polymerase; proteins

72. Which of the following organelles is responsible for synthesizing polypeptides during translation?
    a. Plasma membrane
    b. Nucleus
    c. Golgi apparatus
    d. Ribosomes
    e. Peroxisomes

73. In eukaryotic organisms, translation occurs in which region of the cell?
    a. Nucleus
    b. Matrix
    c. Nucleoid
    d. Rough ER
    e. Cytoplasm

74. Which of the following is ***not*** a form of gene regulation found in prokaryotic organisms?
    a. Transcriptional regulation
    b. RNA Processing
    c. Translational regulation
    d. Post-Translational regulation
    e. All of the above *are* levels at which prokaryotic organisms are able to regulate gene expression

75. The *lac* operon in *E. coli* is a negative inducible operon. What does it mean for an operon to be under negative inducible control?
    a. The regulator is an activator, and the operon can be turned on (normally is off)
    b. The regulator is an activator, and the operon can be turned off (normally is on)
    c. The regulator is a repressor, and the operon can be turned off (normally is on)
    d. The regulator is a repressor, and the operon can be turned on (normally is off)
    e. None of the above

1. Process in which introns are removed from messenger RNA precursor and exons are re-joined is referred to as
   a. Splicing
   b. RNA Capping
   c. Polyadenylation
   d. Replication
2. In transcription, particular segment of DNA is copied to RNA by the enzyme
   a. DNA polymerase
   b. Helicase
   c. RNA polymerase
   d. Primase
3. Modifications of 5'ends of eukaryotic mRNA is called
   a. RNA Capping
   b. Polyadenylation
   c. Splicing
   d. Transcription
4. Modifications of 3' ends of eukaryotic mRNA is called
   a. RNA Capping
   b. Polyadenylation
   c. Splicing
   d. Transcription
5. The process of copying a gene's DNA sequence into a sequence RNA sequence is known as
   a. Transcription
   b. Translation
   c. Replication
   d. Phosphorylation
6. A DNA strand with the sequence AACGTAACG is transcribed. What is the sequence of the mRNA molecule synthesized?
   a. AACGTAACG
   b. UUGCAUUGC
   c. AACGUAACG
   d. TTGCATTGC
7. The poly-A-tail on eukaryotic mRNA is encoded by a long string of Ts at the end of the gene.
   a. True
   b. False
8. The anticodon:
   a. Contains the base thymine
   b. Contains a sequence identical to the codon
   c. Contains a sequence complementary to the codon
   d. None of the above
9. Amino acids are joined together in order to form
   a. Polysaccharides
   b. Lipids
   c. Proteins
   d. Nucleic acids
10. The DNA sequence ATCAGCGCTGGC is part of a gene. how many amino acids are coded for by this message?
    a. 4
    b. 12
    c. 8
    d. 20
11. The noncoding sequences of pre-mRNA's are known as
    a. Introns
    b. Exons
    c. Anticodon
    d. Codon
12. The coding sequences of pre-mRNA's are known as
    a. Introns
    b. Exons
    c. Anticodon
    d. Codon
13. Which of the following enzymes is involved in DNA replication?
    a. DNA polymerase
    b. Spliceosome
    c. RNA polymerase
    d. Aminoacyl-tRNA synthetases
14. Addition of an acetyl group to histones allow for transcription to occur
    a. True
    b. False
15. A cell can change the expression of its genes in response to external signals
    a. True
    b. False
16. What would make the Lac operon be transcribed?
    a. The absence of glucose
    b. An abundance of glucose
    c. The absence of sucrose
    d. An abundance of sucrose