Clark: Biotechnology, 2nd Edition

Chapter 2: DNA, RNA, and Protein

1. According to the Central Dogma of molecular biology
a. RNA is translated from a DNA template then transcribed.
b. Proteins are transcribed at same time they are translated.
*c. The flow of information is from DNA to RNA to protein.
d. Reverse Transcriptase is used to remove introns from RNA.

2. Transcription begins when
a. RNA polymerase finds a 3' UTR.
b. When the first AUG in a template is recognized.
c. An open reading frame is discovered.
*d. RNA polymerase recognizes a promoter sequence, binds to the DNA, and synthesizes RNA from the 5' end towards the 3' end of the new piece.

3. The sequence of mRNA will be the same as the _____ strand of DNA.
*a. Sense
a. Antisense
b. Antiparallel
c. None of the above are correct

4. DNA and RNA are identical in structure except for:
a. DNA has uracil and RNA has thymine
b. RNA has ribose and DNA has deoxyribose
c. RNA has uracil and DNA has thymine
d. RNA has deoxyribose and DNA has ribose
e. A and B are correct
f. C and D are correct
*g. B and C are correct
h. A and D are correct

5. During prokaryotic transcription termination, the following are key factors for Rho-independent termination EXCEPT for:
a. Two inverted repeats
b. A stretch or length of repeated adenines (A's)
c. Hairpin structure
*d. A binding site for a special helicase called rho

6. Bacterial operons are transcribed as a single polycistronic mRNA.
*a. True
b. False

7. Eukaryotic genes are translated as a single monocistronic mRNA.

a. True
*b. False

8. RNA polymerase I
a. Transcribes genes that encode proteins
b. Transcribes the genes for tRNA, ssRNA, and other small RNAs
*c. Transcribes the gene for large ribosomal RNAs

9. RNA polymerase II
*a. Transcribes genes that encode proteins
b. Transcribes the genes for tRNA, ssRNA, and other small RNAs
c. Transcribes the gene for large ribosomal RNAs

10. RNA polymerase III
a. Transcribes genes that encode proteins
*b. Transcribes the genes for tRNA, ssRNA, and other small RNAs
c. Transcribes the gene for large ribosomal RNAs

11. _____are regions in eukaryotic DNA that are thousands of base pairs away from a promoter, yet they regulated that promoter.
*a. Enhancers
b. Insulators
c. Promoter
d. Operator

12. _____ is the sequences that RNA polymerase recognizes and to which it binds.
a. Enhancers
b. Insulators
*c. Promoters
d. Operator

13. Prokaryotic repressor proteins bind to the _____.
a. Enhancers
b. Insulators
c. Promoters
*d. Operator

14. _____ sequences prevent eukaryotic enhances from activating the wrong genes.
a. Enhancer
*b. Insulator
c. Promoter
d. Operator

15. The lac operon has three structural genes controlled by:
a. Three promoters and one operator, one for each structural gene

b. One promoter for all three genes, but a separate operator for each gene
*c. One promoter and one operator to control all three structural genes
d. None of the above

16. What gene encodes the lac operon repressor protein?
a. LacY
b. LacZ
c. LacA
*d. LacI

17. The operon is kept off in the absence of lactose by:
a. LacI protein binds to the promoter, and prevents the binding of RNA polymerase to the promoter.
b. Allolactose is not available to the promoter for *lacI,* therefore RNA polymerase cannot transcribe the *lac*I gene.
*c. LacI protein binds to the operator. and preventing binding of RNA polymerase.
d. Allolactose binds to *lac*I protein which allows it to bind to the operator, preventing transcription.

18. The global activation of this operon is carried out by:
a. IPTG, when glucose is present.
*b. CRP in the presence of cAMP, which activates other operons as well.
c. The sigma factor needed to turn on most default transcription in *E. coli*.
d. CRP in the presence of lactose, which activates other operons as well.

19. DNA structure plays a role in eukaryotic gene expression by:
a. Condensing some regions but not others.
b. Methylating regions called CG islands to keep them silent.
c. Tighten or loosen nucleosomes by deacetylating or acetylating histone tails.
d. Inactivation of one X chromosome of the pair found in females.
*e. All of the above are ways to control eukaryotic gene expression.

20. Transcription in eukaryotes and prokaryotes differs in the followings ways EXCEPT:
a. Prokaryotic transcription is coupled to translation
*b. Eukaryotic DNA has a cap added to the 3' end.
c. Eukaryotic DNA has a poly(A) tail at the 3' end.
d. Splicing factors are used to remove introns in the eukaryotic message.
e. All of the above are differences between eukaryotes and prokaryotes.

21. All of these are differences in translation between eukaryotes and prokaryotes EXCEPT:
*a. Prokaryotic and eukaryotic genetic codes are different from each other.
b. Each organism has its own codon bias, certain codons but not other codons are used more often for the same amino acid.
c. They are carried out on ribosomes of different size.

d. Prokaryotes rely on an RBS or Shine-Delgarno sequence to direct the ribosome to bind.
e. Prokaryotes use formyl-methionine as the first amino acid in the peptide.

22. Which of the following statements concerning translation is true?
a. Occurs when a tRNA with methionine binds to the E-site.
b. Is catalyzed by the proteins bound in the ribosome.
c. Requires ATP for energy.
*d. Uses a genetic triplet code that is universal.
e. Requires polysome structures in both prokaryotes and eukaryotes.

23. The symbiotic theory concerning the origin of mitochondria and chloroplasts is supported by:
a. Many mitochondrial and chloroplast proteins are encoded in the nucleus.
b. They are found inside eukaryotic cells, just like all bacteria.
*c. They contain ribosomes that are similar in size to prokaryotic ribosomes.
d. They use a genetic code that is completely different than prokaryotes or eukaryotes.

24. Epigenetics _____.
a. includes changes and modifications to histones and nucleosomes
b. are inherited changes other than mutations in nucleotide sequence
c. includes imprinting from methylation of genes
d. may be mediated by noncoding RNAs
*e. all of the above

25. EF-T is made of two separate proteins, EF-Tu and EF-Ts, which _____.
*a. Uses a phosphate group from GTP to catalyze the addition of a new tRNA to the A-site
b. Oversees the translocation of the tRNA from the P-site to the E-site
c. Binds to the stop codons and initiates the release of the ribosome, completed mRNA, and the used tRNAs.
d. Recognizes the 5’ cap structure and scans for the first AUG