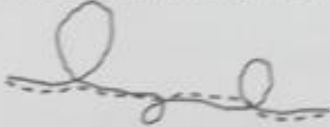


1. Which of the following statements best describes gene expression in humans?
  - A. All human cells have the same genes.
  - B. All human cells express the same genes.
  - C. Human cells have the same genes, but only a subset is expressed in a specific tissue.
  - D. Once genes are turned on in human cells, they cannot be turned off.
2. The following terms are all involved in the same process **except for**:
  - A. Promoter
  - B. Enhancer
  - C. Terminator
  - D. Start codon
  - E. RNA polymerase
3. Gene expression is regulated in both prokaryotic and eukaryotic cells. One mechanism of regulation is through the half-life of messenger RNA. Based on what we have learned about gene expression, an mRNA molecule that has a long life (lasting for a long time) will lead to \_\_\_\_\_.
  - A. More polypeptide and higher level of gene expression.
  - B. More polypeptide and lower level of gene expression.
  - C. Less polypeptide and lower level of gene expression.
  - D. Less polypeptide and higher level of gene expression.
  - E. No effect on gene expression.
4. The following figure shows the DNA-RNA duplex of a gene. The solid line is DNA and the dashed line is RNA. Which of the following correctly describes this gene?
  - A. This is a prokaryotic gene.
  - B. This is a prokaryotic or eukaryotic gene.
  - C. This is a eukaryotic gene with three exons.
  - D. This is a eukaryotic gene with three introns.
5. The DNA strand that forms duplex with its mRNA is the template strand. Which of the following correctly describes the relationship between a template strand and its primary mRNA product?
  - A. Having the same sequences and anti-parallel.
  - B. Having the same sequences and parallel.
  - C. Complementary and anti-parallel.
  - D. Complementary and parallel.

7) Which of the following is **NOT** true about gene expression in Eukaryotes?

- a. Gene expression can be regulated in the nucleus epigenetically.
- b. Gene expression can be regulated transcriptionally by RNA editing.
- c. Gene expression can be regulated in the cytoplasm at the level of translation.
- d. Gene expression can be regulated in the nucleus by post-translational modifications.
- e. None of the above (all of the above statements are TRUE)

8) In PCR, what happens during the **annealing** phase?

- a. Denaturation of DNA template strands
- b. base-pairing between primers and template strands
- c. Extension of target DNA by Taq polymerase
- d. Exponential accumulation of target DNA
- e. None of the above

9) Given the short DNA anticodon sequence: **TAC GGC AGC TTG**

- a. The RNA transcript would be: AUG CCG UCG AAC
- b. The RNA transcript would be: UAC GGC AGC UUG
- c. The RNA transcript would be: ATG CCG TCG AAC
- d. None of the above

10) Which **IS NOT** true about complimentary base-pairing?

- a. It is important for DNA replication
- b. It is important for transcription
- c. It is important for translation
- d. It is important for PCR
- e. None (all of the statements are true)

11) Which is **NOT** an application of DNA fingerprinting?

- a. Identification of human remains
- b. Paternity determination
- c. Crime Scene Investigation
- d. Identification of genetic markers associated with disease risk
- e. None of the above (All are applications of DNA profiling)

12. Gene therapy is best described as

- a) Replacement of a missing gene product (protein)
- b) Replacement of a defective gene
- c) Introduction of a foreign gene (e.g. from another species)
- d) Chemotherapy
- e) None of the above

14. Which of the following is true about epigenetic changes?
- a) Epigenetic changes are stable alterations of chromatin structure.
  - b) Epigenetic changes are passed on to future generations of cells or individual organisms.
  - c) Examples of epigenetic changes are methylation of DNA, usage of variant histone proteins, and binding of proteins to DNA and chromatin.
  - d) Epigenetic changes do not alter DNA sequence but often have major effects on the expression of genes.
  - e) All of the above are true.
15. All of the following are general characteristics of a transposable element (TE) **EXCEPT**:
- ~~a)~~ TE's are sequences that can move about the genome and often cause mutations.
  - b) TE's are rare, not commonly found in different organisms, and make up only 1% of the human genome.
  - ~~c)~~ Some TE's have simple structures, containing only sequences that allow for their own transposition.
  - d) Some TE's have more complex structures and encode a number of functions not directly related to transposition.
  - ~~e)~~ Some TE's transpose as DNA and use the enzyme transposase whereas other TE's use an RNA intermediate and use reverse transcriptase.
16. The number of actual double crossover events between two linked genes, observed in the progeny of a cross, is commonly lower than the expected number because of interference.
- What is interference?
- a) The ratio of observed double crossovers to expected double crossovers.
  - b) The degree to which one crossover interferes with additional crossovers in the same region.
  - c) The same as the coefficient of coincidence.
  - d) Both a and c.
17. Which of the following statements do not apply to chromatin-remodeling complexes like SWI-SNF?
- a) They have a regulatory role in gene expression.
  - b) They play an epigenetic role in key biological processes like DNA replication, apoptosis, and development.
  - c) Chromatin-remodeling complexes are targeted to specific DNA sequences by transcriptional activators or repressors that attach to a remodeling complex and then bind to the promoters of specific genes.
  - d) Chromatin-remodeling complexes work together with enzymes that alter histones, to change chromatin structure and expose DNA for transcription.
  - e) All of the above apply to chromatin-remodeling complexes.



18. Which statement about the genetic code is false?

- A. The genetic code is degenerate and specific.
- B. Nucleotides are always read in groups of three.
- C. Every codon codes for one or more amino acids.
- D. Some amino acids are specified by more than one codon.
- E. The genetic code is practically universal.

19. Through control of gene expression, prokaryotes adjust to changes in \_\_\_\_\_, while eukaryotes \_\_\_\_\_

- A. DNA; silence their RNA
- B. environmental conditions; maintain homeostasis and drive development
- C. RNA; initiate DNA transcription through enhancers
- D. homeostasis; proofread their DNA
- E. pathogenicity; maintain the length of their chromosomes

20. A defining characteristic of eukaryotic organisms is that they

- A. have their transcription occurring in the cytoplasm and translation in the nucleus.
- B. have their transcription occurring in the nucleus and translation in the cytoplasm.
- C. have only operons to assist in gene expression.
- D. carry out protein synthesis only in the presence of the cAMP molecule.
- E. use the leucine zipper primarily for the production of the amino acid tryptophan.

21. Control of the *lac* operon and lactose utilization is

- A. conserved in humans and bacteria.
- B. repressed when lactose is present.
- C. an example of negative regulation of gene expression, mediated by a repressor.
- D. an example of epigenetic control.
- E. necessary for DNA packaging in bacteria.

22. Chromatin structure is affected by all of these except for:

- A. DNA methylation
- B. Histone modifications
- C. Alternative splicing
- D. Non-coding RNAs