*Biology for a Changing World 2e,* Chapter 8 Test Bank

1. Most tasks in a cell are carried out by

A. proteins.

B. carbohydrates.

C. DNA.

D. lipids.

E. membranes.

Answer: A

DQ: What determines the shape of a protein molecule?

Type: Know It

Difficulty: Easy

Important Words/Concepts: protein function, role of proteins in cells

2. Most of a cell’s work is carried out by \_\_\_\_\_, which are made from many \_\_\_\_\_.

A. proteins; amino acids

B. proteins; nucleic acids

C. amino acids; nucleic acids

D. nucleic acids; nucleotides

E. nucleic acids; amino acids

Answer: A

DQ: What determines the shape of a protein molecule?

Type: Know It

Difficulty: Easy

Important Words/Concepts: protein function, role of proteins in cells, amino acids, protein structure

3. Proteins do all of the following tasks EXCEPT

A. carry out chemical reactions.

B. store information.

C. regulate processes within the body.

D. help blood to clot.

E. give structure to cells, such as hair, skin, and muscle.

Answer: B

DQ: What determines the shape of a protein molecule?

Type: Know It

Difficulty: Hard

Important Words/Concepts: protein function, protein types

4. In your body, what kind of molecule acts as an enzyme, helps to transport other molecules, and gives structural support in many cells?

A. sugar

B. protein

C. lipid

D. nucleic acid

E. carbohydrate

Answer: B

DQ: What determines the shape of a protein molecule?

Type: Know It

Difficulty: Easy

Important Words/Concepts: protein structure, protein function, biomolecules, molecules of life

5. What is a protein?

A. a macromolecule that is made from various nucleotides

B. a macromolecule that is made from various amino acids

C. a molecule that plays only a minor role in cellular function

D. a molecule that comes in many shapes but is always the same size

E. a molecule that comes in many sizes but is always the same shape

Answer: B

DQ: What determines the shape of a protein molecule?

Type: Know It

Difficulty: Easy

Important Words/Concepts: amino acid, protein function, protein shape

6. What are amino acids?

A. sequences of DNA that help determine the function of proteins

B. proteins, which in turn aid in making other proteins

C. building blocks used to construct proteins

D. a type of chemical used to break down cellular wastes

E. small sugar molecules important in cellular function

Answer: C

DQ: What determines the shape of a protein molecule?

Type: Know It

Difficulty: Easy

Important Words/Concepts: amino acid, protein function, protein shape

7. Amino acid side groups

A. help determine the structure of the protein and its function.

B. can be found throughout an individual’s DNA.

C. are the parts that are linked together to form long chains.

D. will be removed when amino acids are linked together.

E. are the same for every amino acid, to allow efficient packing.

Answer: A

DQ: What determines the shape of a protein molecule?

Type: Know It

Difficulty: Easy

Important Words/Concepts: amino acid, protein function, protein shape

8. Proteins are linear chains made out of

A. lipids.

B. carbohydrates.

C. amino acids.

D. nucleotides.

E. deoxyribonucleotides.

Answer: C

DQ: What determines the shape of a protein molecule?

Type: Know It

Difficulty: Easy

Important Words/Concepts: amino acid, protein

9. The function of a protein does NOT depend on

A. its gene’s DNA sequence.

B. the protein’s three-dimensional shape.

C. its gene’s regulatory sequence.

D. the sequence of the amino acids.

E. accurate messenger RNA expression.

Answer: C

DQ: What determines the shape of a protein molecule?

Type: Know It

Difficulty: Easy

Important Words/Concepts: amino acid, protein function, protein shape

10. All proteins begin with the amino acid

A. glycine (gly).

B. valine (val).

C. leucine (leu).

D. methionine (met).

E. proline (pro).

Answer: D

DQ: What determines the shape of a protein molecule?

Type: Know It

Difficulty: Hard

Important Words/Concepts: amino acid, protein function, protein shape

11. The overall three-dimensional shape of a protein is determined by

A. the kind of ribosomes that build it.

B. how other enzymes react with it and shape it.

C. the order of amino acids and how it folds up.

D. the type of cell that makes it.

E. the cell’s water content.

Answer: C

DQ: What determines the shape of a protein molecule?

Type: Use It

Difficulty: Easy

Important Words/Concepts: amino acid, protein function, protein shape

12. Which statement is FALSE?

A. Some proteins contain more than one amino acid chain.

B. A protein’s function can be altered by just one amino acid change.

C. The side chains of amino acids are responsible for protein folding.

D. All proteins begin with the amino acid methionine.

E. All proteins fold into the same basic three-dimensional shape.

Answer: E

DQ: What determines the shape of a protein molecule?

Type: Use It

Difficulty: Hard

Important Words/Concepts: amino acid, protein function, protein shape

13. Many human proteins are in the range of

A. 100–200 amino acids.

B. 200–250 amino acids.

C. 250–300 amino acids.

D. 50–100 amino acids.

E. 400–450 amino acids.

Answer: E DQ: What determines the shape of a protein molecule?

Type: Know It

Difficulty: Hard

Important Words/Concepts: Amino acids

14. The shape of proteins

A. determines what they can do and how they function.

B. can be formed by more than one folded chain of amino acids.

C. is determined by the side groups on its amino acids.

D. can be altered by a change in gene sequence.

E. All of the above.

Answer: E

DQ: What determines the shape of a protein molecule?

Type: Know It

Difficulty: Hard

Important Words/Concepts: amino acid, protein function, protein shape

15. The shape and function of a protein is determined by its .

*Answer:* amino acid sequence

DQ: What determines the shape of a protein molecule?

Type: Know It

Difficulty: Easy

Important Words/Concepts: amino acid, protein function, protein shape

16. How does the sequence of amino acids in a protein influence the way it folds?

*Answer:* The sequence of a protein includes the type and order of amino acids in a protein. The interactions between the side groups on the amino acids is what gives us the overall three-dimensional structure of the protein.

DQ: What determines the shape of a protein molecule?

Type: Know It

Difficulty: Easy

Important Words/Concepts: amino acid, protein function, protein shape

17. True or False: The sequence of its amino acids determines the shape of a protein.

*Answer:* True

DQ: What determines the shape of a protein molecule?

Type: Know It

Difficulty: Easy

Important Words/Concepts: protein structure, protein sequence, amino acids, protein function, protein three-dimensional shape

18. A mutation in a gene results in a protein with a distorted three-dimensional structure. What is the likely effect of that mutation on the cell, and why?

*Answer:* The overall structure of a protein is very specifically related to its function. A mutation that distorts the three-dimensional structure of a protein could disrupt the activity of the protein’s normal function.

DQ: What determines the shape of a protein molecule?

Type: Use It

Difficulty: Hard

Important Words/Concepts: amino acid, gene expression, protein function, protein shape, mutation

19. A mutation in the gene for insulin results in a protein with a drastically distorted three-dimensional shape. What is the most likely outcome?

A. The insulin protein will not function properly.

B. Other proteins will be mutated to replace it.

C. There will be no effect; the shape is rarely important.

D. The effect will be minor, and the protein will mostly function.

E. None of the above.

Answer: A

DQ: What determines the shape of a protein molecule?

Type: Use It

Difficulty: Hard

Important Words/Concepts: amino acid, gene expression, protein function, protein shape, mutation

20. How many different amino acids are responsible for making up the thousands of different proteins found in a cell?

A. 3

B. 4

C. 15

D. 20

E. thousands

Answer: D

DQ: What determines the shape of a protein molecule?

Type: Know It

Difficulty: Easy

Important Words/Concepts: amino acid, protein structure

21. What is a gene?

A. a segment of RNA that encodes several proteins

B. a segment of DNA that encodes at least one protein

C. a type of protein found within DNA

D. all the nucleotide sequences contained in one chromosome

E. a molecule that turns on DNA and starts the process of translation

Answer: B

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Easy

Important Words/Concepts: chromosome, gene, protein

22. A gene is a section of a(n) \_\_\_\_\_\_\_\_\_\_ molecule.

A. DNA

B. protein

C. RNA

D. small

E. amino acid

Answer: A

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Easy

Important Words/Concepts: gene, DNA

23. A gene is

A. a section of DNA.

B. a set of instructions for building a protein.

C. the way you inherit a physical feature.

D. located on a chromosome.

E. All of the above.

Answer: E

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know it

Difficulty: Easy

Important Words/Concepts: gene structure, gene function, DNA

24. \_\_\_\_\_\_ contain(s) many \_\_\_\_\_\_, and \_\_\_\_\_\_ are instructions for producing \_\_\_\_\_\_.

A. Chromosomes; genes; genes; proteins

B. DNA; chromosomes; chromosomes; genes

C. DNA; genes; genes; chromosomes

D. Genes; proteins; chromosomes; genes

E. Proteins; genes; chromosomes; proteins

Answer: A

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Hard

Important Words/Concepts: chromosome, DNA, gene, protein, gene function, gene structure, chromosome structure

25. If a gene is activated, what is being produced?

A. DNA

B. protein

C. amino acids

D. chromosomes

E. cells

Answer: B

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Easy

Important Words/Concepts: genes, proteins

26. Genes

A. are found on chromosomes.

B. are templates for messenger RNA.

C. contain the instructions for making proteins.

D. are part of DNA.

E. All of the above.

Answer: E

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Easy

Important Words/Concepts: chromosome, gene, DNA, messenger RNA protein

27. Antithrombin deficiency results when a person inherits two defective alleles of the antithrombin gene. What do you think would happen if a person had one defective allele and the other allele was functional?

*Answer:* If someone had one defective and one functional antithrombin allele, they would make antithrombin protein, although likely not as much as someone with two functional alleles. The amount of protein they make, however, may be sufficient to prevent disease.

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Hard

Important Words/Concepts: antithrombin, gene expression

28. Lactose intolerance results when a person inherits two defective alleles for the lactase gene. Normally, this gene produces the enzyme lactase, which breaks down lactose during digestion. What would most likely happen if a person had one defective allele and the other allele was functional?

A. The person would not digest lactose at all.

B. The person would digest less lactose than normal.

C. The person would make lactase but not use it.

D. The person would make more lactase than normal.

E. The person would make no lactase but could digest lactose.

Answer: B

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Hard

Important Words/Concepts: mutation, gene expression, central dogma, enzyme function, allele

29. Chromosomes contain genes; genes have the information for making \_\_\_\_\_\_\_.

*Answer:* proteins

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Easy

Important Words/Concepts: chromosome, gene, protein

30. Each gene carries the instructions to make \_\_\_\_\_\_\_.

*Answer:* at least one protein

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Easy

Important Words/Concepts: gene protein

31. What is gene expression?

*Answer:* when DNA is transcribed into mRNA, which is then translated into a polypeptide

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Easy

Important Words/Concepts: DNA, transcription, translation, messenger RNA, protein

32. Explain the function of DNA.

*Answer:* DNA is the template for making mRNA, which is the “recipe,” and for making other types of RNA as well as proteins. DNA can be duplicated and passed on from cell to cell, but in a human cell it never leaves the nucleus.

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Hard

Important Words/Concepts: DNA, mRNA, protein

33. Explain how some people can make normal antithrombin AND abnormal antithrombin in the same cell.

*Answer:* We have two copies of every chromosome; therefore, we have two copies of every gene. A person could inherit a normal antithrombin gene from one parent and an abnormal antithrombin gene for the other parent. If both are expressed in the same cell, the cell will have both types of antithrombin.

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Hard

Important Words/Concepts: antithrombin, gene expression.

34. If a person has an antithrombin deficiency, what is the likelihood that both alleles are defective?

A. 50%

B. 100%

C. 25%

D. 75%

E. 0%

Answer: B

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Hard

35. Alleles are alternate versions of \_\_\_\_\_ gene(s) that have \_\_\_\_ nucleotide sequences.

A. different; the same

B. different; completely different

C. different; small differences in their

D. the same; completely different

E. the same; small differences in their

Answer: E

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Hard

Important Words/Concepts: allele, genotype, phenotype

36. If someone inherits a protein deficiency, it means that the protein

A. might be absent.

B. might be defective.

C. might be a mutant.

D. may be present in insufficient amounts.

E. All of the above.

Answer: E

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Easy

Important Words/Concepts: allelic, protein function, protein shape

37. A functioning allele on one chromosome

A. can prevent a disease.

B. can cause a protein deficiency disease.

C. can never be inherited by the offspring.

D. can never make up for a defective allele.

E. is usually inherited from the mother.

Answer: A

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Easy

Important Words/Concepts: allele, disease, phenotype, protein function

38. \_\_\_\_\_\_\_\_\_\_\_ are alternate versions of a gene, which differ slightly in their nucleotide sequence.

*Answer:* Alleles

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Easy

Important Words/Concepts: allele, genotype

39. The regulatory sequence of a gene is the portion of DNA that

A. determines when a protein is made.

B. can “turn on” or “turn off” a gene.

C. determines how much of a protein is made.

D. determines in which cells a gene is expressed.

E. All of the above.

Answer: E

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Easy

Important Words/Concepts: coding sequence, gene, regulatory sequence

40. The coding sequence of a gene is the portion of the DNA that

A. determines the timing, amount, and location of the protein produced.

B. acts like an “on/off” switch for gene expression.

C. specifies the shape and function of a protein.

D. encodes for carbohydrates.

E. is removed prior to transcription.

Answer: C

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Easy

Important Words/Concepts: coding sequence, gene, regulatory sequence

41. You create a hybrid transgene containing DNA from a human and a mouse. Which of the following factors would most strongly affect when, where, and how much protein is expressed from that gene?

A. the gene’s regulatory region

B. the gene’s coding sequence

C. the age of the host animal

D. on which chromosome the gene resides

E. the number of alleles

Answer: A

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Easy

Important Words/Concepts: gene expression, regulatory sequence

42. The amount of each specific protein made in a cell is generally determined by the

A. age and history of the cell.

B. regulatory sequences in its DNA.

C. overall length of its mRNA.

D. cell’s size.

E. number of ribosomes in the cell.

Answer: B

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Easy

Important Words/Concepts: gene expression, regulatory sequence

43. The regulatory region of a gene is required for

A. gene expression.

B. protein secretion.

C. gene activation.

D. turning off a gene.

E. All of the above.

Answer: E

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Easy

Important Words/Concepts: gene expression, regulatory sequence

44. If there was a mutation in the regulatory sequence of a gene, what types of issues might arise?

*Answer:* The regulatory region of a gene controls the expression of that gene. A mutation in that region would cause abnormal regulation of the gene. Depending on the mutation, it could result in the gene being turned on all the time, made in the wrong places or at the wrong time, turned off all the time, or rendered unable to respond to its usual regulatory proteins.

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Easy

Important Words/Concepts: gene expression, regulatory sequence

45. If a mutation occurs in the regulatory sequence of a gene, what types of issues might arise?

A. The gene could have abnormal regulation.

B. The gene could be permanently turned on.

C. The gene could be permanently turned off.

D. The gene could be expressed in the wrong places.

E. All of the above.

Answer: E

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Easy

Important Words/Concepts: gene expression, regulatory sequence

46. How does DNA differ from RNA?

A. DNA codes for proteins; RNA codes for lipids.

B. RNA is inherited; DNA is a temporary genetic message.

C. RNA is a double helix; DNA is a single strand.

D. DNA never leaves the nucleus; RNA is in the nucleus and in the cytoplasm.

E. DNA lacks sugars in its backbone; RNA has the sugar ribose.

Answer: D

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Hard

Important Words/Concepts: gene, protein

47. Transcription occurs in a eukaryotic cell’s \_\_\_\_, and it uses \_\_\_\_ to produce \_\_\_\_\_.

A. cytoplasm; mRNA; proteins

B. nucleus; mRNA; proteins

C. nucleus; genes; mRNA

D. nucleus; ribosomes; proteins

E. cytoplasm; ribosomes; proteins

Answer: C

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Hard

Important Words/Concepts: coding sequence, gene, mRNA, protein, transcription, translation

48. What does RNA polymerase do?

A. It binds to the regulatory sequence of DNA and produces mRNA.

B. It binds to the coding sequence of RNA and produces proteins.

C. It is an enzyme that binds to and degrades mRNA.

D. It is a protein that binds to DNA and prevents its degradation.

E. It binds to the coding sequence of DNA and prevents it from being expressed.

Answer: A

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Hard

Important Words/Concepts: mRNA, protein, RNA polymerase, transcription, translation

49. What is the difference between eukaryotic and prokaryotic gene transcription?

A. In eukaryotes it occurs in the cytoplasm; in prokaryotes it occurs in the nucleus.

B. In eukaryotes it occurs in the cytoplasm; in prokaryotes it occurs in the ribosomes.

C. In eukaryotes it occurs in the nucleus; in prokaryotes it occurs in the Golgi apparatus.

D. In eukaryotes it occurs in the nucleus; in prokaryotes it occurs in the cytoplasm.

E. In eukaryotes it occurs in the nucleus; in prokaryotes genes are never transcribed.

Answer: D

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Hard

Important Words/Concepts: gene, mRNA, transcription

50. What is a codon?

A. three mRNA nucleotides that encode a specific amino acid

B. three mRNA nucleotides that encode a particular protein

C. five mRNA nucleotides that encode a specific amino acid

D. five mRNA nucleotides that encode a particular protein

E. the entire mRNA sequence, which codes for a specific protein

Answer: A

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Easy

Important Words/Concepts: amino acid, codon, mRNA, nucleotide, protein, translation

51. Translation is a process that occurs in the \_\_\_\_ and uses \_\_\_ to produce \_\_\_\_.

A. cytoplasm; mRNA; proteins

B. nucleus; mRNA; proteins

C. cytoplasm; the coding sequence of a gene; mRNA

D. nucleus; the coding sequence of a gene; mRNA

E. nucleus; ribosomes and a gene; tRNA

Answer: A

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Hard

Important Words/Concepts: mRNA, protein, transcription, translation

52. A ribosome is cellular machinery that is located in the \_\_\_\_ and assembles \_\_\_\_\_\_.

A. nucleus; DNA using a template

B. nucleus; mRNA from the regulatory region of DNA

C. nucleus; proteins during the process of transcription

D. cytoplasm; mRNA from the regulatory region of DNA

E. cytoplasm; proteins from mRNA instructions

Answer: E

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Hard

Important Words/Concepts: mRNA, protein, ribosome, translation

53. Translation

A. begins when the regulatory sequence binds to the transfer RNA.

B. occurs in the nucleus.

C. depends directly on RNA polymerase.

D. occurs in the cytoplasm.

E. produces a complementary DNA sequence.

Answer: D

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Easy

Important Words/Concepts: mRNA, protein, translation

54. Which of the following is NOT needed for gene expression?

A. transfer RNA

B. ribosome

C. transcription

D. DNA polymerase

E. RNA polymerase

Answer: D

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Easy

Important Words/Concepts: gene expression, transcription, translation

55. If a DNA coding region has 12 nucleotides, how many amino acids could it encode?

A. 12

B. 36

C. 3

D. 4

E. 120

Answer: D

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Easy

Important Words/Concepts: coding sequence, gene, mRNA, protein, transcription, translation

56. A dysfunctional antithrombin protein can result from

A. overexpression of the gene.

B. one allele turning off.

C. DNA replication.

D. a single nucleotide change in the coding region.

E. deep vein thrombosis.

Answer: D

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Easy

Important Words/Concepts: antithrombin, thrombosis

57. Match the following items with the correct descriptions. (Each term may be used more than once.)

A. DNA B. All types of RNA C. tRNA D. mRNA

\_\_\_\_ is a double helix (A)

\_\_\_\_ is a template for RNA (A)

\_\_\_\_ contains uracil (B)

\_\_\_\_ contains Thymine (A)

\_\_\_\_ is the “recipe” for proteins (D)

\_\_\_\_ passes on genetic information to next generation (A)

\_\_\_\_ contains anticodons (C)

\_\_\_\_ never exits the nucleus (A)

\_\_\_\_ can carry amino acids (C)

\_\_\_\_ contains codons (D)

\_\_\_\_ can exit the nucleus (B)

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Hard

Important Words/Concepts: DNA, transcription, translation

58. Put the following terms in the order they would be needed when a gene is expressed:

amino acid, DNA, mRNA, protein, ribosome, transcription, tRNA

*Answer:* DNA, transcription, mRNA, ribosome, tRNA, amino acid, protein

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Easy

Important Words/Concepts: amino acid, DNA, mRNA, protein, ribosome, transcription, translation, tRNA

59. How is transcription different from translation with respect to 1) location, 2) template, and 3) end-product?

*Answer:* Transcription takes place in the nucleus using DNA as a template to make RNA. Translation takes place in the cytoplasm using mRNA as a template to produce proteins.

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Easy

Important Words/Concepts: DNA, mRNA, protein, transcription, translation

60. Transcription builds \_\_\_\_, whereas translation builds \_\_\_\_\_.

A. DNA; RNA

B. proteins; DNA

C. RNA; proteins

D. RNA; DNA

E. DNA; proteins

Answer: C

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Easy

Important Words/Concepts: transcription, translation

61. Which of these statements does NOT correctly describe both transcription AND translation?

A. They each require an enzyme.

B. They each involve RNA.

C. They each involve ribosomes.

D. Proteins are part of both processes.

E. All of the above.

Answer: C

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Easy

Important Words/Concepts: transcription, translation, ribosomes

62. mRNA is constantly being broken down by the cell; thus, transcription of a gene cannot occur just once, but must be a continuous process. Why might this be important for the regulation of gene expression?

*Answer:* Because mRNA is constantly being broken down, it cannot be translated into protein indefinitely. This allows for more carefully controlled gene expression. If mRNA was never degraded but stayed in the cytoplasm forever, then the regulatory region of a gene would lose the ability to stop protein production. When mRNA degrades, however, the regulatory region simply needs to turn the gene “on” again to allow for additional transcription and translation of a protein.

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Hard

Important Words/Concepts: gene expression, mRNA, regulatory sequence, transcription, translation

63. Of the molecules DNA, transfer RNA (tRNA), messenger RNA (mRNA), and amino acids, which are involved in transcription and which in translation?

*Answer:* transcription—DNA and mRNA; translation—mRNA, tRNA, and amino acids

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Hard

Important Words/Concepts: coding sequence, gene, mRNA, protein, transcription, translation

64. Transcribe the sequence TAC GTC ATC. Then, rewrite YOURtranscribed sequence with a mutation of a G to a C in the third codon.

*Answer:*

AUG CAG UAG

AUG CAG UAC

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Hard

Important Words/Concepts: coding sequence, gene, mRNA, protein, transcription, codon

65. What happens when a chromosome is finished making mRNA?

*Answer:* The DNA will rewind itself back into a double helix.

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Easy

Important Words/Concepts: mRNA, transcription

66. Explain how RNA nucleotides match up with DNA nucleotides when RNA is made.

*Answer:* RNA lacks thymine and has uracil. DNA lacks uracil and has thymine. For every thymine in DNA, an RNA adenine is added; for every cytosine in DNA, an RNA guanine is added; for every DNA guanine, an RNA cytosine is added. However, it is different for adenine: for every DNA adenine, an RNA uracil is added.

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Hard

Important Words/Concepts: DNA, RNA

67. What RNA molecule would be made from the DNA template CGTTACG?

A. CGTTAGC

B. GCAAUGC

C. CGUUAGC

D. GCATTGC

E. CGUAACG

Answer: B

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Easy

Important Words/Concepts: transcription, base pairing, RNA, DNA template

68. Which of the following base pairings would never be found in normal DNA or RNA?

A. A and T

B. U and A

C. C and G

D. T and C

E. All of the above.

Answer: D

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Easy

Important Words/Concepts: transcription, base pairing, RNA, DNA template, uracil

69. True or False: RNA polymerase is an enzyme that makes DNA.

ANS: False

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Hard

Important Words/Concepts: transcription, RNA polymerase

70. When DNA is copied to make RNA, this process is called \_\_\_\_\_\_\_\_\_\_\_\_\_.

A. replication

B. transcription

C. translation

D. conservative replication

E. polymerization

Answer: B

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Easy

Important Words/Concepts: transcription

71. What is the correct base pairing of RNA nucleotides?

A. adenine-thymine; cytosine-guanine

B. adenine-guanine; thymine-uracil

C. adenine-cytosine; guanine-uracil

D. adenine-uracil; cytosine-guanine

E. uracil-thymine; cytosine-guanine

Answer: D

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Easy

Important Words/Concepts: base pairing, mRNA, nucleotide, transcription

72. Which molecules contain thymine?

A. proteins

B. ribosomes

C. transfer RNA

D. chromosomes

E. messenger RNA

Answer: D

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: mRNA

Important Words/Concepts: transcription, translation

73. A mutation in a gene results in a defective protein that is smaller than the normal, functional one. The mutation is probably a result of

A. DNA duplication.

B. mRNA degradation.

C. deletion of the regulatory region.

D. a stop codon in the coding region.

E. a stop codon in the regulatory region.

Answer: D

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Hard

Important Words/Concepts: mutation, coding, non-coding

74. Which two nucleotide bases are complementary to adenine?

*Answer:* thymine and uracil

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Easy

Important Words/Concepts: base pairing, DNA, mRNA, transcription

75. You can differentiate RNA from DNA by the presence or absence of the nucleotide base in the sequence.

*Answer:* uracil or thymine

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Easy

Important Words/Concepts: base pairing, mRNA, transcription

76. What do you think would be the result of a mutation that reduces the efficiency of RNA polymerase?

*Answer:* If the efficiency of RNA polymerase is reduced, then transcription is also reduced, which would ultimately lead to reduced translation and protein production and possibly disease.

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Hard

Important Words/Concepts: mRNA, RNA polymerase, transcription

77. Transcription begins when the enzyme \_\_\_\_\_\_ binds to the regulatory sequence of a gene.

*Answer:* RNA polymerase

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Easy

Important Words/Concepts: modification of pre-mRNA

78. Put the following steps of transcription in order. (Not every step will be used.)

1. DNA unwinds

2. DNA leaves the nucleus

3. RNA polymerase binds to regulatory sequence

4. mRNA leaves the nucleus

5. DNA polymerase adds new nucleotides to the RNA

6. DNA primer added

7. RNA polymerase adds new nucleotides to the RNA

*Answer:* 3, 1, 7, 4

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Hard

Important Words/Concepts: mRNA, transcription

79. A piece of mRNA that is 300 bases long can make a protein that has \_\_\_\_\_ amino acids.

A. 30

B. 100

C. 300

D. 600

E. 900

Answer: B

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Hard

Important Words/Concepts: translation, codons, genetic code

80. To make more proteins, a cell will need an increased number of

A. Golgi bodies.

B. lysosomes.

C. vesicles.

D. ribosomes.

E. mitochondria.

Answer: D

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Easy

Important Words/Concepts: translation, ribosomes

81. The cellular machines that make proteins are called

A. vesicles.

B. lysosomes.

C. ribosomes.

D. Golgi bodies.

E. enzymes.

Answer: C

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Easy

Important Words/Concepts: translation, ribosomes

82. If a protein is 300 amino acids long, then there are

A. 300 nucleotide bases in the DNA gene.

B. 300 codons in the messenger RNA.

C. 600 nucleotides in the anticodon region.

D. 100 nucleotide bases in the messenger RNA.

E. 600 anticodons.

Answer: B

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Hard

Important Words/Concepts: amino acid, nucleotide, translation

83. A DNA gene coding sequence that is 90 nucleotides long could ultimately result in a protein of how many amino acids?

A. 270

B. 30

C. 90

D. 9

E. 45

Answer: B

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Easy

Important Words/Concepts: codons, translation, transcription

84. The correct amino acid is selected and added to the growing protein, when the \_\_\_\_\_\_ and \_\_\_\_ bond to each other.

A. anticodon; codon

B. ribosome; mRNA

C. DNA; mRNA

D. anticodon; tRNA

E. tRNA; amino acid

Answer: A

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Hard

Important Words/Concepts: anticodon, codon, translation

85. Translation is the process by which

A. protein is made from amino acids.

B. mRNA is made from a DNA sequence.

C. codons are made from nucleotides.

D. DNA is copied into RNA.

E. All of the above.

Answer: A

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Easy

Important Words/Concepts: anticodon, codon, translation

86. Translation requires

A. DNA and RNA.

B. RNA only.

C. RNA, amino acids, and ribosomes.

D. DNA, RNA, and ribosomes.

E. DNA, RNA, amino acids, and ribosomes.

Answer: C

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Hard

Important Words/Concepts: anticodon, codon, translation

87. The start codon is \_\_\_\_\_\_ and also codes for the amino acid \_\_\_\_\_.

A. AUG; methionine

B. ATG; methionine

C. TAC; tryptophan

D. UAC; tryptophan

E. UAG; methionine

Answer: A

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Easy

Important Words/Concepts: start codon

88. Explain why it is important that the cell has a mechanism for destroying mRNA molecules.

*Answer:* If the mRNA remained intact and active forever, once a gene was expressed its product would continually be made. This would not allow for precise gene regulation that is needed for normal cell function.

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Hard

Important Words/Concepts: gene expression, mRNA

89. mRNA may associate with multiple ribosomes to form polyribosomes. How does this affect protein production?

*Answer:* It will allow the cell to make multiple copies of the same protein without making extra mRNA molecules.

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Easy

Important Words/Concepts: ribosome

90. Compare anticodons and codons.

*Answer:* Codons are found on mRNA. Anticodons are found on tRNA. The codon-anticodon pairing (A to U, C to G), determines which tRNA fits with the mRNA. Each tRNA carries one particular amino acid.

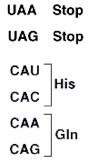
DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Easy

Important Words/Concepts: anticodon, codon

Use the following diagram to answer Questions 91-93:



91. CAU is a(n)

A. codon.

B. anticodon.

C. amino acid.

D. nucleic acid.

E. protein.

Answer: A

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use it

Difficulty: Easy

Important Words/Concepts: genetic code, codon, translation

92. CAU would be found in

A. DNA.

B. mRNA.

C. ribosomes.

D. RNA.

E. protein.

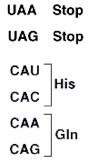
Answe: B

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use it

Difficulty: Hard

Important Words/Concepts: genetic code, codon, translation, amino acid



93. The diagram indicates that

A. two codons represent the amino acid “His.”

B. two amino acids match the codon “His.”

C. to cause a stop, the sequence must read “UAAUAG.”

D. “CAA” can mean “His” or “Gln” or “Stop.”

E. the anticodon CAU means “His.”

Answer: A

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use it

Difficulty: Easy

Important Words/Concepts: genetic code, codon, translation, amino acid

94. Codons are found in \_\_\_\_\_\_\_\_\_\_\_\_; anticodons are found in \_\_\_\_\_\_\_\_\_\_\_\_\_.

A. tRNA; mRNA

B. proteins; tRNA

C. mRNA; proteins

D. mRNA; tRNA

E. tRNA; DNA

Answer: D

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know it

Difficulty: Easy

Important Words/Concepts: anticodon, codon, translation

95. When one end of a tRNA molecule binds to mRNA, to what does the other end bind?

A. DNA

B. an amino acid

C. the nucleus

D. another mRNA

E. another tRNA

Answer: B

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Easy

Important Words/Concepts: amino acid, codon, mRNA, protein, translation, tRNA

96. Which amino acid has only one codon?

A. methionine (met)

B. arginine (arg)

C. glycine (gly)

D. lysine (lys)

E. leucine (leu)

Answer: A

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Hard

Important Words/Concepts: amino acid, codon, mRNA, protein, translation, tRNA

97. If a cloned DNA sequence made a protein containing 600 amino acids when it should be only 500 amino acids, you would suspect a problem in

A. the start signal anticodon.

B. the stop signal codon.

C. the regulatory region of the gene.

D. the downstream region of the gene.

E. Any of the above.

Answer: B

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Hard

Important Words/Concepts: amino acid, codon, mRNA, protein, translation, tRNA

98. The codon for the amino acid methionine is AUG. What anticodon on a tRNA molecule will match methionine’s codon?

A. AUG

B. ATG

C. TAC

D. UAC

E. UAG

Answer: D

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Easy

Important Words/Concepts: amino acid, codon, anticodon, tRNA

99. The genetic code table shows the relationship between \_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_.

A. DNA; RNA

B. promoters; proteins

C. codons; anticodons

D. codons; amino acids

E. ribosomes; enzymes

Answer: D

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use it

Difficulty: Easy

Important Words/Concepts: genetic code, codon, translation

100. Somewhere in the middle of a gene are the letters AAG. If we insert a letter to make it AACG, the resulting PROTEIN will most likely

A. have many amino acids changed.

B. be one amino acid longer.

C. not exist; no protein will be made.

D. be exactly the same.

E. have only one amino acid changed.

Answer: A

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Hard

Important Words/Concepts: mutation, translation, codon

101. Which of the following is NOT a stop codon? (*Hint:* Use the genetic code table.)

A. UAA

B. UGA

C. ATG

D. UAG

E. All of the above are stop codons.

Answer: C

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Easy

Important Words/Concepts: stop codon, genetic code table, translation

102. Which one of these nucleotide combinations stands for the amino acid “Leu” (or leucine)? (*Hint:* Use the genetic code table.)

A. GGA

B. ATC

C. UUA

D. CCU

E. UAG

Answer: C

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Easy

Important Words/Concepts: amino acid, codon, genetic code table, translation

103. A biologist finds a mutation in a gene, but notices that the protein it encodes is not changed in any way. What kind of mutation could have this effect?

A. insertion of one nucleotide

B. deletion of the start codon

C. deletion of one nucleotide

D. substitution of one nucleotide

E. deletion of the regulatory sequence

Answer: D

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Hard

Important Words/Concepts: mutation, translation

104. A stretch of DNA is 1000 nucleotides long, 100 of which are non-coding. How many amino acids could it make?

A. 100

B. 1000

C. 300

D. 450

E. 900

Answer: C

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Hard

Important Words/Concepts: genetic code, codons, amino acids

105. All protein-coding sequences begin with \_\_\_\_\_\_\_\_\_ and end with\_\_\_\_\_\_\_\_\_.

A. AUG; UAG

B. AUG; UAA

C. AUG; UGA

D. a start codon; a stop codon

E. All of the above.

Answer: E

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Hard

Important Words/Concepts: genetic code, codons, amino acids

106. Codons are groups of \_\_\_\_\_\_ nucleotide(s) in mRNA.

A. 1

B. 3

C. 5

D. 2

E. 4

Answer: B

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Easy

Important Words/Concepts: codon

107. An mRNA molecule with 1200 nucleotides from the beginning of the start codon to the end of the stop codon will make a polypeptide that is \_\_\_\_ amino acids long.

A. 400

B. 1200

C. 600

D. 900

E. 399

Answer: E

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Know It

Difficulty: Hard

Important Words/Concepts: codon, start codon, stop codon

108. If a codon that normally codes for an amino acid is changed to a stop codon, how would that change alter the protein?

*Answer:* The protein would be shorter and incomplete. Whether it can still function depends on where the stop codon was inserted.

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Easy

Important Words/Concepts: codons

109. You notice that a single change to a gene causes the sequence of protein A to become drastically *longer*. What could that change be?

A. The first codon in the gene now encodes a stop codon.

B. The gene has been deleted.

C. The stop codon in the gene has been changed to another codon.

D. A single codon has been inserted in the middle of the gene.

E. Several codons have been added to one end of the gene.

Answer: C

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Hard

Important Words/Concepts: mutation, protein function, stop codon, reading frame

110. You notice that a single change to a gene causes the sequence of protein B to become drastically *shorter*. What could that change be?

A. All the codons for the amino acid methionine have been changed to cysteine.

B. Two copies of the gene have been fused together.

C. The stop codon in the gene has been changed to another codon.

D. A stop codon has been inserted in the middle of the gene.

E. Several codons have been added to the end of the gene.

Answer: D

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Hard

Important Words/Concepts: mutation, protein function, stop codon, reading frame

111. Describe how the change of a single nucleotide in the DNA sequence can have an effect on protein function.

*Answer:* If a single nucleotide in the DNA is changed, it will alter the corresponding nucleotide in the mRNA. A change in the mRNA nucleotides will then change the codon and possibly result in an incorrect amino acid being inserted into the protein. An incorrect amino acid will have an incorrect side chain that then may alter the folding of the protein and thus the protein shape and function.

DQ: What are the steps of gene expression, and where do they occur in a cell?

Type: Use It

Difficulty: Hard

Important Words/Concepts: amino acid, gene expression, nucleotide, protein function, protein shape

112. To produce a human gene in goat milk you would fuse

A. the coding region of a human gene to the coding region of a goat gene.

B. regulatory elements from a protein produced in goat milk to the coding region of the human gene.

C. regulatory elements from a human protein to the human coding region.

D. regulatory elements from a human protein to the coding region of a protein produced in goat milk.

E. the regulatory elements from a goat-milk protein to the regulatory elements from a human protein.

Answer: B

DQ: How can animals be genetically modified to produce human proteins (with therapeutic uses)?

Type: Use It

Difficulty: Hard

Important Words/Concepts: gene expression, regulatory sequence

113. Why was it necessary to place the human coding sequence for antithrombin next to a goat regulatory sequence in order to get it expressed in goat cells?

*Answer:* Without the regulatory sequence to “turn on” the antithrombin gene in the goat, it would not be expressed by the goat’s cells.

DQ: How can animals be genetically modified to produce human proteins (with therapeutic uses)?

Type: Use It

Difficulty: Easy

Important Words/Concepts: gene expression, regulatory sequence

114. Why was it necessary to place the human coding sequence for antithrombin next to a goat regulatory sequence in order to get it expressed in goat cells?

A. Without the regulatory sequence, the gene would be expressed in the wrong tissues.

B. Without the regulatory sequence, the gene would never be expressed.

C. Without the regulatory sequence, the wrong gene would be expressed.

D. With the regulatory sequence, the gene will be expressed in all tissues.

E. With the regulatory sequence, the gene can be permanently turned off.

Answer: B

DQ: How can animals be genetically modified to produce human proteins (with therapeutic uses)?

Type: Use It

Difficulty: Easy

Important Words/Concepts: gene expression, regulatory sequence

115. Why was the coding region of the gene for human antithrombin placed near the regulatory region of a gene that is only expressed in the goat’s mammary cells?

*Answer:* So that the antithrombin would be produced into the goat’s milk. If it was placed near a random goat-protein regulatory sequence, it might not be expressed in the goat milk, or it might be expressed in goat tissues where it would incorrectly prevent clotting.

DQ: How can animals be genetically modified to produce human proteins (with therapeutic uses)?

Type: Use It

Difficulty: Hard

Important Words/Concepts: GMO, transgenic organisms, gene expression, regulatory sequence, coding sequence, gene structure

116. Why was the coding region of the gene for human antithrombin placed near the regulatory region of a gene that is only expressed in the goat’s mammary cells?

A. This ensured that the protein would be produced at high levels in all cells.

B. This ensured that the protein would appear in the milk.

C. This ensured that the two proteins would combine into a larger protein.

D. Both genes produce commercially desirable proteins.

E. Only mammary cells actually produce protein.

Answer: B

DQ: How can animals be genetically modified to produce human proteins (with therapeutic uses)?

Type: Use It

Difficulty: Easy

Important Words/Concepts: gene expression

117. What is a transgenic organism?

A. an organism that contains genes from a different species

B. an organism with one or more genes deleted from its genome

C. an organism with one or more of its natural genes mutated by scientists

D. an organism that contains genes from another animal of the same species

E. an organism with two or more genes that have been rearranged between chromosomes

Answer: A

DQ: How can animals be genetically modified to produce human proteins (with therapeutic uses)?

Type: Know It

Difficulty: Easy

Important Words/Concepts: transgenic organism, GMO, species, genes

Use the following information to answer questions 118 and 119.

Artist Eduardo Kac includes “bio art” among his specialties. In 2000, he unveiled “Alba,” an albino rabbit with some unusual features. Alba’s cells produce GFP, a green fluorescent protein naturally found in a species of jellyfish. When Alba is illuminated with blue light, she fluoresces a bright lime green color. Born in France, this unique work of living art went home with Kac, his wife, and his daughter to live with them as a family pet in their Chicago home.

118. Which of the following statements about Alba is correct?

A. Alba is transgenic.

B. The GFP gene in Alba probably has a jellyfish regulatory sequence.

C. The GFP gene had to be rewritten so its code was “readable” by rabbit cells.

D. The GFP gene was most likely inserted into each of Alba’s cells, one by one.

E. All of the above.

Answer: A

DQ: How can animals be genetically modified to produce human proteins (with therapeutic uses)?

Type: Know It

Difficulty: Easy

Important Words/Concepts: gene, genetically modified, transgenic organism

119. Which of the following describes the steps most likely used to produce Alba?

A. Jellyfish cells were fused with rabbit embryo cells, the cells were grown for a while in a lab, and then implanted into a surrogate mother rabbit.

B. DNA for GFP was given a rabbit regulatory sequence, injected into a fertilized rabbit egg, and implanted into a surrogate mother rabbit.

C. The GFP gene was removed from jellyfish DNA, injected into rabbit cells, and then implanted into a surrogate mother rabbit.

D. Jellyfish DNA was injected into an unfertilized rabbit egg, and then the egg was implanted into a surrogate mother rabbit.

E. Jellyfish sperm were used to fertilize rabbit eggs, and resulting offspring were examined for desired traits.

Answer: B

DQ: How can animals be genetically modified to produce human proteins (with therapeutic uses)?

Type: Use It

Difficulty: Hard

Important Words/Concepts: GMO, transgenic organisms, cloning, nuclear transfer, surrogacy, gene structure, regulatory sequence, coding sequence, gene expression

120. What is a genetically modified organism (GMO)?

A. an organism that contains genes from a different species

B. an organism that contains different alleles for a gene

C. an organism that is missing a chromosome

D. an organism with naturally high levels of allelic diversity

E. an organism that contains mitochondrial DNA

Answer: A

DQ: How can animals be genetically modified to produce human proteins (with therapeutic uses)?

Type: Know It

Difficulty: Easy

Important Words/Concepts: gene, genetically modified, transgenic organism

121. An animal modified by humans to carry genes from another species is called

A. complementary.

B. cloned.

C. antigenic.

D. transgenic.

E. a hybrid species.

Answer: D

DQ: How can animals be genetically modified to produce human proteins (with therapeutic uses)?

Type: Know It

Difficulty: Easy

Important Words/Concepts: genetically modified, transgenic organism

122. In an animal containing a human transgene

A. the DNA regulatory region has been isolated from bacteria.

B. the coding DNA sequence has been isolated from bacteria.

C. the coding DNA sequence generally comes from the host animal.

D. the regulatory DNA sequence generally comes from the host animal.

E. the proteins are less functional than proteins isolated from humans.

Answer: D

DQ: How can animals be genetically modified to produce human proteins (with therapeutic uses)?

Type: Know It

Difficulty: East

Important Words/Concepts: coding region, genetically modified, regulatory region, transgenic organism

123. To get optimal production of a human protein in a goat, scientists fused together

A. human coding sequences and bacteria regulatory sequences.

B. human coding sequences and goat coding sequences.

C. human regulatory sequences and goat regulatory sequences.

D. human regulatory sequences and goat coding sequences.

E. human coding sequences and goat regulatory sequences.

Answer: E

DQ: How can animals be genetically modified to produce human proteins (with therapeutic uses)?

Type: Know It

Difficulty: Hard

Important Words/Concepts: coding sequence, genetically modified, regulatory sequence, transgenic organism

124. If a transgene is inserted into an animal embryo

A. only the sperm and egg cells should contain the transgene DNA.

B. only the non-reproductive cells should contain the transgene DNA.

C. the animal should become sterile as an adult.

D. every cell should contain the transgene DNA.

E. the transgene protein will be expressed in all cells.

Answer: D

DQ: How can animals be genetically modified to produce human proteins (with therapeutic uses)?

Type: Know It

Difficulty: Easy

Important Words/Concepts: genetically modified, transgenic organism

125. Creating transgenic organisms involves moving pieces of DNA from one organism to another one. Which of the following would be the first required step in this process? Support your answer.

A. finding a suitable mechanism of transferring the DNA

B. finding a suitable host organism

C. locating and mapping a gene that you want to transfer

D. locating a method of cutting the DNA you want to transfer

E. finding a suitable surrogate to give birth to the organism

Answer: C

DQ: How can animals be genetically modified to produce human proteins (with therapeutic uses)?

Type: Use It

Difficulty: Hard

Important Words/Concepts: transgenic organisms

Instructor note: Best answer is C. The step of mapping DNA is often overlooked as an essential step, but before we can move DNA, we must have a gene to move and we must know the location of the gene in order to access the gene and know its sequence so that we don’t accidentally cut it in half when trying to transfer it.

126. What was the advantage of using the goat casein gene as the insertion site for the human antithrombin gene?

*Answer:* Casein is a protein manufactured only by mammary glands and secreted in milk. By attaching the human antithrombin gene to the regulatory region of the casein gene, scientists were able to ensure that the antithrombin protein would be produced in large amounts in the goats’ milk, thus simplifying extraction of the protein. Furthermore, the human protein would not be expressed anywhere else in the goat, where it might disrupt normal cellular functions.

DQ: How can animals be genetically modified to produce human proteins (with therapeutic uses)?

Type: Know It

Difficulty: Hard

Important Words/Concepts: antithrombin, gene expression, genetically modified, transgenic

127. The fact that a goat can produce human proteins means all of the following EXCEPT

A. the DNA coding sequence is not recognized as foreign by the goat.

B. the goat RNA polymerase must be similar to human RNA polymerase.

C. goat amino acids and human amino acids must be identical or extremely similar.

D. goat coding sequences and human coding sequences are usually identical.

E. goat codons specify the same amino acids that human codons specify.

Answer: D

DQ: How can animals be genetically modified to produce human proteins (with therapeutic uses)?

Type: Know It

Difficulty: Hard

Important Words/Concepts: biotechnology, genetically modified, genetic code, protein, transgenic organism

128. Write true (T) or false (F) for each statement.

1. All organisms make proteins by a similar process. (T)

2. The genetic code is universal for all organisms. (T)

3. Transcription occurs in the cytoplasm of all cells. (F)

4. Translation occurs in the nucleus of all cells. (F)

5. All organisms use complementary base pairing. (T)

DQ: How can animals be genetically modified to produce human proteins (with therapeutic uses)?

Type: Use It

Difficulty: Easy

Important Words/Concepts: genetic code, codons, transcription and translation

129. The antithrombin gene codes for a chain of 432 amino acids. How many nucleotides would code for this gene?

A. 1296

B. 146

C. 432

D. 4320

E. 12960

Answer: A

DQ: How can animals be genetically modified to produce human proteins (with therapeutic uses)?

Type: Use It

Difficulty: Easy

Important Words/Concepts: genetic code, codons, amino acids

130. If the genetic code was not universal but was limited to separate genetic codes for each kingdom (archaea, bacteria, protists, fungi, plants, and animals), what impacts would that have on our ability to create transgenic organisms? How would it affect our ability to produce antithrombin in goats?

*Answer:* It would limit us to moving pieces of DNA only between members of the same kingdom; however, humans and goats both belong to the animal kingdom, so we would still be able to create transgenic goats with human genes.

DQ: How can animals be genetically modified to produce human proteins (with therapeutic uses)?

Type: Use It

Difficulty: Hard

Important Words/Concepts: DNA comparison

131. If a gene for human insulin is inserted into a cow embryo, and the mature transgenic cow is examined

A. only the sperm and egg cells should contain the insulin DNA.

B. only the non-reproductive cells should contain the insulin DNA.

C. the cow would become sterile as an adult.

D. every cell should contain the insulin DNA.

E. the insulin protein would be expressed in all cells.

Answer: D

DQ: How can animals be genetically modified to produce human proteins (with therapeutic uses)?

Type: Use It

Difficulty: Hard

Important Words/Concepts: genetically modified, transgenic organism

Use the following information to answer questions 132-134.

About 1 in every 100 Caucasians suffers from celiac disease. These individuals have severe allergic responses and digestive problems when they eat certain grains. Their illness is caused specifically by gluten, a protein found in wheat, barley, and rye. Treatments for this disease often rely on dietary supplements that contain protein-degrading enzymes that can break down the gluten during normal digestion, making it harmless.

One such enzyme is called AN-PEP (an abbreviation for prolyl endoprotease), and it is isolated from the fungus *Aspergillus niger*. Various research groups are investigating ways to use this enzyme to treat humans. One group is researching the possibility of adding the gene for AN-PEP to wheat so that gluten protein will be detoxified at the very source.

132. The wheat containing AN-PEP would be

A. transgenic.

B. naturally occurring.

C. a GMO.

D. a fungus.

E. Both A and C.

Answer: E

DQ: What are some practical applications of genetically modified organisms in treating human disease?

Type: Know it

Difficulty: Easy

Important Words/Concepts: GMO, transgenic

133. If the AN-PEP gene were somehow inserted into the intestinal cells of celiac patients, this would be a form of

A. gene therapy.

B. hereditary mutation.

C. cloning.

D. All of the above.

E. None of the above.

Answer: A

DQ: What are some practical applications of genetically modified organisms in treating human disease?

Type: Use it

Difficulty: Easy

Important Words/Concepts: GMO, transgenic organisms, gene therapy

134. The wheat cells manipulated by the research group would probably contain

A. a fungal AN-PEP gene fused to a wheat regulatory sequence.

B. a wheat AN-PEP gene fused to a fungal regulatory sequence.

C. a wheat AN-PEP gene fused to a wheat regulatory sequence.

D. a fungal AN-PEP gene fused to a fungal regulatory sequence.

E. a human AN-PEP gene fused to a wheat regulatory sequence.

Answer: A

DQ: What are some practical applications of genetically modified organisms in treating human disease?

Type: Use it

Difficulty: Easy

Important Words/Concepts: GMO, transgenic organisms, regulatory sequence, coding sequence, gene expression

135. One of the first drugs to be produced using genetically modified goats was

A. human growth hormone.

B. insulin.

C. antithrombin.

D. antivenom.

E. antibody.

Answer: C

DQ: What are some practical applications of genetically modified organisms in treating human disease?

Type: Know It

Difficulty: Easy

Important Words/Concepts: antithrombin, genetically modified, pharming, transgenic organism

136. What is the function of antithrombin?

A. It’s a protein that causes causing thrombosis.

B. It’s a protein that gives structure to blood vessels, so they don’t collapse.

C. It’s a protein produced in the pancreas.

D. It’s a protein that helps to prevent blood clots.

E. It’s an enzyme that causes blood clotting.

Answer: D

DQ: What are some practical applications of genetically modified organisms in treating human disease?

Type: Know It

Difficulty: Easy

Important Words/Concepts: antithrombin, blood clotting, thrombosis

137. All of the following describe antithrombin deficiency EXCEPT

A. an inherited disorder where there is no expression of the antithrombin gene

B. an acquired disorder in which individuals do not produce antithrombin

C. an inherited disorder where an antithrombin gene is present but not functional

D. a disorder that increases the risk of dangerous blood clots

E. an extremely rare disorder affecting fewer than 1 in every 300,000 people

Answer: E

DQ: What are some practical applications of genetically modified organisms in treating human disease?

Type: Know It

Difficulty: Easy

Important Words/Concepts: antithrombin, thrombosis

138. Antithrombin deficiency is overcome by

A. monitoring one’s diet.

B. vein removal.

C. gene therapy.

D. taking anticlotting drugs.

E. All of the above.

Answer: D

DQ: What are some practical applications of genetically modified organisms in treating human disease?

Type: Know It

Difficulty: Hard

Important Words/Concepts: antithrombin, thrombosis

139. Which statement is FALSE?

A. Thrombosis can be fatal.

B. Antithrombin deficiency is rare.

C. Antithrombin is a protein.

D. Antithrombin prevents blood clots.

E. Antithrombin deficiency can be inherited.

Answer: B

DQ: What are some practical applications of genetically modified organisms in treating human disease?

Type: Use It

Difficulty: Easy

Important Words/Concepts: antithrombin, thrombosis

140. Antithrombin deficiency can result from

A. a hereditary defect.

B. liver disease.

C. heart disease.

D. kidney disease.

E. All of the above.

Answer: E

DQ: What are some practical applications of genetically modified organisms in treating human disease?

Type: Use It

Difficulty: Hard

Important Words/Concepts: antithrombin, thrombosis

141. Which of the following statements is TRUE?

A. In humans, only liver cells have the antithrombin gene.

B. In transgenic goats, only the liver cells have the antithrombin gene.

C. In goats, the antithrombin gene is normally expressed by the cells of the mammary gland.

D. In humans, only the liver cells express the antithrombin gene.

E. In humans, only the pancreas cells contain the antithrombin gene.

Answer: D

DQ: What are some practical applications of genetically modified organisms in treating human disease?

Type: Know It

Difficulty: Hard

Important Words/Concepts: antithrombin, gene expression

142. Why is thrombosis dangerous?

*Answer:* Thrombosis can lead the blood clots that travel through the body, potentially causing heart or brain damage.

DQ: What are some practical applications of genetically modified organisms in treating human disease?

Type: Use It

Difficulty: Easy

Important Words/Concepts: antithrombin, gene expression, thrombosis.

143. What is the practical significance of using transgenic animals to produce human proteins?

A. Transgenic animals produce more potent drugs than do humans.

B. Transgenic animals produce less potent drugs but make more of it than do humans.

C. Transgenic animals can produce massive amounts of a drug very quickly.

D. Transgenic animals are able to produce massive amounts of a drug; however, the protein form of the drug matches the animal’s protein, not the human’s.

E. The types of drugs transgenic animals can make are extremely limited.

Answer: C

DQ: What are some practical applications of genetically modified organisms in treating human disease?

Type: Know It

Difficulty: Hard

Important Words/Concepts: gene, genetically modified, transgenic organism

144. Which of the following statements about genetically modified organisms is NOT true?

A. Unlike mutants, GMOs make only gene products they would normally produce.

B. It is cheaper to use GMOs than traditional methods to produce drugs.

C. GMOs make products that are unsafe for human consumption.

D. GMOs can produce drugs more quickly than traditional methods.

E. It is easier to build up a large supply of any particular gene product using GMOs.

Answer: A

DQ: What are some practical applications of genetically modified organisms in treating human disease?

Type: Know It

Difficulty: Easy

Important Words/Concepts: genetically modified, transgenic organism

145. The term “pharming” refers to the ability to

A. produce medications from GMOs.

B. purify pharmaceutical drugs from natural sources.

C. make human proteins in bacteria.

D. clone animals on a research farm.

E. isolate drugs from plant sources.

Answer: A

DQ: What are some practical applications of genetically modified organisms in treating human disease?

Type: Know It

Difficulty: Easy

Important Words/Concepts: genetically modified, pharming, transgenic organism

146. All of the following are advantages of producing human drugs in animals EXCEPT

A. more consistent and reliable supply of a drug.

B. drugs produced in animals are less likely to degrade over time.

C. large amounts of drugs can be produced in a shorter period of time.

D. less risk of transmitting infections such as HIV or hepatitis.

E. generally costs less than traditional methods.

Answer: B

DQ: What are some practical applications of genetically modified organisms in treating human disease?

Type: Know It

Difficulty: Easy

Important Words/Concepts: genetically modified, pharming, transgenic organism

147. What are some of the advantages of using transgenic animals to produce human proteins?

*Answer:* Transgenic animals remove the need to rely on human donors. Thus, they can produce large amounts of proteins in a short period of time very cheaply and without the risk of transmitting many human diseases such as HIV and hepatitis.

DQ: What are some practical applications of genetically modified organisms in treating human disease?

Type: Know It

Difficulty: Easy

Important Words/Concepts: genetically modified, transgenic organism

Use the following information to answer Questions 148 - 150.

In December 2010, approximately 6000 male mosquitoes were released in Malaysia. They contained a fruit fly gene called “tTA,” which kills the mosquito when expressed. In the lab, tTA gene expression was suppressed by treating the mosquitos with tetracycline. The goal for releasing the males was to allow them to mate with wild female mosquitoes. The resulting offspring from this mating would all die, and the number of mosquitoes in the area would plummet, as would the number of humans infected by dengue fever through mosquito bites. The released male mosquitos would then also die from lack of tetracycline-based suppression of tTA gene expression.

148. tTA is a(n)

A. allele.

B. protein.

C. transgene.

D. antibiotic.

E. phenotype.

Answer: C

DQ: What are some practical applications of genetically modified organisms in treating human disease?

Type: Use It

Difficulty: Easy

Important Words/Concepts: transgene, GMO, transgenic organisms

149. The male mosquitoes are

A. GMOs.

B. transgenic.

C. mutant.

D. unable to reproduce.

E. All of the above.

Answer: E

DQ: What are some practical applications of genetically modified organisms in treating human disease?

Type: Use It

Difficulty: Easy

Important Words/Concepts: transgene, GMO, transgenic organisms

150. In the male mosquitoes, tTA is

A. probably fused with a fruit fly regulatory sequence.

B. probably fused with a mosquito regulatory sequence.

C. expressed without a regulatory sequence.

D. a gene normally found in wild populations.

E. an antibiotic that neutralizes the dengue virus.

Answer: B

DQ: What are some practical applications of genetically modified organisms in treating human disease?

Type: Use It

Difficulty: Easy

Important Words/Concepts: transgene, GMO, transgenic organisms, gene expression, regulatory sequence, coding sequence

151. Which of the following is an example of gene therapy?

A. An ear of corn contains genes that produce natural pesticides.

B. A human has one allele for a normal gene and one allele for a mutated gene.

C. A patient with hereditary anemia is given a normal version of the gene.

D. Protein from a healthy person is injected into someone who cannot make that protein.

E. A human protein is made in bacteria for future injection into someone who lacks it.

Answer: C

DQ: What are some practical applications of genetically modified organisms in treating human disease?

Type: Know It

Difficulty: Hard

Important Words/Concepts: gene therapy, genetically modified, transgenic organism

152. Which is currently NOT true of genetic engineering? Scientists can

A. produce human proteins in animals.

B. reverse antibiotic resistance in bacteria.

C. clone animals.

D. insert genes into humans to treat some enzyme deficiencies.

E. insert genes from one species into another.

Answer: B

DQ: What are some practical applications of genetically modified organisms in treating human disease?

Type: Know It

Difficulty: Easy

Important Words/Concepts: biotechnology, genetically modified, transgenic organism

153. The medical application of inserting a new gene into a cell with a defective gene is termed .

*Answer:* gene therapy

DQ: What are some practical applications of genetically modified organisms in treating human disease?

Type: Know It

Difficulty: Easy

Important Words/Concepts: biotechnology, gene therapy