

# Protein Synthesis Quiz 2

Name: \_\_\_\_\_

Choose the response which best answers the question or completes the statement and so make you tutor smile ☺!

- The genetic specifications for assembling a protein are in the DNA. The first step in protein synthesis is for that code to be:
  - transcribed to tRNA
  - transcribed to mRNA
  - translated to tRNA
  - transmitted by SMS
  - translated to mRNA
- Which molecule carries amino acids to the ribosomes?
  - rRNA
  - tRNA
  - DNA
  - mRNA
  - ATP
- Which is found in RNA but not in DNA?
  - adenine
  - cytosine
  - guanine
  - uracil
  - phosphate groups
- Which of the following is **true** of tRNA?
  - It functions in carrying the code from messenger RNA from the nucleus to the ribosomes.
  - It consists of a single strand of nucleotides.
  - It is necessary for translation.
  - all of the previous are true statements
  - none of the above
- Which statement about DNA is **false**?
  - The sugar in DNA has one less oxygen molecule than that in RNA.
  - DNA is a double stranded molecule.
  - In DNA, the base uracil replaces thymine.
  - DNA is a polymer made of nucleotide subunits.
  - DNA stands for National Dyslexia Association
- The process of synthesizing mRNA along a DNA template is called
  - transcription
  - translation
  - transformation
  - translocation
  - crossing over

In questions 7 and 8 below, a segment of DNA has one strand with the following sequence of bases.

**A G C G C A T A G C A A**

- The complementary strand of DNA is
  - U C G C G U A U C G U U
  - T C G C C G A T C G T T
  - T C G C G T A T C G T T
  - T C G C A T T A C A U U
  - T C G W R O N G A C U U
- The mRNA molecule coded for by the original strand is
  - T C G C G T A T C G T T
  - U C G C G U A U C G U U
  - T C A C M R N A T C C C
  - U A C A T T U C A G G G
  - U C G G C A T T U G G C

9. Which is **true** of a codon?

- a) It consists of 64 nucleotides.
- b) It may code for the same amino acid as another codon does.
- c) It never codes for more than one amino acid.
- d) It extends from one end of a tRNA molecule
- e) It is the basic unit of the genetic code.

10. Which structure is coded for by the shortest (or smallest) sequence of DNA?

- a) a tRNA having 75 nucleotides
- b) a mRNA having 75 codons
- c) a polypeptide composed of 75 amino acids
- d) a protein composed of 2 polypeptides, each 35 amino acids long
- e) a tRNA molecule

11. The nucleotides in DNA are grouped in triplets, or 3-letter 'words', known as a codon. The total possible number of codons that can be made from the DNA nucleotides is

- a) 64      b) 16      c) 20      d) 46      e)  $2^{64}$

12. In what direction can DNA polymerase work when catalyzing the addition of individual nucleotides to build a strand of DNA?

- a) from the 5' toward the 3' end of the new strand being assembled
- b) from the replication centers in two directions called replication forks
- c) from the 3' to the 5' end of the strand being assembled
- d) in both directions if DNA ligase is present
- e) in the direction of the French sea-parrot's repeated alarm cry (i.e. Polly mers 'Eh!'s)

13. The DNA of all organisms replicates by

- a) dispersive replication
- b) reverse replication
- c) semi-conservative replication
- d) conservative replication
- e) New Labour replication

14. The scientist(s) most associated with the currently accepted theory of DNA replication is (are)

- a) Darwin and Lamarck
- b) Griffith and Wilkins
- c) Meselson and Stahl
- d) Cartwright and Davis
- e) Starsky and Hutch

15. The two sides of the DNA molecule are held together at their bases by:

- a) covalent bonds    b) peptide bonds    c) James Bonds    d) ionic charges    e) hydrogen bonds

16. The three parts of a nucleotide are held together by

- a) ionic bonds    b) covalent bonds    c) van der Waals forces    d) hydrogen bonds    e) James Bonds

17. The technology that finally clarified the structure of DNA was

- a) autoradiography
- b) ultracentrifugation
- c) electron microscopy
- d) X-ray diffraction
- e) gel electrophoresis

18. What kind of bond joins the complementary nucleotides?  
a) ionic bonds   b) nitrogenous bases   c) strands of RNA   d) covalent bonds   e) hydrogen bonds
19. The actual assembly of amino acids into protein occurs on the  
a) endoplasmic reticulum   b) ribosomes   c) tRNAs   d) Golgi bodies   e) none of these
20. To read the genetic code, the bases of DNA or RNA are placed in groups of  
a) 1   b) 4   c) 6   d) 8   e) none of these
21. The total number of codons possible in the code system is:  
a) 4   b) 16   c) 32   d) 64   e) none of these
22. Which remains in the nucleus during translation?  
a) tRNA   b) mRNA   c) rRNA   d) all of these   e) none of these
23. Which does NOT represent a difference between RNA and DNA?  
a) RNA is single stranded.  
b) RNA contains the sugar ribose.  
c) RNA utilizes nucleotides in its structure.  
d) RNA substitutes uracil for thymine.  
e) All of the above represent differences between DNA and RNA.
24. Which represents a similarity between DNA and RNA?  
a) Double-stranded helical structure  
b) The presence of uracil  
c) The same number of oxygen atoms in each of their pentose sugars  
d) Nucleotides consisting of a phosphate, sugar, and nitrogenous base  
e) The relative length of each molecule is similar
25. Research by biologists such as Beadle and Tatum has led to the now questioned hypothesis that the synthesis of each protein (enzyme) in a cell is governed by the action of a single  
a) gene   b) chromosome   c) nitrogenous base   d) phosphate molecule   e) text message
26. The coded information in a DNA molecule directly determines the formation of  
a) polypeptides   b) polysaccharides   c) lipids   d) glycerol   e) monosaccharides
27. Electrophoresis is used to  
a) amplify small DNA samples to obtain enough for analysis  
b) clone genes  
c) match a gene with its function  
d) cut DNA into fragments  
e) separate fragments of DNA
28. DNA fingerprints used as evidence in a murder trial look something like supermarket bar codes. The pattern of bars in a DNA fingerprint shows  
a) the order of genes along particular chromosomes  
b) the presence of various-sized fragments of DNA  
c) the exact location of a specific gene in a genomic library  
d) the presence of dominant or recessive alleles for particular traits  
e) the order of bases in a particular gene

29. The immediate goal of the Human Genome Project was to
- Develop new technologies for studying DNA
  - compare the genomes of a large number of individuals from different parts of the world
  - map and sequence the genomes of important research organisms such as *Drosophila sp.*
  - map all the human genes and determine the nucleotide sequence of the entire human genome
  - find cures for human genetic disorders
30. The deoxyribose part in the name deoxyribonucleic acid refers to the
- rungs of the sugar ladder
  - bonds that hold the two strands together
  - sugar component of DNA
  - type of helical arrangement
  - a new type of oxygen-free blackcurrant drink
31. Which of the statements about electrophoresis is **false**?
- The process requires an electric current
  - This technique can be used to separate charged molecules
  - Large molecules migrate more slowly in the agarose gel than small molecules
  - The technique can be used to easily separate nonpolar molecules.
32. A nucleotide of DNA could contain
- adenine, ribose, and phosphate
  - nitrogenous base, phosphate, and glucose
  - phosphate, deoxyribose, and thymine
  - uracil, deoxyribose and phosphate
  - anything whatever – its 4,500 million years old, for goodness sake!
33. In recombinant DNA experiments, \_\_\_\_\_ is used to cut pieces of DNA and \_\_\_\_\_ joins the resulting fragments to form recombinant DNA.
- a transposon . . . a restriction enzyme
  - a transposon . . . a plasmid
  - DNA ligase . . . a restriction enzyme
  - a plasmid . . . DNA ligase
  - a restriction enzyme . . . DNA ligase
34. The phosphate and sugar groups of a nucleotide are held together by
- ionic bonds
  - covalent bonds
  - Van der Waals forces
  - hydrogen bonds
  - James Bonds
35. The technology that Rosalind Franklin used that finally clarified the structure of DNA was
- autoradiography
  - ultracentrifugation
  - electron microscopy
  - X-ray diffraction
  - gel electrophoresis
36. Beadle and Tatum showed that each kind of mutant bread mould they studied lacked a specific enzyme. Their experiments demonstrated that
- cells need specific enzymes in order to function
  - genes are made of DNA
  - enzymes are required to repair damaged DNA information
  - mutations are changes in genetic information
  - genes carry information for making proteins

37. At one point as a cell carried out its day-to-day activities, the nucleotides GAT were paired with the nucleotides CUA. This pairing occurred
- when an mRNA codon paired with a tRNA anticodon
  - during translation
  - during transcription
  - It is impossible to say, given this information
  - in a double-stranded DNA molecule
38. The information carried by a DNA molecule is in
- the sugars and phosphates forming its backbone
  - the total number of nucleotides it contains
  - the order of the nucleotides in the molecule
  - its amino acid sequence
  - the RNA units that make up the molecule
39. Which are arranged in the correct order by size, from largest to smallest?
- chromosome - gene - nucleotide - codon
  - chromosome - gene - codon - nucleotide
  - codon - chromosome - gene - nucleotide
  - nucleotide - chromosome - gene - codon
  - gene - chromosome - codon - nucleotide
40. During translation, chain elongation continues until
- no amino acids are left
  - all tRNAs are empty
  - the polypeptide is long enough
  - the ribosomes run off the end of mRNA
  - chain terminator codons occur
41. Imagine an error occurring during DNA replication in a cell, so that where there is supposed to be a T in one of the genes there is instead a G. What effect will this probably have on the cell?
- The amino acid sequence of one of its kinds of protein will be completely changed
  - Each of its kinds of protein will contain an incorrect amino acid
  - One of its kinds of protein might contain an incorrect amino acid
  - An amino acid will be missing from one of its kinds of protein
  - An amino acid will be missing from each of its kinds of protein
42. A geneticist found that a particular mutation had no effect on the polypeptide encoded by a gene. This mutation probably involved
- deletion of the entire gene
  - insertion of one nucleotide
  - substitution of one nucleotide
  - deletion of one nucleotide
  - alteration of the start codon
43. During the process of translation (polypeptide synthesis), \_\_\_\_\_ matches an mRNA codon with the proper amino acid.
- DNA polymerase
  - transfer RNA
  - a ribosome
  - messenger RNA
  - GTP

44. Each nucleotide in a DNA molecule is composed of
- a nitrogenous base and a phosphate group
  - a sugar called ribose, a nitrogenous base, and a phosphate group
  - a sugar called deoxyribose, a nitrogenous base, and a phosphate group
  - a sugar called deoxyribose and a phosphate group
  - deoxyribose and a nitrogen base.
45. The bases on one strand of DNA are CTAGAAC. The complementary section on the other strand of DNA is
- CTAGAAC
  - AGCTCCA
  - GATCTTG
  - TCGAGGT
  - GUTCTTG.
46. Covalent bonds between the nucleotides of new DNA strands are formed by enzymes called
- pyrimidines
  - purines
  - nucleotides
  - transforming factors
  - DNA polymerases.
47. DNA replication occurs ensuring that all cells in a multicellular organism carry the same genetic information.
- in a few hours
  - slowly
  - before a cell divides
  - after cell division ends
  - whenever
48. Each gene minimally dictates the production of one
- chromosome
  - codon
  - tRNA
  - DNA strand
  - polypeptide.
49. Transcription is the process of converting a sequence of DNA nucleotides into
- a single strand of RNA
  - a double strand of RNA
  - a single complementary helix of DNA.
  - protein
  - polypeptides.
50. The conversion of a sequence of RNA nucleotides into a sequence of amino acids is called
- transcription
  - replication
  - RNA splicing
  - translation
  - mutation.
51. mRNA directs the building of proteins through a sequence of
- introns
  - codons
  - exons
  - anticodons
  - proteins
52. The RNA molecule used during transcription is
- transfer RNA
  - ribosomal RNA
  - transcription RNA
  - messenger RNA
  - polymerase RNA.
53. The codons of mRNA are translated to amino acids by
- translation RNA
  - transcription RNA
  - transfer RNA.
  - messenger RNA.
  - ribosomal RNA.
54. Any change in a nucleotide sequence of DNA is called
- mutagen
  - replication
  - duplication
  - splicing
  - mutation

55. Rejoining DNA fragments from two organisms is best known as

- a) conjugating DNA
- b) declining DNA
- c) mapping genes
- d) recombinant DNA technology
- e) gene sequencing

56. The gene-cutting tools of recombinant DNA technology are

- a) helicases
- b) DNA ligases
- c) DNA vectors
- d) plasmids
- e) restriction enzymes

57. The "one gene one protein " theory can be explained how genes control in cells by

- a) determining polypeptide chains
- b) interacting with proteins in the chromosomes
- c) assorting independently during meiosis
- d) inhibiting enzyme formation in some cell reactions
- e) replicating before the beginning mitosis

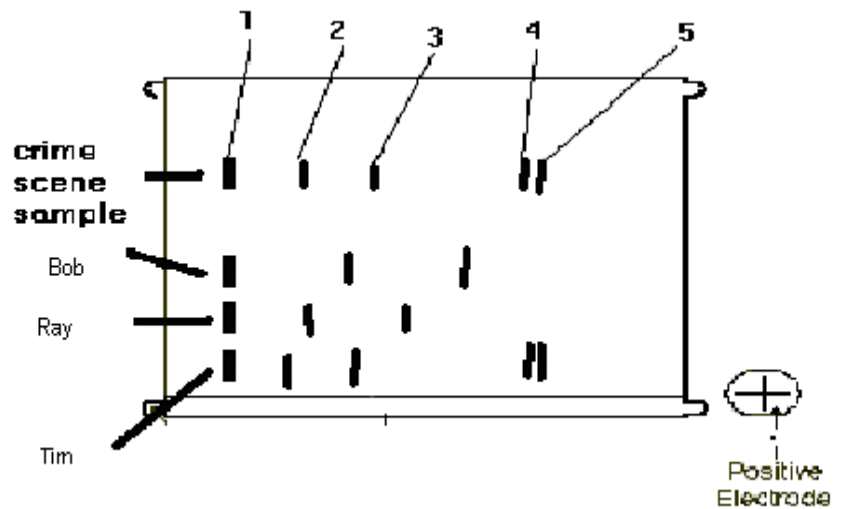
58. Point mutations

- a) remain in the parent and cannot be passed on to the offspring
- b) occur at the 5' end of a DNA strand
- c) forces the genetic code to be read from the wrong point
- d) are caused by a break in the chromosome
- e) result when one nucleotide is changed for another

Use the diagram of a technique in molecular biology and your knowledge of biology (you what?) to answer questions 59 to 61 (below):

59. The technique being used to assess this information is:

- a) human genome determination
- b) karyotyping
- c) transformation
- d) DNA blotting
- e) electrophoresis



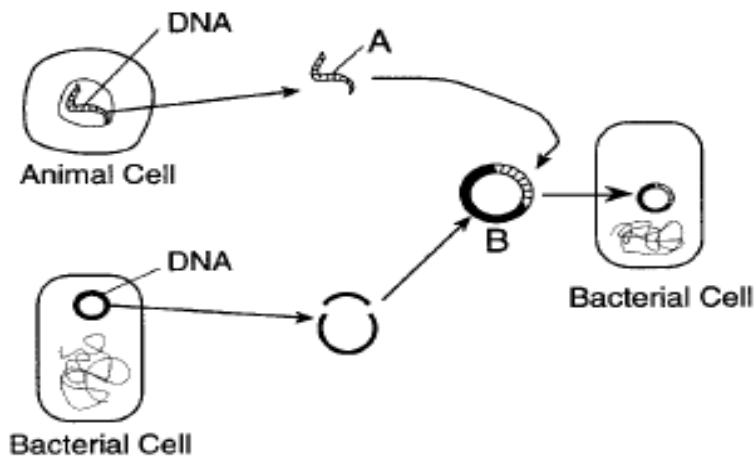
60. Based on the indicated position of the wells, the longest DNA fragment in the crime scene sample is at position

- a) 1
- b) 2
- c) 3
- d) 4
- e) 5

61. Based on the results of this forensic investigation, it is likely that the guilty culprit is

- a) Mr. Bean
- b) Bob
- c) Ray
- d) Tim
- e) Mr. Rogers

Use the diagram below to assist you in answering questions 62 to 64.



62. Structure A contains a

- a) genetic code
- b) messenger RNA molecule
- c) single nucleotide, only
- d) small polysaccharide
- e) male gamete

63. Structure B represents

- a) a ribosome
- b) recombinant DNA
- c) transfer RNA
- d) a female gamete
- e) a rubber band

64. The technique illustrated in the diagram is known as

- a) cloning
- b) protein synthesis
- c) genetic engineering
- d) in vitro fertilization
- e) weird sex



## Correctly complete the statements below.

1. The fact that adenine bonds with thymine and guanine with cytosine provides an example of the concept of \_\_\_\_\_ base pairing.
2. DNA is a polymer made up of \_\_\_\_\_ subunits.
3. The enzyme which cuts a DNA molecule into smaller pieces is called a(n) \_\_\_\_\_.
4. The transfer of segments of DNA from one species into another is referred to as \_\_\_\_\_ technology.
5. A triplet of mRNA is called a(n) \_\_\_\_\_.
6. A triplet of tRNA is called a(n) \_\_\_\_\_.
7. The currently most accepted theory of DNA replication is that of \_\_\_\_\_ replication.
8. A pattern of a single strand of DNA or RNA used in the replication process is called a(n) \_\_\_\_\_.
9. In RNA, the base uracil replaces the base \_\_\_\_\_.
10. RNA is a \_\_\_\_\_ stranded molecule.
11. The sugar found in the DNA molecule is called \_\_\_\_\_.
12. The enzyme \_\_\_\_\_ separates the DNA strands thus allowing the replication process to occur.
13. The process of forming mRNA from DNA is called \_\_\_\_\_.
14. The sequence of DNA which stops the transcription process is called \_\_\_\_\_.
15. The \_\_\_\_\_ is the region of a DNA strand where the replication process is occurring.
16. The translation of \_\_\_\_\_ occurs on the ribosomes of a cell.
17. The total number of possible codons is \_\_\_\_\_.
18. The fact that frequently several different triplets can code for the same amino acid is proof that the genetic code is \_\_\_\_\_.
19. A(n) \_\_\_\_\_ is a part of the mRNA as transcribed from the DNA that contains a portion of the information necessary for the final gene product.
20. A(n) \_\_\_\_\_ is an intervening or non-coding segment of a gene.