

PRACTICE TEST QUESTIONS

PART A: MULTIPLE CHOICE QUESTIONS

DNA & PROTEIN SYNTHESIS

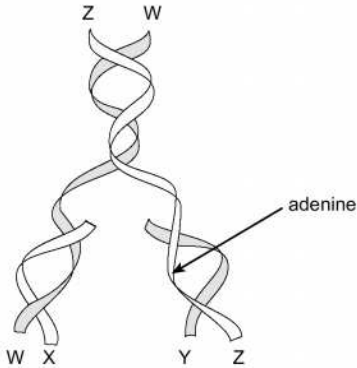
1.	One of the functions of DNA is to A. secrete vacuoles. B. make copies of itself. C. join amino acids to each other. D. carry genetic information out of the nucleus.
2.	Two sugars found in nucleic acids are A. sucrose and ribose. B. glucose and fructose. C. deoxyribose and ribose. D. deoxyribose and glucose.
3.	The number of adenine bases in a DNA molecule equals the number of thymine bases because A. DNA contains equal numbers of all four bases. B. thymine always follows adenine on each DNA strand. C. DNA is made of alternating adenine and thymine bases. D. adenine on one strand bonds to thymine on the other strand.
4.	Which of the following would not occur during complementary base pairing? A. A-T B. U-G C. C-G D. A-U
5.	Which of the following describes a DNA molecule? A. Double helix of glucose sugars and phosphates. B. Ladder-like structure composed of fats and sugars. C. Double chain of nucleotides joined by hydrogen bonds. D. A chain of alternating phosphates and nitrogenous bases.
6.	Which of the following is an example of complementary base pairing? A. Thymine – uracil. B. Guanine – adenine. C. Adenine – thymine. D. Cytosine – thymine.
7.	Which of the following is the correct matching of base pairs in DNA? A. Adenine–Guanine and Thymine–Uracil. B. Guanine–Cytosine and Adenine–Uracil. C. Adenine–Thymine and Guanine–Cytosine. D. Guanine–Thymine and Adenine–Cytosine.
8.	DNA replication involves the breaking of bonds between A. bases. B. sugars and bases. C. phosphates and bases. D. sugars and phosphates.
9.	Which of the following statements best describes DNA replication ? A. tRNA, by complementary base pairing with mRNA, produces proteins. B. RNA nucleotides, by complementary base pairing with DNA, produce DNA. C. DNA nucleotides, by complementary base pairing with DNA, produce DNA. D. RNA nucleotides, by complementary base pairing with DNA, produce tRNA.
10.	The base found in RNA nucleotides but not in DNA nucleotides is A. uracil (U). B. adenine (A). C. guanine (G). D. cytosine (C).
11.	The product of transcription is A. DNA. B. protein. C. mRNA. D. a ribosome.
12.	A section of DNA has the following sequence of nitrogenous bases: CGATTACAG Which of the following sequences would be produced as a result of transcription? A. CGTUUCTG B. GCTAATGTC C. CGAUUACAG D. GCUAAUGUC
13.	mRNA is produced in the process called A. respiration. B. translation. C. replication. D. transcription.
14.	A function of transfer RNA (tRNA) is to A. stay in the nucleus and be copied by DNA. B. carry amino acids to the growing polypeptide chain. C. copy DNA and carry the information to the ribosome. D. read the codons and provide the site for protein synthesis.
15.	Which of the following best describes the function of mRNA? A. It stays in the nucleus and is copied by DNA. B. It carries amino acids to the growing polypeptide chain. C. It makes up the ribosomes and provides the site for protein synthesis. D. It is transcribed from the DNA and carries the information to the ribosome.
16.	The molecule that is responsible for carrying amino acids to ribosomes is A. DNA. B. tRNA. C. rRNA. D. mRNA.
17.	A polypeptide found in the cytoplasm of a cell contains 12 amino acids. How many nucleotides would be required in the mRNA for this polypeptide to be translated? A. 4 B. 12 C. 24 D. 36
18.	If the nucleotide sequence of an anticodon was AUC, then the DNA triplet would be A. ATC. B. TAG. C. AUC. D. UAG.
19.	If the code for an amino acid is AGC on the DNA molecule, the anticodon on the tRNA would be A. AGC B. TGC C. UCG D. UGC
20.	During protein synthesis, peptide bonds are formed at the A. nucleus. B. nucleolus. C. lysosomes. D. ribosomes.
21.	Determine the sequence of amino acids produced by this DNA sequence: GGAGTTTTC A. Proline, Valine, Lysine. B. Glycine, Valine, Leucine. C. Proline, Glutamine, Lysine. D. Glycine, Glutamic acid, Leucine.
22.	Use the following information to answer the question: 1. Uracil bonds with adenine. 2. Complementary bonding between codon and anticodon. 3. DNA unzips. 4. mRNA joins with ribosome. The correct order of the above during protein synthesis is A. 1, 2, 4, 3 B. 1, 3, 2, 4 C. 3, 1, 4, 2 D. 3, 2, 1, 4
23.	The tRNA anticodon for the DNA sequence AGT would be A. UCA. B. AGU. C. TCA. D. AGT.
24.	A change in the sequence of bases in a strand of DNA that occurs as a result of exposure to X-rays is an example of A. mutation. B. denaturation. C. transcription. D. protein synthesis.
25.	For a substance to be classified as a mutagen, it must cause A. a change in DNA. B. enzymes to denature. C. hydrolysis of proteins. D. mRNA to be produced.
26.	Which of the following would be a result of the substitution of one base pair in DNA by a different base pair during replication? A. A mutation would occur. B. tRNA would bond to DNA. C. Phosphate would join with adenine. D. Uracil would appear in the DNA strand.
27.	Recombinant DNA is defined as DNA produced from A. RNA and a protein. B. DNA and hemoglobin. C. viral DNA and glucose. D. DNA of two different organisms.
28.	When a foreign gene is incorporated into an organism's nucleic acid, the resulting molecule is called A. ATP. B. recombinant DNA. C. transfer RNA (tRNA). D. messenger RNA (mRNA).
29.	If the triplet code on a DNA molecule changes from ACT to AGC, the result is called A. mutation. B. metastasis. C. translation. D. transcription.
30.	Use the following events to answer the question. 1. mRNA is formed. 2. DNA segment opens (unzips). 3. mRNA attaches to ribosomes. 4. amino acids form peptide bonds. 5. tRNA carries amino acids to mRNA. 6. The correct order of events required for protein synthesis is A. 1, 2, 3, 4, 5. B. 2, 1, 3, 4, 5. C. 2, 1, 3, 5, 4. D. 2, 1, 4, 5, 3.
31.	Which of the following terms describes the process shown below? DNA → mRNA A. Unzipping. B. Translation. C. Replication. D. Transcription.
32.	One of the functions of DNA is to A. secrete vacuoles. B. make copies of itself. C. join amino acids to each other. D. carry genetic information out of the nucleus.
33.	A role of mRNA in protein synthesis is to A. form ribosomes. B. form the protein's tertiary structure. C. carry appropriate amino acids into place. D. carry genetic information out of the nucleus.

PART B: SHORT ANSWER AND MULTIPLE CHOICE QUESTIONS

DNA, PROTEIN SYNTHESIS, RECOMBINANT DNA

1. Give the purpose of each of the following steps in the process of protein synthesis.
 - a) Ribosome moving along a mRNA: **(1 mark)**
 - b) Adenine bonding to thymine: **(1 mark)**
 - c) An amino acid bonding to a specific tRNA: **(1 mark)**
 - d) Forming of peptide bonds: **(1 mark)**

2.



If adenine is located on **strand Z** as shown, then on **strand X** at the same location must be
 A. uracil. B. adenine. C. thymine. D. cytosine.

3. Describe the structure of DNA. You may use a labeled diagrams to answer this question (4 marks).

4. Using the table below, list **three** differences between RNA and DNA.

(3 marks: 1 mark for each contrasting pair)

RNA	DNA

5.

Three-letter codons of messenger RNA, and the amino acids specified by the codons			
AAU } Asparagine AAC }	CAU } Histidine CAC }	GAU } Aspartic acid GAC }	UAU } Tyrosine UAC }
AAA } Lysine AAG }	CAA } Glutamine CAG }	GAA } Glutamic acid GAG }	UAA } Stop UAG }
ACU } Threonine ACC ACA ACG }	CCU } Proline CCC CCA CCG }	GCU } Alanine GCC GCA GCG }	UCU } Serine UCC UCA UCG }
AGU } Serine AGC }	CGU } Arginine CGC CGA CGG }	GGU } Glycine GGC GGA GGG }	UGU } Cysteine UGC }
AGA } Arginine AGG }			UGA – Stop UGG – Tryptophan
AUU } Isoleucine AUC AUA }	CUU } Leucine CUC CUA CUG }	GUU } Valine GUC GUA GUG }	UUU } Phenylalanine UUC }
AUG – Methionine			UUA } Leucine UUG }

a) Given the DNA sequence **CACGTATGCAAATT**, use the table above to describe the primary structure of the protein it would transcribe.

b) A strand of DNA has the following bases: **CACGGCC**

If the adenine base was deleted, which amino acids would be coded for?

A. valine, proline B. glycine, alanine C. proline, arginine D. glycine, arginine

c) Determine the sequence of amino acids produced by this DNA sequence: GGAGTTTTTC

A. Proline, Valine, Lysine. B. Glycine, Valine, Leucine. C. Proline, Glutamine, Lysine. D. Glycine, Glutamic acid, Leucine.

d) A tRNA molecule with the anticodon GCU would be carrying the amino acid

A. valine. B. alanine. C. tyrosine. D. arginine.

e) If the code for an amino acid is AGC on the DNA molecule, the anticodon on the tRNA would be

A. AGC B. TGC C. UCG D. UGC

f) If the triplet code on a DNA molecule changes from ACT to AGC, the result is called

A. mutation. B. metastasis. C. translation. D. transcription.

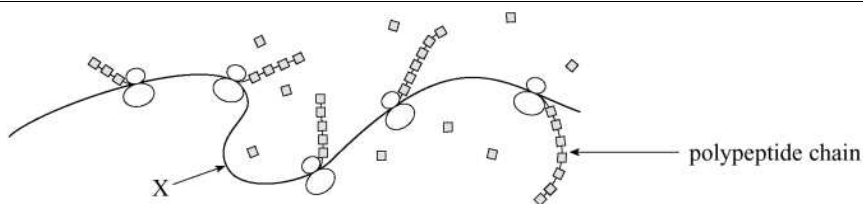
g) Read the strand of DNA from left to right: T G A G C G C C T A A A T T

a) Give the order of the bases in the m-RNA strand that would be transcribed from the above section of DNA. (1 mark)

b) Give the sequence of amino acids in the protein molecule that is synthesized from the above sequence of DNA. (2 marks)

c) If the underlined base C is deleted, what effect will this have on the protein being synthesized? (1 mark)

6.



The molecule represented by the line labelled **X** is

- A. DNA.
- B. tRNA.
- C. rRNA.
- D. mRNA.

7.

A section of DNA has the following sequence of nitrogenous bases:

CGAT T ACAG

Which of the following sequences would be produced as a result of transcription?

A. CGTUUTCTG B. GCTAATGTC C. CGAUUACAG D. GCUA AUGUC

8. Demonstrate your understanding of the structure of DNA by describing the following features of the DNA molecule. You may use drawings in your answers.
- Describe the **shape** of the DNA molecule. (1 mark)
 - Describe the **structure** of the strands (backbone) of DNA. (1 mark)
 - Describe** complementary base pairing. (1 mark)
 - Describe** the bonding that occurs between bases. (1 mark)

9.
 - Define recombinant DNA. (1 mark)
 - Describe **two** uses for recombinant DNA. (2 marks)

10. State **one** role for each of the following molecules in the process of protein synthesis. (3 marks)
- DNA:
 - mRNA:
 - tRNA:

11. Complete the following table comparing DNA and RNA. (3 marks: 1 mark each)

	DNA	RNA
Bases	C, G, A, T	
Location in cell		nucleus and cytoplasm
Number of strands	2	

12. Give **one** role of each of the following in the process of translation. (3 marks: 1 mark each)
- tRNA:
 - Ribosome:
 - mRNA:

13. The process shown in the diagram is A. hydrolysis. B. translation. C. replication. D. transcription.

14. Give **one** role of each of the following in the production of a protein. (4 marks: 1 mark each)
- DNA:
 - mRNA:
 - tRNA:
 - rRNA:

15. List **three** ways in which mRNA is different from DNA. (3 marks)

16.
 - Under experimental conditions, cells grown in a medium containing thymine would incorporate thymine into their DNA. If cells grown for a number of generations in a medium containing radioactive thymine were removed from this medium and allowed to replicate once using thymine that was not radioactive, what percent of these cells would now be radioactive?
A. 0% B. 25% C. 50% D. 100%

b) DNA replication involves the breaking of bonds between
 A. bases. B. sugars and bases. C. phosphates and bases. D. sugars and phosphates.

c) When a foreign gene is incorporated into an organism's nucleic acid, the resulting molecule is called
 A. ATP. B. recombinant DNA. C. transfer RNA (tRNA). D. messenger RNA (mRNA).

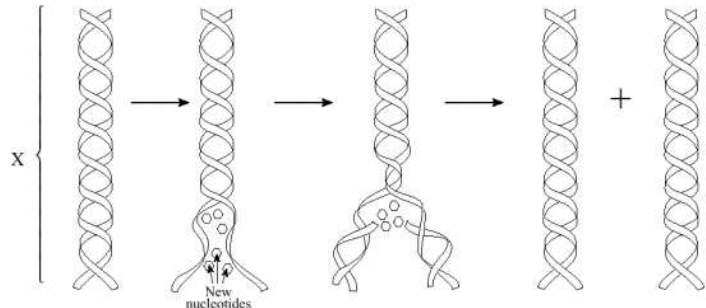
17.
 1. Uracil bonds with adenine.
 2. Complementary bonding between codon and anticodon.
 3. DNA unzips.
 4. mRNA joins with ribosome.

The correct order of the above during protein synthesis is

- A. 1, 2, 4, 3 B. 1, 3, 2, 4 C. 3, 1, 4, 2 D. 3, 2, 1, 4

18. a) Describe DNA replication. (3 marks)

19. a) Name the molecule indicated by X. (1 mark)
- b) Where in a human cell does the process shown above occur? (1 mark)
- c) List two functions of molecule X. (2 marks: 1 mark each)

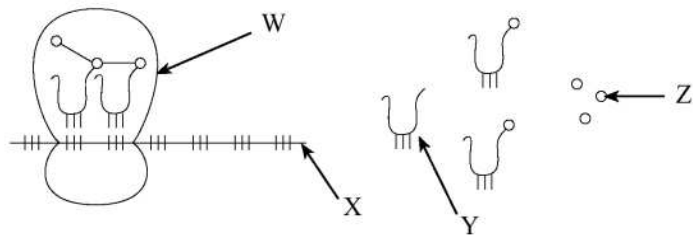


20. In paragraph form, explain how each of the following is involved in protein synthesis. (6 marks)

- DNA • ribosome
- mRNA • peptide bond
- tRNA • amino acid

21. The diagram above shows a part of the process of protein synthesis.

- a) Identify the following labelled structures. (4 marks)
- b) Name the part of protein synthesis represented by the diagram above. (1 mark)
- c) Where in the cell is X synthesized? (1 mark)



22. Describe the process of:
 - a) transcription. (1 mark)
 - b) translation. (1 mark)

23. a) Describe the three steps of DNA replication. (3 marks)
- b) Where in the cell does DNA replication occur? (1 mark)
- c) What is the purpose of DNA replication? (1 mark)
- d) Which base is found in DNA but not in RNA? (1 mark)

24. a) Outline the function of each of the following during protein synthesis: i) DNA ii) mRNA ii) tRNA
- b) List two factors that could cause changes in the type of protein formed. Explain why each factor causes a change in the protein formed. (2 marks)

25. a) List the events which occur during the replication (copying) of DNA. (4 marks)
- b) Why does DNA replication occur before cell division? (1 mark)

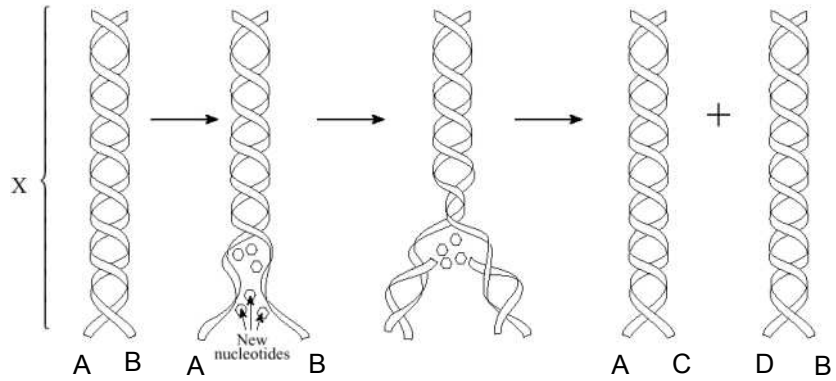
26. Discuss how the mutation of a single nucleotide base can cause the synthesis of an abnormal protein. Your answer should include a detailed explanation of protein synthesis. (8 marks)

27. a) Give the location of the following processes in the cell: i) transcription (1 mark) ii) translation (1 mark)
- b) What is the role of mRNA in transcription? (1 mark)
- c) What is the role of mRNA and tRNA in translation? (2 marks)

28. Due to a mutation, one base pair is lost from a DNA molecule. Describe the effect this mutation has on the protein being synthesized. (1 mark)

29. Describe the role of each of the following in protein synthesis: (5 marks) a) DNA b) mRNA c) tRNA d) ribosome e) peptide bond

30. a) Name the process shown in the diagram. (1 mark) b) Give the letter of the strand that is identical to strand A. (1 mark) c) Give the purpose of this process and give a location in the cell where this process occurs.



31.

	<u>DNA</u>	<u>RNA</u>
Name of sugar		
Nitrogen base present		
Shape of the molecules		
One function in the cell		

Give the differences between DNA and RNA in terms of: a) name of sugar b) nitrogen base present c) shape of the molecules d) one function in the cell (4 marks: 1/2 mark for each box)

32.

	<u>DNA</u>	<u>RNA</u>
Number of strands		
Role in protein synthesis		
Nitrogenous bases		

Compare DNA and RNA by giving the differences for the following: (3 marks: 1/2 marks each)

PART C: ANSWER KEY FOR PART A

DNA & PROTEIN SYNTHESIS

1. B
2. C
3. D
4. B
5. C
6. C
7. C
8. A
9. C
10. A
11. C
12. D
13. D
14. B
15. D
16. B
17. D
18. A
19. A
20. D
21. C
22. C
23. B
24. A
25. A
26. A
27. D

- 28. B
- 29. A
- 30. C
- 31. D
- 32. B
- 33. D