

## Benchmark Test 4

Choose the letter of the best answer.

**1 Many different types of RNA molecules aid in producing proteins. Which RNA molecules carry amino acids to a ribosome?**

- A tRNA
- B mRNA
- C rRNA
- D snRNA

**2 A scientist wants to produce a protein in a test tube. Which combination of components would need to be put into the test tube?**

- A mRNA, tRNA, amino acids, nucleic acids
- B tRNA, amino acids, ribosomes, DNA
- C mRNA, ribosomes, amino acids, proteins
- D mRNA, tRNA, amino acids, ribosomes

**3 What molecule carries genetic information from the nucleus to the cytoplasm in eukaryotes?**

- A tRNA
- B ribosome
- C mRNA
- D DNA

**4 A polypeptide consists of the following chain of amino acids: Phe-Leu-Asn-Arg. Which mRNA sequence could code for this polypeptide?**

- A UUUCUUA
- B UUCCUAAAA
- C UUCCUGAACCGG
- D UUACUUAAGCGACAU

**5**

		second base							
		U	C	A	G				
U	UUU	phenylalanine (Phe)	UCU	serine (Ser)	UAU	tyrosine (Tyr)	UGU	cysteine (Cys)	U
	UUC		UCC		UAC		UGC		C
	UUA	leucine (Leu)	UCA		UAA	STOP	UGA	STOP	A
	UUG		UCG		UAG	STOP	UGG	tryptophan (Trp)	G
C	CUU	leucine (Leu)	CCU	proline (Pro)	CAU	histidine (His)	CGU	arginine (Arg)	U
	CUC		CCC		CAC		CGC		C
	CUA		CCA		CAA	glutamine (Gln)	CGA		A
	CUG		CCG		CAG		CGG		G
A	AUU	isoleucine (Ile)	ACU	theonine (Thr)	AAU	asparagine (Asn)	AGU	serine (Ser)	U
	AUC		ACC		AAC		AGC		C
	AUA		ACA		AAA	lysine (Lys)	AGA	arginine (Arg)	A
	AUG	methionine (Met)	ACG		AAG		AGG		G
G	GUU	valine (Val)	GCU	alanine (Ali)	GAU	aspartic acid (Asp)	GGU	glycine (Gly)	U
	GUC		GCC		GAC		GGC		C
	GUA		GCA		GAA	glutamic acid (Glu)	GGA		A
	GUG		GCG		GAG		GGG		G

**Use the table to answer this question. What is the polypeptide chain encoded by the mRNA sequence UUUAUUCCCUAC?**

- A Phe-Tyr-Ser-Leu
- B Phe-Ile-Pro
- C Phe-Ile-Ser-Tyr
- D Phe-Ile-Pro-Tyr

**6 The genetic information found in the nucleus is used to produce proteins in the cytoplasm. What organelle is responsible for translating genetic code into a protein in the cytoplasm?**

- A ribosome
- B DNA
- C Golgi apparatus
- D tRNA

**7 Mutations are changes in genetic information. Which of the following *best* describes a structure in which a mutation might occur?**

- A DNA
- B RNA
- C amino acids
- D ribosomes

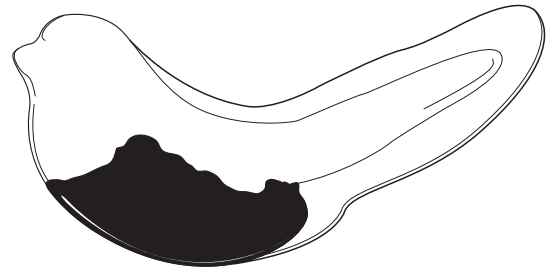
**8 When a single nucleotide is added into a genetic sequence, it is a mutation called an insertion. Which of the following *best* describes how a nucleotide insertion might cause a change in the amino acid sequence?**

- A by occurring frequently
- B by changing the codon
- C by acting on noncoding sequences
- D by existing in somatic cells

**9 Suppose a woman had a mutation that caused skin cancer. She was treated and cured, but she is concerned that she might pass the mutation on to her future children. This is not possible if the mutations that led to the cancer**

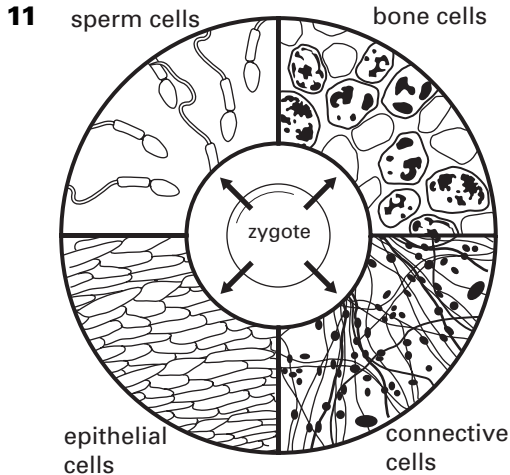
- A happened while she was still young.
- B occurred only in her skin cells.
- C affected her germline cells.
- D did not change her fertility.

**10**



**The darkened area in the tadpole, above, shows where mRNA transcribed from a gene called "Darmin" is found. What is the *most* likely explanation for why this mRNA is not found throughout the tadpole's body?**

- A The gene is absent from some cells.
- B Some cells are younger than others.
- C The gene is expressed in some cells and not in others.
- D Translation is taking place only in certain cells.



**The figure shows different types of cells that arise from an animal zygote. What is the reason that the cells look different?**

- A The cells have different genes.
- B Each cell expresses different genes.
- C Some types of cells are longer-lived than others.
- D The cells have different amino acids.

**12 Which of the following best describes a gene that is "off"?**

- A not transcribed into RNA
- B absent from DNA
- C formed by a mutation
- D expressed in a cell

**13 All of the proteins that are produced by an organism are made up of a small number of amino acids. Which of the following best explains how a small number of amino acids can give rise to thousands of different proteins?**

- A Proteins have unique combinations of amino acids.
- B The number of amino acids differs among proteins.
- C Proteins have unique numbers and combinations of amino acids.
- D The same amino acids are not found in all proteins.

**14 How many naturally occurring amino acids are found in organisms' proteins?**

- A 10
- B 20
- C 100
- D 500

**15 Suppose a graduate student discovers two proteins. Both proteins have 120 amino acids in their sequences and both are made up of the same 12 amino acids. What must be determined before the student can conclude that they are the same protein?**

- A the size of the proteins
- B the charge of the proteins
- C the number of peptide bonds in the proteins
- D the amino acid sequence of the proteins

**16 RNA is a single-strand of nucleotides. In which cell process do RNA molecules play a *major* role?**

- A carbohydrate secretion
- B ion transport
- C DNA replication
- D protein production

**17 When two strands of nucleotides in a molecule of DNA separate during replication, which of the following functions do the nucleotides on each strand provide?**

- A They make exact copies of themselves.
- B They act as a template for a new strand of DNA.
- C They rearrange themselves into a new order.
- D They attract amino acids that form proteins.

**18 Suppose a researcher wants to produce RNA from a DNA template. The researcher puts DNA into a test tube. Which free-floating nucleotides should be added to the test tube to produce RNA?**

- A A, C, G, T
- B A, C, G, U
- C A, G, T, U
- D C, G, T, U

**19**



**Based on the structure of the molecule in the figure, what is it *most* likely to be?**

- A a protein
- B DNA
- C mRNA
- D an enzyme

**20 If a molecule of DNA has one strand with the sequence AACTAAGGC, what is the sequence of the other (complementary) strand?**

- A UUCAUUGGC
- B GGTCGGAAT
- C CCAGCCUUA
- D TTGATTCCG

**21 An mRNA molecule has the sequence UGCAUUGCAA. What is the DNA sequence from which it was transcribed?**

- A ACGUAACGUU
- B TCGTTTCGTT
- C ACGTAACGTT
- D TCGUTTTCGUU

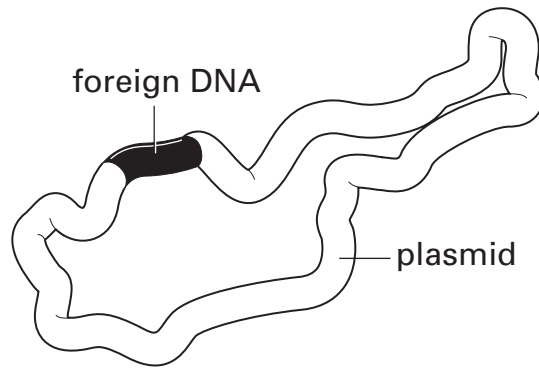
**22 DNA replication results in two identical DNA molecules. What is true for these molecules?**

- A Each has one new DNA strand.
- B One has two new DNA strands.
- C Both have two new DNA strands.
- D Neither has a new DNA strand.

**23 Restriction enzymes are naturally occurring enzymes found in bacteria. Scientists use restriction enzymes to cut genetic material into smaller pieces during genetic engineering. What molecules do restriction enzymes cut?**

- A carbohydrates
- B DNA
- C RNA
- D proteins

**24**



**Recombinant DNA is DNA that contains genes from more than one organism. The figure here shows a plasmid that contains genes from another organism. Which of the following organisms did the plasmid *most likely* come from?**

- A a plant
- B a bacterium
- C an animal
- D a protist

**25 Scientists have produced bacteria that have the gene that produces human growth hormone (hGH). These bacteria are able to make hGH protein in large amounts. Bacteria such as these were produced by**

- A genetic recombination.
- B genetic engineering.
- C genetic therapy.
- D gene expression.