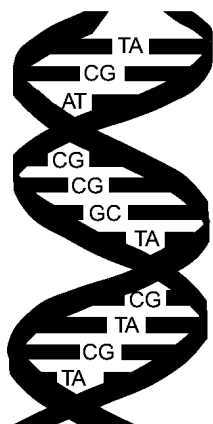
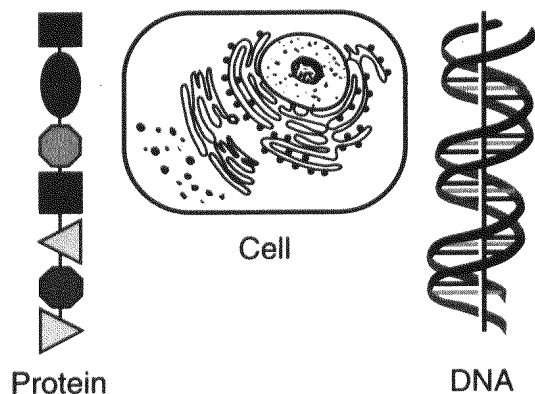


1. Base your answer to the following question on The type of molecule represented below is found in organisms.



Which statement correctly describes the sequence of bases found in this type of molecule?

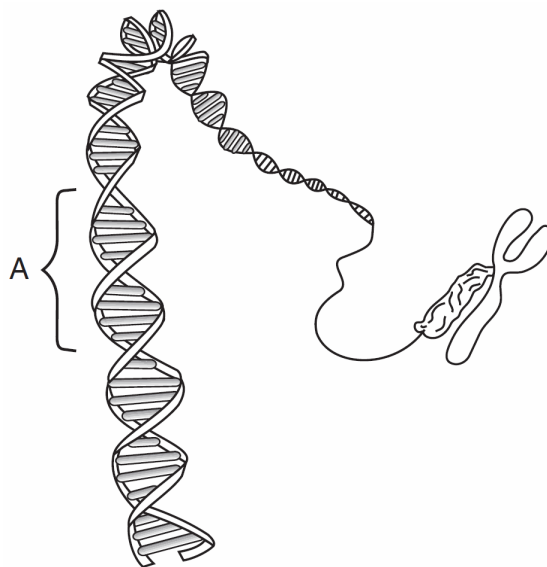
- A) It changes every time it replicates.
 B) It determines the characteristics that will be inherited.
 C) It is exactly the same in all organisms.
 D) It directly controls the synthesis of starch within a cell.
2. Base your answer to the following question on Three structures are represented in the diagram below.



What is the relationship between these three structures?

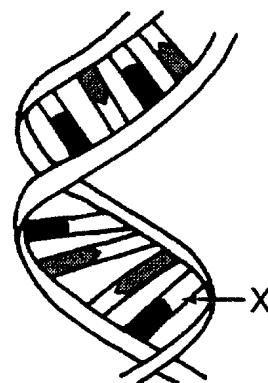
- A) DNA is made up of proteins that are synthesized in the cell.
 B) Protein is composed of DNA that is stored in the cell.
 C) DNA controls the production of protein in the cell.
 D) The cell is composed only of DNA and protein.

3. The diagram below represents a structure found in most cells.



The section labeled *A* in the diagram is most likely a

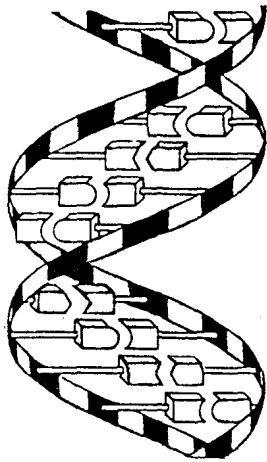
- A) protein composed of folded chains of base subunits
 B) biological catalyst
 C) part of a gene for a particular trait
 D) chromosome undergoing a mutation
4. The diagram below represents a portion of a nucleic acid molecule.



The part indicated by arrow *X* could be

- A) adenine B) ribose
 C) deoxyribose D) phosphate
5. If 15% of a DNA sample is made up of thymine, T, what percentage of the sample is made up of cytosine, C?
- A) 15% B) 35% C) 70% D) 85%

6. Base your answer to the following question on Which scientists developed the molecular model represented below?



- A) Mendel and Darwin
 B) Watson and Crick
 C) Lamarck and Weismann
 D) Miller and Fox
7. Four different segments of a DNA molecule are represented below.

Segment 1	Segment 2	Segment 3	Segment 4
T-A-G-G-C	G-G-T-G-A	G-A-T-T-A	C-A-A-T-G
A-T-C-C-G	C-C-A-C-T	C-C-A-A-T	G-T-T-A-C

There is an error in the DNA molecule in

- A) segment 1, only B) segment 3, only
 C) segments 2 and 3 D) segments 2 and 4
8. The instructions for the traits of an organism are coded in the arrangement of
- A) glucose units in carbohydrate molecules
 B) bases in DNA in the nucleus
 C) fat molecules in the cell membrane
 D) energy-rich bonds in starch molecules
9. The coded information of a DNA molecule is determined by the
- A) sequence of amino acids
 B) number of ribose units
 C) sequence of the nitrogenous bases
 D) sequence of the sugar-phosphate units

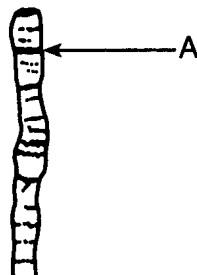
10. The diagram below represents genetic material.



The expression of the section labeled X may be modified by

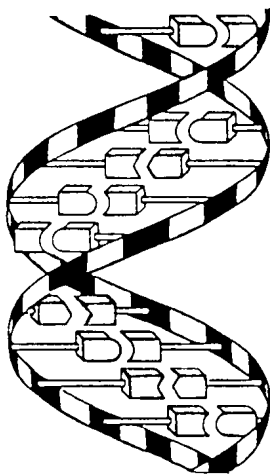
- A) temperature, only
 B) asexual reproduction
 C) the environment
 D) pH, only
11. In addition to a phosphate group, a DNA nucleotide could contain
- A) thymine and deoxyribose
 B) uracil and deoxyribose
 C) thymine and ribose
 D) uracil and ribose
12. Which pair of molecules, when bonded together, would most likely be found in a nucleotide of DNA?
- A) ribose and adenine
 B) ribose and thymine
 C) deoxyribose and guanine
 D) deoxyribose and uracil
13. When bonded together chemically, deoxyribose, phosphate, and an adenine molecule make up
- A) a DNA nucleotide
 B) an RNA nucleotide
 C) a DNA molecule
 D) an RNA molecule
14. Which is the sugar component of a DNA nucleotide?
- A) adenine B) deoxyribose
 C) glucose D) phosphate

15. The diagram below represents a portion of a chromosome of a fruit fly.



What would most likely be located at area *A*?

- A) centrioles B) spindle fibers
C) nucleolus D) nucleic acid
16. Base your answer to the following question on



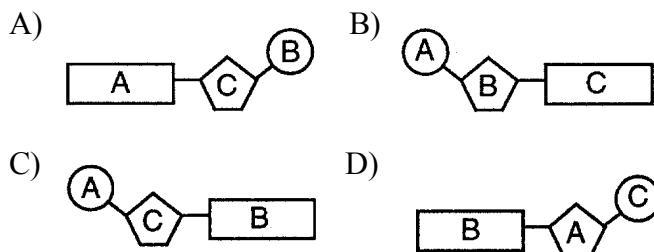
In the diagram of a polymer above, the repeating subunits are known as

- A) amino acids B) polysaccharides
C) nucleotides D) fatty acids
17. Which molecule is correctly paired with its building blocks?
- A) cellulose – polypeptides
B) DNA – nucleotides
C) protein – monosaccharides
D) fat – disaccharides
18. What do the letters *A*, *G*, *C*, and *T* represent in nucleotides?
- A) phosphate groups
B) deoxyribose sugars
C) nitrogenous bases
D) ribose sugars

19. The parts of a DNA nucleotide are indicated in the chart below by letters *A*, *B*, and *C*. An X indicates which chemical elements are present in each part.

DNA Nucleotide Parts	Elements				
	C	O	H	N	P
<i>A</i>		X	X		X
<i>B</i>	X	X	X		
<i>C</i>	X	X	X	X	

Which diagram best represents a DNA nucleotide.



20. Base your answer to the following question on the "help-wanted advertisements" below and on your knowledge of biology.

Job A

Accuracy and Speed vital for this job in the field of translation. Applicants must demonstrate skills in transporting and positioning amino acids. Salary commensurate with experience.

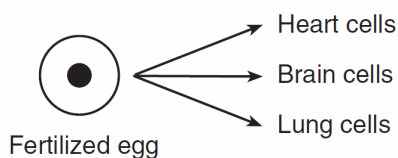
Job B

Executive Position available. Must be able both to maintain genetic continuity through replication and to control cellular activity by regulation of enzyme production. Limited number of openings. All benefits.

Which "applicant" would qualify for job *B*?

- A) DNA B) messenger RNA
C) transfer RNA D) ADP
21. When DNA separates into two strands, the DNA would most likely be directly involved in
- A) replication B) fertilization
C) differentiation D) evolution

22. The diagram below represents a process that occurs during normal human development.



Which statement is correct regarding the cells and DNA?

- A) All the cells have identical DNA.
- B) The DNA of the fertilized egg differs from the DNA of all the other cells.
- C) The DNA of the fertilized egg differs from some, but not all, of the other cells.
- D) Only the fertilized egg contains DNA.

23. Genes involved in the production of abnormal red blood cells have an abnormal sequence of

- A) ATP molecules B) amino acids
- C) sugars D) bases

24. Which characteristic distinguishes a DNA molecule from a protein molecule?

- A) can replicate itself
- B) can be very large
- C) is found in cytoplasm
- D) is composed of subunits

25. One similarity between DNA and messenger RNA molecules is that they both contain

- A) the same sugar
- B) genetic codes based on sequences of bases
- C) a nitrogenous base known as uracil
- D) double-stranded polymers

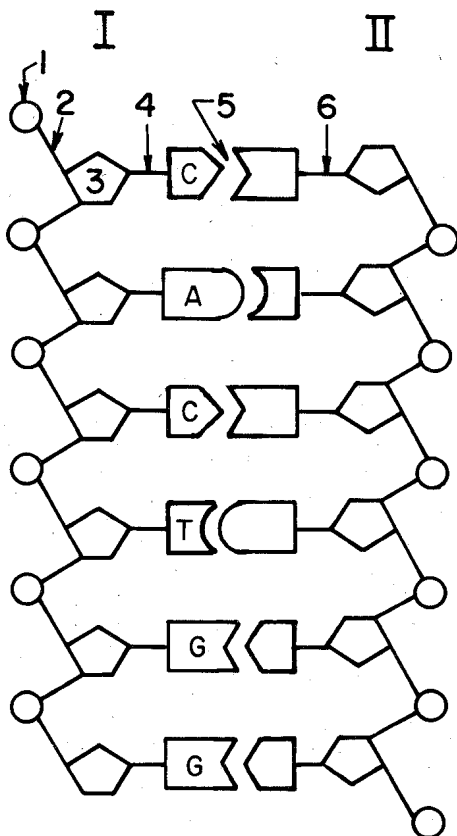
26. A certain protein is found in mitochondria, chloroplasts, and bacteria. Which similarity does this provide evidence for?

- A) They have some similar DNA base sequences.
- B) They can use carbon dioxide to make proteins.
- C) They digest proteins into simple sugars.
- D) They contain certain pathogenic microbes.

27. A sudden change in the DNA of a chromosome can usually be passed on to future generations if the change occurs in a

- A) skin cell B) liver cell
- C) sex cell D) brain cell

Base your answers to questions 28 and 29 on the diagram below which represents a portion of a double-stranded DNA molecule and on your knowledge of biology.

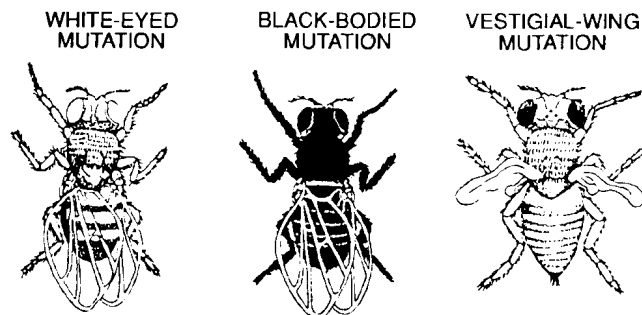


28. The model of DNA represented in the diagram was developed by
- Hardy and Weinberg
 - Miller and Fox
 - Watson and Crick
 - Weismann and Lamarck
29. Which process takes place before mitosis occurs in a cell containing this DNA?
- Hydrogen bonds at 6 break and one double-stranded DNA molecule results.
 - Hydrogen bonds at 5 break and two double-stranded DNA molecules are synthesized.
 - Covalent bonds at 2 and 6 break and one double-stranded DNA molecule results.
 - Covalent bonds at 4 break and two double-stranded DNA molecules are synthesized.

30. Which statement is true regarding an alteration or change in DNA?

- It is always known as a mutation.
- It is always advantageous to an individual.
- It is always passed on to offspring.
- It is always detected by the process of chromatography.

31. The diagram below illustrates differences that occur in fruit flies.



These differences could have been caused by

- hydrogen bonds breaking in the process of DNA replication
 - random errors occurring in the process of DNA replication
 - the substitution of ribose for deoxyribose in RNA
 - the substitution of uracil for thymine in RNA
32. Base your answer to the following question on the list of genetic changes. Choose from the list below that is best described by that statement.

Genetic Changes

- Translocation
- Addition
- Deletion
- Gene mutation

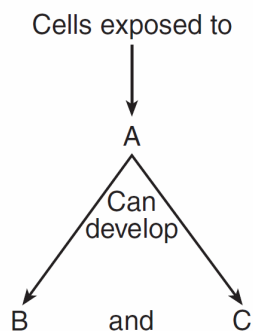
A random change in the base sequence of DNA results in an alteration of a polypeptide.

- A) 1 B) 2 C) 3 D) 4

33. A change in the base sequence of DNA is known as

- a gene mutation
- a karyotype
- nondisjunction
- polyploidy

34. The diagram below can be used to illustrate cellular changes.



Which row of terms in the chart below best completes the diagram?

Row	A	B	C
(1)	atmospheric oxygen	mutations	increased mitochondria
(2)	radiation	cancer	mutations
(3)	salt water	more cytoplasm	two nuclei
(4)	less sunlight	extra genes	decreased mutations

A) 1 B) 2 C) 3 D) 4

35. Coded instructions that are passed from one generation to the next can be most directly changed by the processes of

- A) passive transport, natural selection, and synthesis
- B) selective breeding, replication, and absorption
- C) recombination, mutation, and genetic engineering
- D) evolution, reproduction, and digestion

36. In the portions of the DNA molecules below, *X* represents the base sequence of strand I in the original DNA molecule, and *Y* represents the base sequence of strand I in the newly formed DNA molecule.

X: A–T–G–C–C–A–T–A–G

Y: A–T–G–C–C–A–A–T–G

The base sequence in *Y* is an example of

- A) polyploidy
- B) a chromosome deletion
- C) a gene mutation
- D) translocation

37. The ozone layer of Earth's atmosphere helps to filter ultraviolet radiation. As the ozone layer is depleted, more ultraviolet radiation reaches Earth's surface. This increase in ultraviolet radiation may be harmful because it can directly cause

- A) photosynthesis to stop in all marine organisms
- B) abnormal migration patterns in waterfowl
- C) mutations in the DNA of organisms
- D) sterility in most species of mammals and birds

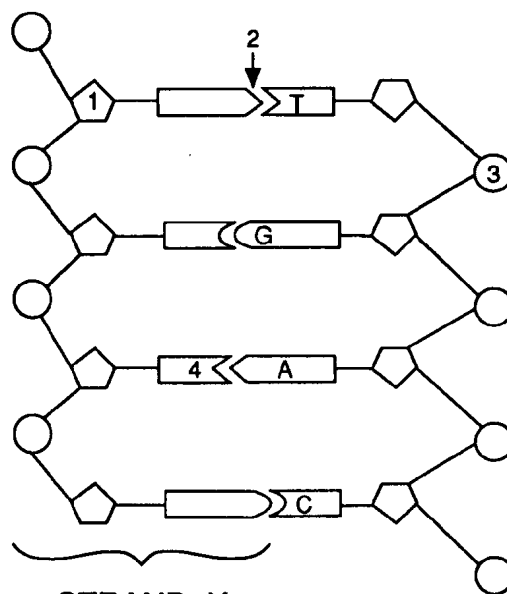
38. Which row in the chart below best describes what happens when some DNA bases are deleted from a gene?

Row	Gene	Trait Controlled By the Original DNA
(1)	is not changed	is never changed
(2)	is not changed	may be changed
(3)	is changed	is never changed
(4)	is changed	may be changed

A) 1 B) 2 C) 3 D) 4

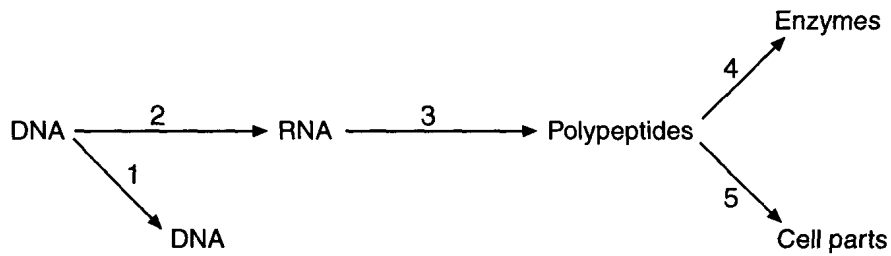
39. What will happen if a base sequence of a strand of DNA is changed from A–T–G to A–T–C?
- The m-RNA will be changed from U–A–C to U–A–G.
 - The t-RNA will be changed from U–A–C to T–A–C.
 - The m-RNA will be changed from T–U–C to T–U–G.
 - The t-RNA will be changed from C–A–U to C–A–C.
40. Which base is normally used in the synthesis of RNA but *not* in the synthesis of DNA?
- adenine
 - uracil
 - cytosine
 - guanine
41. Base your answer to the following question on What is the complementary messenger-RNA sequence for the DNA sequence shown below?
- C A A G G T
- └─┴─┴─┴─┴─┘
- C-A-A-G-G-U
 - G-T-T-C-C-A
 - G-U-U-C-C-A
 - C-A-A-G-G-T
42. In the synthesis of proteins, what is the function of messenger-RNA molecules?
- They act as a template for the synthesis of DNA.
 - They carry information that determines the sequence of amino acids.
 - They remove amino acids from the nucleus.
 - They carry specific enzymes for dehydration synthesis.
43. What is the sequence of subunits in a protein most directly dependent on?
- the region in the cell where enzymes are produced
 - DNA in the chromosomes in a cell
 - the type of cell in which starch is found
 - kinds of materials in the cell membrane
44. The DNA of a human cell can be cut and rearranged by using
- a scalpel
 - electrophoresis
 - hormones
 - enzymes

Base your answers to questions 45 through 48 on the diagram below of a DNA molecule and on your knowledge of biology.



45. Structure 3 represents a
- phosphate
 - deoxyribose sugar
 - ribose sugar
 - base
46. Which activity occurs in the process of replication?
- Structure 1 is hydrolyzed.
 - A chemical bond is broken in region 2.
 - Structure 3 is synthesized.
 - Proteins are formed in region 2.
47. The base sequence of strand X is
- C-A-T-G
 - A-C-G-T
 - A-C-T-G
 - G-C-T-A
48. Which substances would *not* be found in RNA?
- 1 and 4
 - 1 and C
 - 3 and 1
 - 3 and G
-
49. Which concept provides an explanation for the process by which cellular activities are indirectly controlled by the nucleus?
- one gene–one polypeptide hypothesis
 - fluid-mosaic model
 - theory of evolution
 - heterotroph hypothesis

Base your answers to questions **50** through **52** on the diagram below, which contains arrows representing different processes occurring in a cell.



50. Which processes occur in the nucleus?

- A) 1 and 2 B) 2 and 3 C) 3 and 4 D) 4 and 5

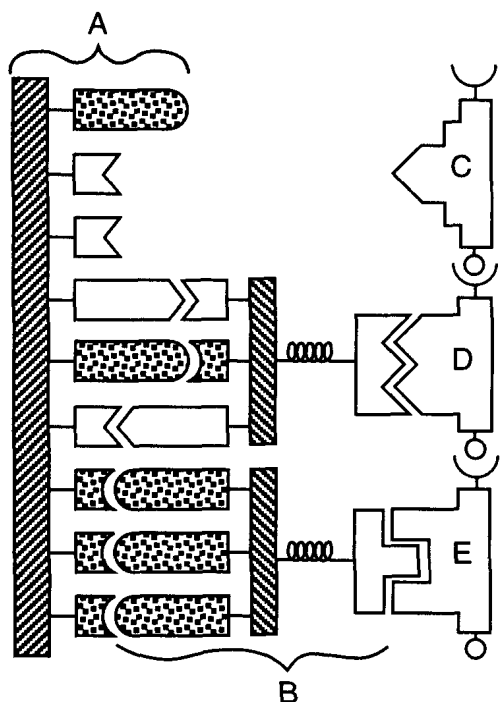
51. What is the product of process 3?

- A) a strand of DNA B) two complementary strands of DNA
C) a strand of RNA D) a chain of amino acids

52. What is Process 1 known as?

- A) replication B) mutation C) nondisjunction D) translocation

Base your answers to questions **53** and **54** on the diagram below, which represents some components involved in cellular protein synthesis, and on your knowledge of Biology.



53. What does Structure B represent a molecule of?

- A) nuclear DNA B) cytoplasmic DNA
C) ribosomal RNA D) transfer RNA

54. How many codons are located on the messenger RNA molecule in the diagram?

- A) 1 B) 6 C) 3 D) 9

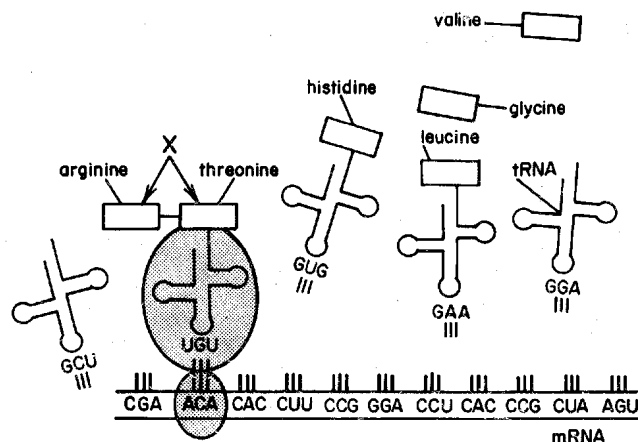
55. During protein synthesis, amino acids in the cytoplasm are picked up by molecules of

- A) transfer RNA
B) messenger RNA
C) mitochondrial DNA
D) nuclear DNA

56. Breeders have developed corn with 15-foot stalks and pumpkins weighing 300 pounds. Which method did these breeders most likely use to develop these new varieties?

- A) regeneration B) natural selection
C) artificial selection D) grafting

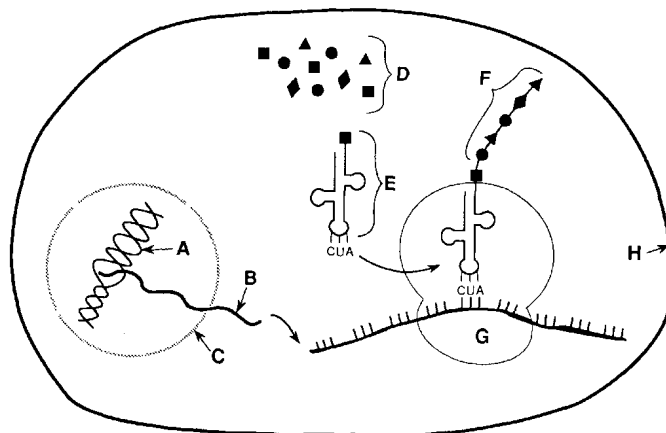
57. Base your answer to the following question on the diagram below of a biochemical process that occurs within cells and on your knowledge of biology.



The process represented in the diagram is

- A) lipid digestion B) cell respiration
C) protein synthesis D) protein hydrolysis

Base your answers to questions **58** and **59** on the diagram below which represents protein synthesis within a cell and on your knowledge of biology.



58. Which letter indicates the building blocks of a protein?

- A) E B) B C) G D) D

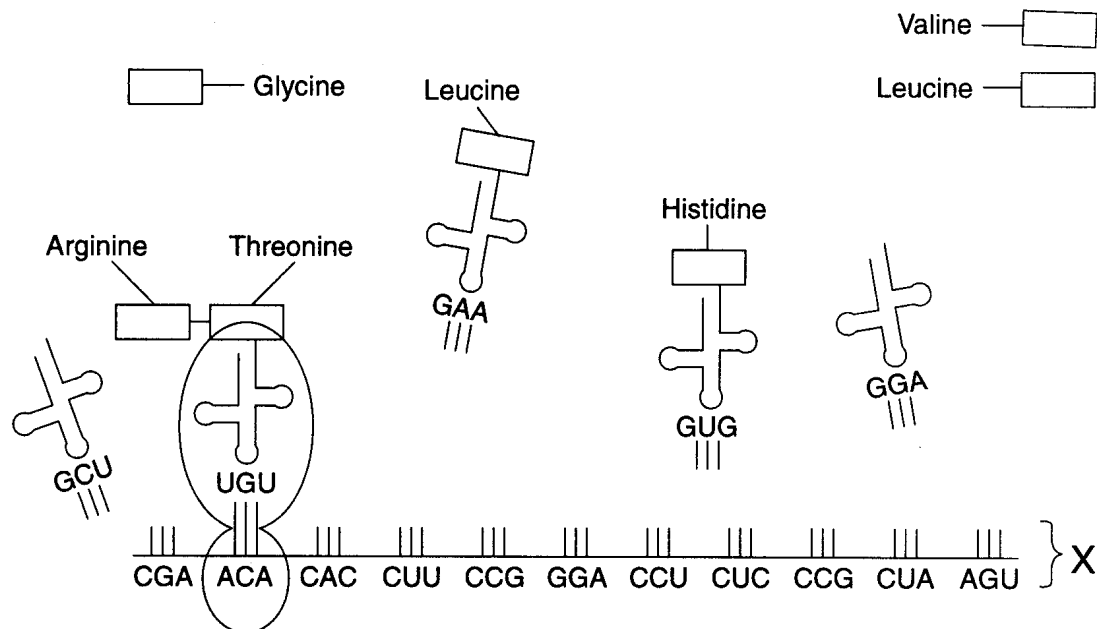
59. Which letter indicates the site of protein synthesis?

- A) G B) H C) C D) D

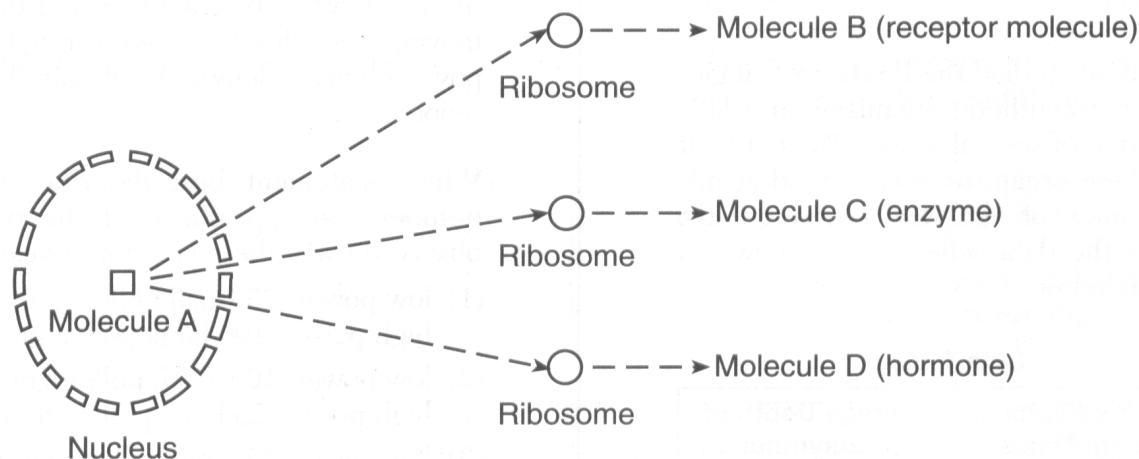
60. Which laboratory procedure has made possible the development of bacteria that can synthesize human insulin?

- A) karyotyping
B) genetic engineering
C) amniocentesis
D) screening of body fluids

Base your answers to questions **61** and **62** on the diagram below of a biochemical process and on your knowledge of biology.



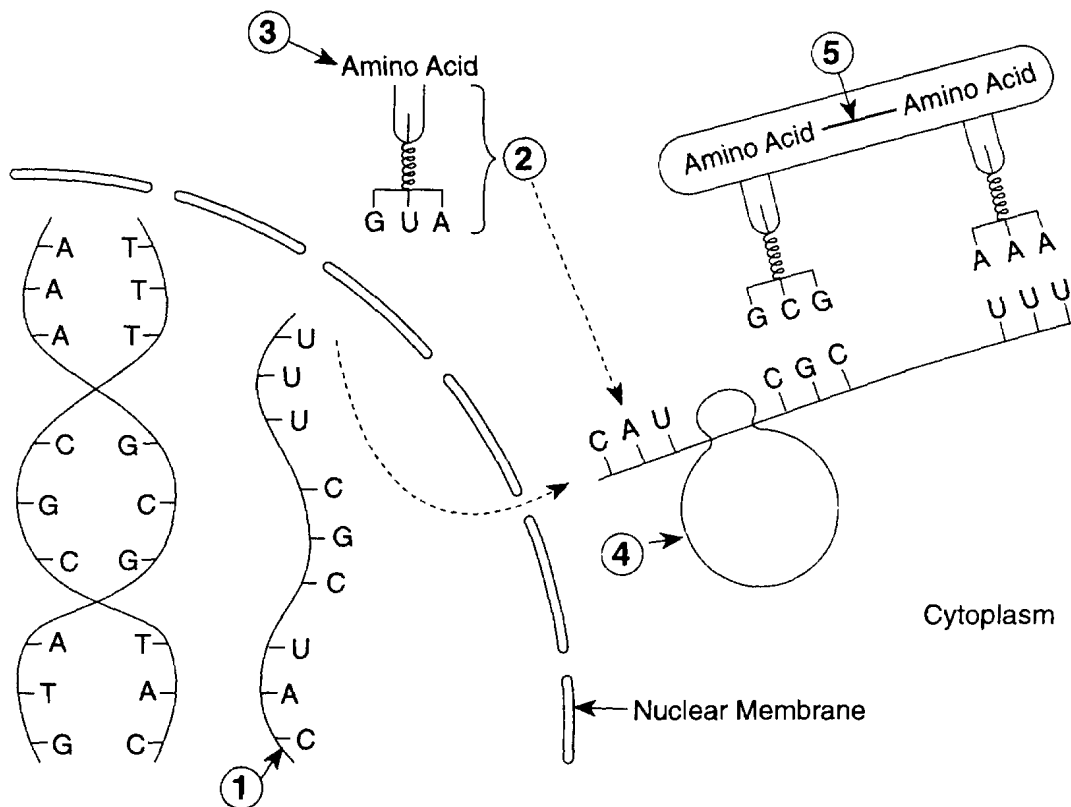
61. Which amino acid would be transferred to the position of codon CAC?
- A) leucine B) glycine C) valine D) histidine
62. The synthesis of structure *X* occurred in the
- A) nucleus B) cytoplasm C) lysosome D) vacuole
63. Base your answer to the following question on the diagram below, which represents a sequence of events in a biological process that occurs within human cells and on your knowledge of biology.



How are molecules B, C, and D similar?

- A) they are usually composed of genetic information
- B) they are usually involved in the synthesis of antibiotics
- C) they are usually composed of amino acids
- D) they are usually involved in the diffusion of oxygen into the cell

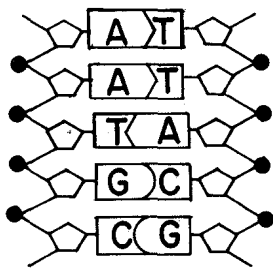
64. Base your answer to the following question on the diagram below, which represents some biochemical reactions involved in a cellular process.



What is the bond labeled 5 known as?

- A) a peptide bond
B) a hydrogen bond
C) an ionic bond
D) a carboxyl bond

Base your answers to questions 65 and 66 on the diagram below which represents a segment of a DNA molecule and on your knowledge of biology.



65. If the segment of DNA represented by the diagram was used as a template in the synthesis of messenger RNA, which sequence represents the order of bases found in the messenger RNA molecule?

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

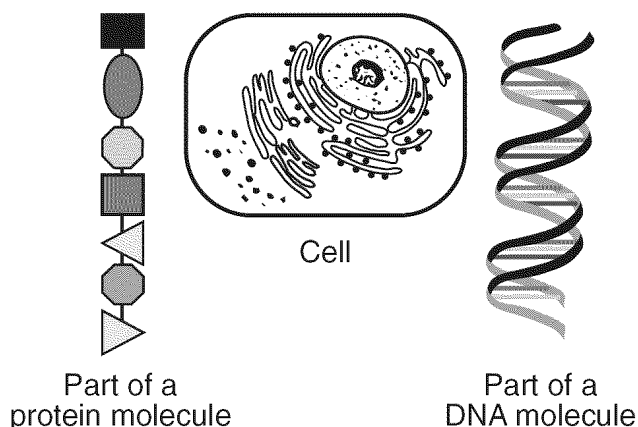
66. This DNA molecule acts as a template for RNA construction in the process of

- A) gene replication
B) protein synthesis
C) osmosis
D) synapsis

67. When humans first domesticated dogs, there was relatively little diversity in the species. Today, there are many variations such as the German shepherd and the dalmatian. This increase in diversity is most closely associated with

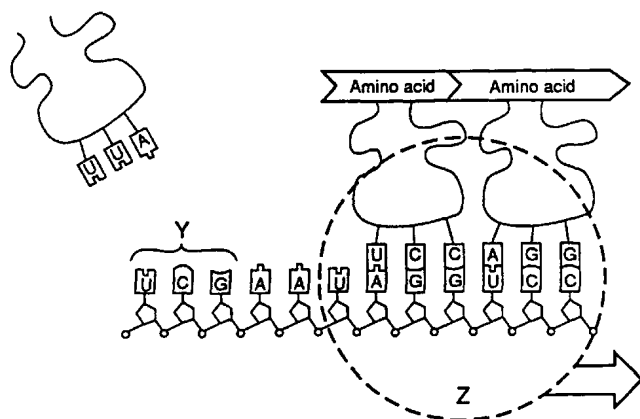
- A) cloning of selected body cells
B) selective breeding
C) mitotic cell division
D) environmental influences on inherited traits

68. Base your answer to the following question on Which statement best expresses the relationship between the three structures represented below?



- A) DNA is produced from protein absorbed by the cell.
 B) Protein is composed of DNA that is produced in the cell.
 C) DNA controls the production of protein in the cell.
 D) Cells make DNA by digesting protein.

Base your answers to questions 69 and 70 on the diagram below which represents a biochemical process that occurs in a cell and on your knowledge of biology.

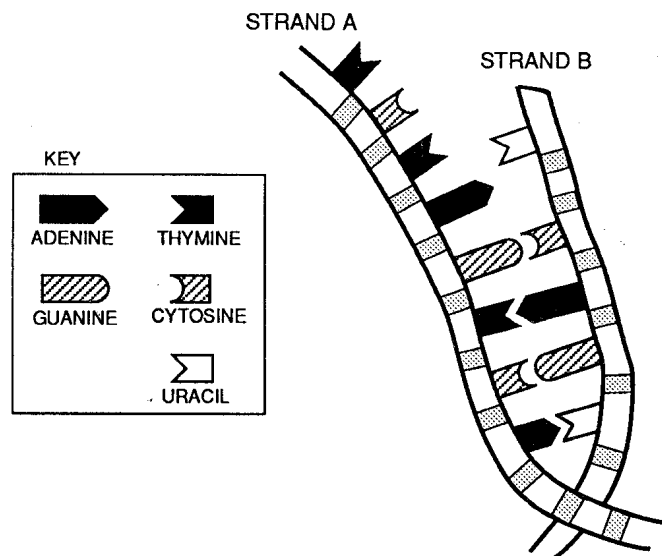


69. The arrangement of the nitrogenous bases at region Y was determined by the
- A) type of amino acids present in the cytoplasm
 B) sequence of nucleotides in DNA
 C) number of ATP molecules in the cytoplasm
 D) concentration of enzyme in region Z

70. The organelle labeled Z represents a

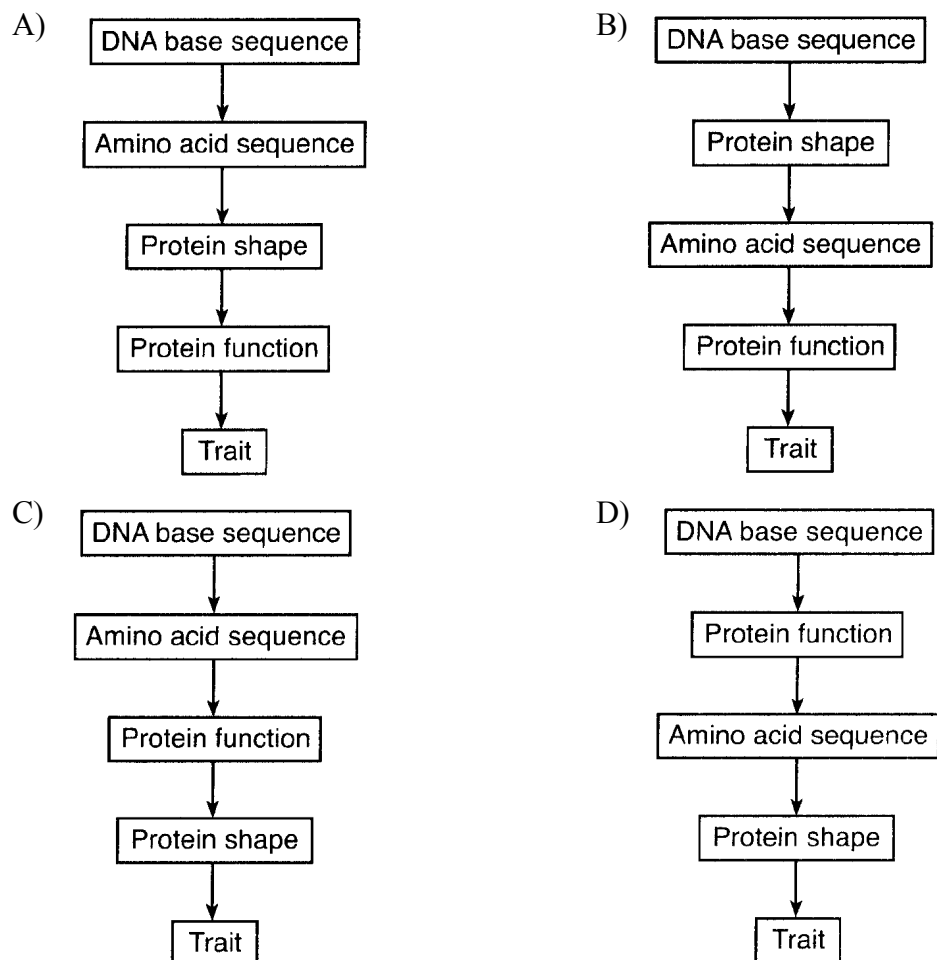
- A) ribosome B) Golgi body
 C) mitochondrion D) nucleus

Base your answers to questions 71 and 72 on the diagram below and on your knowledge of biology.



71. If strand A represents a portion of a DNA molecule, its complementary sequence of nitrogenous bases on messenger RNA would normally be
- A) A-G-A-T-C-A-G-T
 B) T-C-T-A-G-T-C-T
 C) A-G-A-U-C-A-G-U
 D) U-G-U-A-G-U-C-U
72. If the diagram represents a part of the process of protein synthesis, strand A would
- A) serve as a template for the synthesis of messenger RNA
 B) carry a code determined by the original DNA molecule from the nucleus to the cytoplasm
 C) pick up and transfer specific amino acids to the cytoplasm
 D) pick up and transfer nucleic acids to the nucleus

73. Which sequence best represents the relationship between DNA and the traits of an organism?



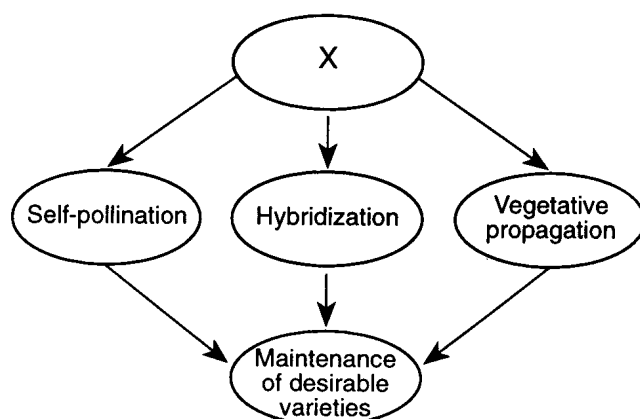
74. One variety of strawberry is resistant to a damaging fungus, but produces small fruit. Another strawberry variety produces large fruit, but is not resistant to the same fungus. The two desirable qualities may be combined in a new variety of strawberry plant by

- A) cloning
- B) asexual reproduction
- C) direct harvesting
- D) selective breeding

75. For centuries, certain animals have been crossed to produce offspring that have desirable qualities. Dogs have been mated to produce Labradors, beagles, and poodles. All of these dogs look and behave very differently from one another. This technique of producing organisms with specific qualities is known as

- A) gene replication
- B) natural selection
- C) random mutation
- D) selective breeding

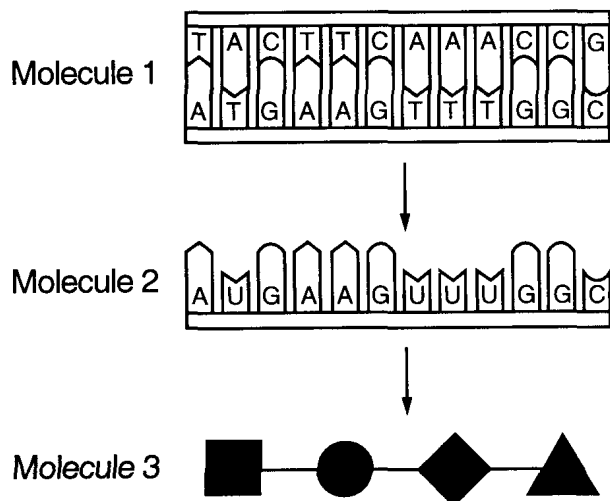
76. The diagram below represents some methods used by plant growers to produce and maintain desirable varieties of plants.



Which term belongs in area X?

- A) use end disuse
- B) artificial selection
- C) synapsis
- D) gradualism

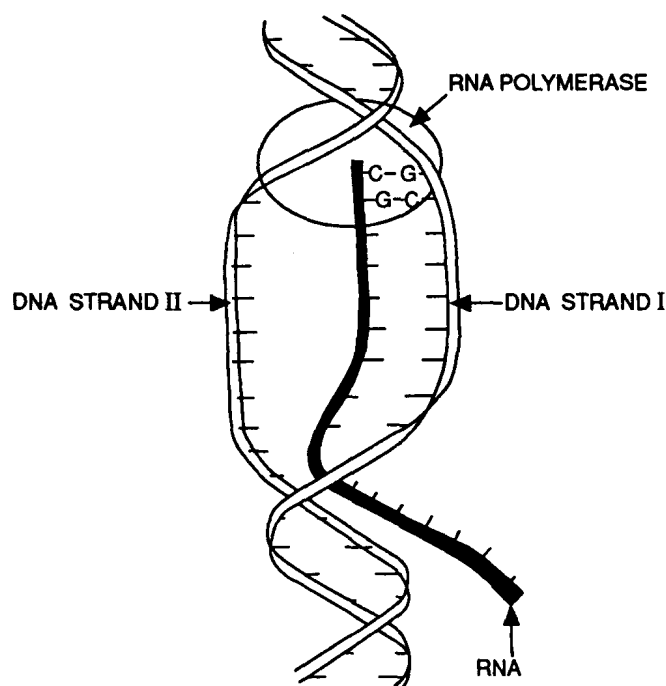
77. Base your answer to the following question on the diagram below and on your knowledge of biology. The diagram represents molecules involved in protein synthesis.



Molecule 3 is formed as a result of

- A) deamination
 - B) dehydration synthesis
 - C) enzymatic hydrolysis
 - D) oxidation
78. In order to produce the first white marigold flower, growers began with the lightest yellow-flowered marigold plants. After crossing them, these plants produced seeds, which were planted, and only the offspring with very light-yellow flowers were used to produce the next generation. Repeating this process over many years, growers finally produced a marigold flower that is considered the first white variety of its species. This procedure is known as
- A) differentiation
 - B) cloning
 - C) gene insertion
 - D) selective breeding
79. Research applications of the basic principles of genetics have contributed greatly to the rapid production of new varieties of plants and animals. Which activity is an example of such an application?
- A) testing new fertilizers on food crops
 - B) selective breeding of plants and animals that exhibit high resistance to disease
 - C) developing new irrigation methods to conserve water
 - D) using natural predators to control insect pests

80. Base your answer to the following question on the diagram below and on your knowledge of biology. The diagram represents a step in protein synthesis.



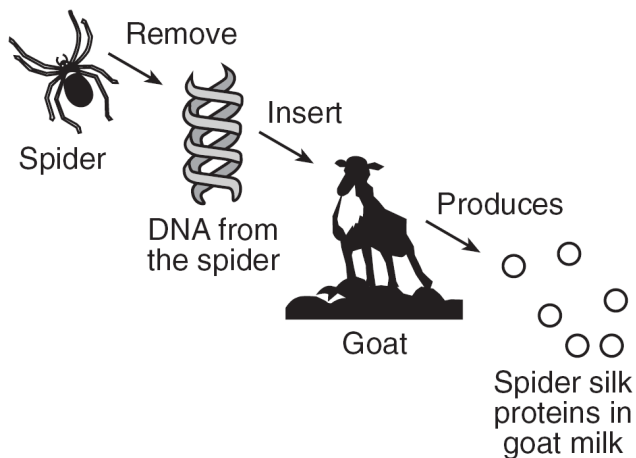
If a sequence of nitrogenous bases on DNA strand I is T-A-G-C-C-T-A, the corresponding sequence on the RNA will be

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

Base your answers to questions **81** and **82** on the information below and on your knowledge of biology.

In 1973, Stanley Cohen and Herbert Boyer inserted a gene from an African clawed frog into a bacterium. The bacterium then began producing a protein directed by the code found on the inserted frog gene.

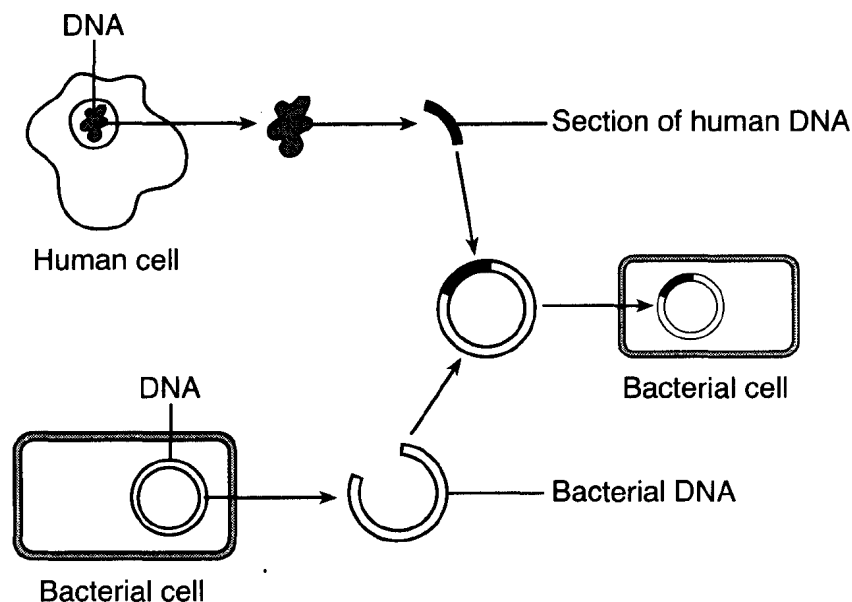
81. Analysis of the DNA from both the frog and the bacterium would reveal that
- A) frog DNA is single stranded, but bacterial DNA is double stranded
 - B) frog DNA contains thymine, but bacterial DNA contains uracil
 - C) DNA from both organisms is composed of repeating nucleotide units
 - D) DNA from both organisms contains the sugar ribose
82. The procedure used by Cohen and Boyer is known as
- A) cloning
 - B) genetic engineering
 - C) karyotyping
 - D) genetic screening
83. Base your answer to the following question on Which process is illustrated in the diagram below?



- A) chromatography
- B) direct harvesting
- C) meiosis
- D) genetic engineering

84. In the United States, there has been relatively little experimentation involving the insertion of genes from other species into human DNA. One reason for the lack of these experiments is that
- A) the subunits of human DNA are different from the DNA subunits of other species
 - B) there are many ethical questions to be answered before inserting foreign genes into human DNA
 - C) inserting foreign DNA into human DNA would require using techniques completely different from those used to insert foreign DNA into the DNA of other mammals
 - D) human DNA always promotes human survival, so there is no need to alter it
85. Which statement best describes human insulin that is produced by genetically engineered bacteria?
- A) This insulin will not function normally in humans because it is produced by bacteria.
 - B) This insulin is produced as a result of human insulin being inserted into bacteria cells.
 - C) This insulin is produced as a result of exposing bacteria cells to radiation, which produces a mutation.
 - D) This insulin may have fewer side effects than the insulin previously extracted from the pancreas of other animals.
86. Plants in species *A* cannot fight most fungal infections. Plants in species *B* make a protein that kills many fungi. One possible way for humans to produce species *A* plants with the ability to synthesize this protein would be to
- A) mutate fungal DNA and introduce the mutated DNA into species *B* using a virus
 - B) add DNA from species *B* into the soil around species *A*
 - C) insert the gene for the protein from species *B* into a chromosome in species *A*
 - D) cross species *A* and a fungus to stimulate the synthesis of this protein

87. The diagram below represents a technique currently used by scientists in the field of biotechnology.



Which statement describes a possible outcome of this technique?

- A) The bacterium is able to produce a human hormone.
- B) It allows the bacterium to grow in humans, since it contains a human gene.
- C) It allows humans to become immune to an infection from this type of bacteria.
- D) The bacterium can now produce human cells identical to cells of the DNA donor.

88. If a gene is inserted into the DNA of a bacterial cell, every cell produced by that cell will have

- A) DNA that is different from that of the other cells produced
- B) a 50% chance of having a copy of the inserted gene
- C) a copy of the inserted gene
- D) a new type of DNA base

89. A scientist claimed that he had cloned a guinea pig to produce two offspring, a male and a female. The claim is *not* valid because

- A) guinea pigs can reproduce both sexually and asexually
- B) the two offspring are not identical copies of the original guinea pig
- C) each of the offspring had half the genetic information of the original guinea pig
- D) none of the genetic information came from the original guinea pig

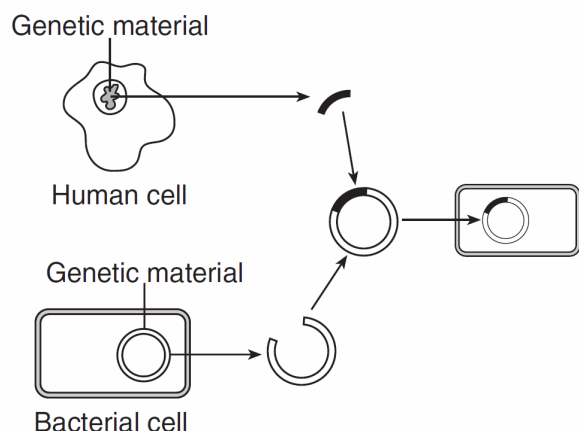
90. What prevents scientists from cloning humans despite the fact that other mammals such as sheep have been cloned?

- A) the technology to clone humans has not been explored
- B) human reproduction is very different from that of other mammals
- C) there are many ethical problems involved in cloning humans
- D) cloning humans would take too long

91. Certain chemicals, such as cytochrome C, are found within cells of all living organisms. The biochemical structure of cytochrome C in ground finches and in tree finches is very similar. This suggests that tree finches and ground finches have

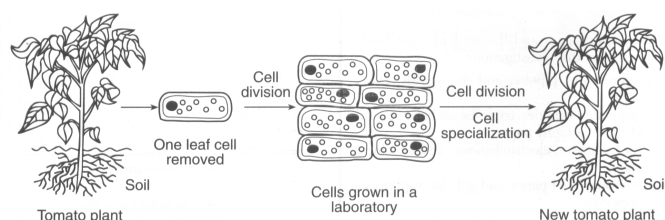
- A) identical DNA
- B) a common ancestor
- C) evolved at the same time
- D) the same nesting site

92. A laboratory technique is represented in the diagram below.



Which knowledge was needed to develop this technique?

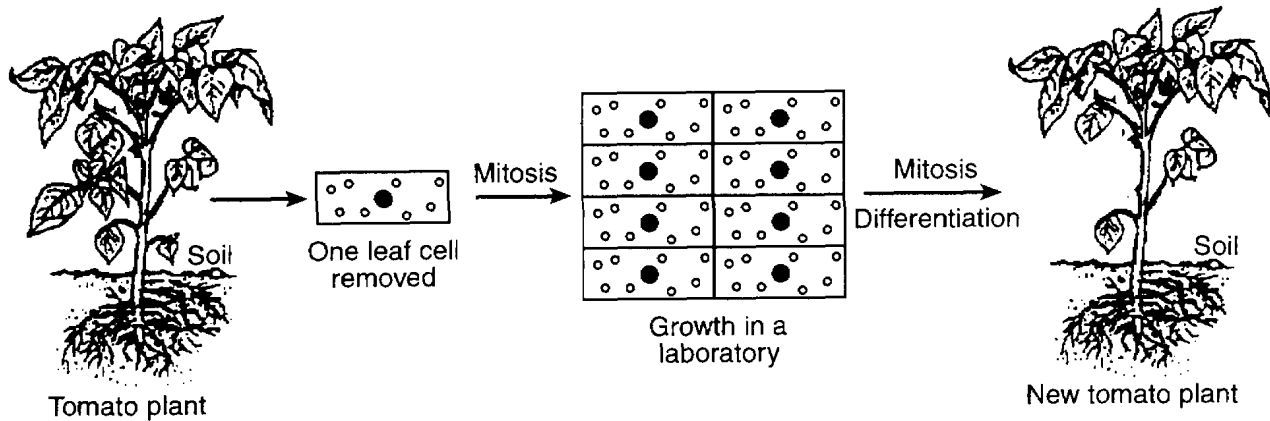
- A) knowledge of sexual reproduction in plants
 - B) knowledge of the structure of starch molecules
 - C) knowledge of the development of embryos
 - D) knowledge of the structure of a DNA molecule
93. A technique used to produce new plants is represented in the diagram below.



Which statement is *best* supported by the information in the diagram?

- A) The one leaf cell removed formed a zygote that developed into a new plant by mitotic cell division.
- B) This procedure is used to produce new tomato plants that are clones of the original tomato plant.
- C) The cell taken from the leaf produced eight cells, each having one-half of the genetic information of the original leaf cell.
- D) The new tomato plant will not be able to reproduce sexually because it was produced by mitotic cell division.

94. A process used in agriculture is represented in the diagram below.



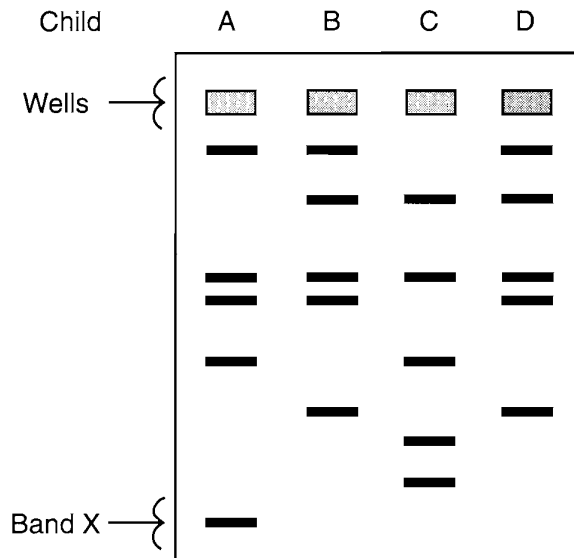
The diagram illustrates a process known as

- A) amniocentesis B) translocation C) cloning D) nondisjunction

95. In the past, diabetics used horse or cow insulin to control their glucose levels. Today, as a result of genetic engineering, human insulin can be synthesized by bacteria. State *one* advantage for a person with diabetes to receive genetically engineered insulin rather than insulin taken from a horse or cow.

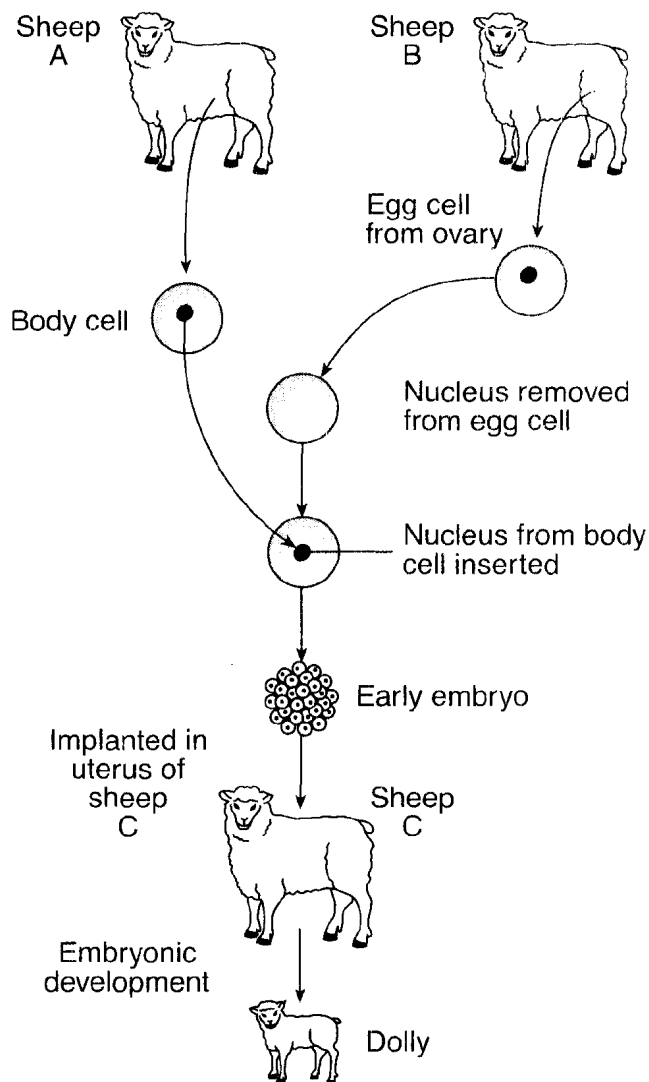
96. Base your answer to the following question on the information and diagram below and on your knowledge of biology.

DNA samples were collected from four children. The diagram below represents the results of a procedure that separated the DNA in each sample.



State *one* way information obtained from this procedure can be used.

97. The diagram below represents the process used in 1996 to clone the first mammal, a sheep named Dolly.



Which statement concerning Dolly is correct?

- A) Gametes from sheep *A* and sheep *B* were united to produce Dolly.
- B) The chromosome makeup of Dolly is identical to that of sheep *A*.
- C) Both Dolly and sheep *C* have identical DNA.
- D) Dolly contains genes from sheep *B* and sheep *C*.

Base your answers to questions 98 through 100 on the information below and on your knowledge of biology.

DNA samples were taken from three different species and used to determine the amino acid sequence for a portion of a particular protein. The amino acids *were* then compared in order to determine which species were most closely related. Some of the information is shown on the table below.

Species A	DNA base sequence mRNA base sequence amino acid sequence	GAC CUG LEU	TGA ACU THR	CTC GAG _____	CAC GUG VAL	TGA ACU _____
Species B	DNA base sequence mRNA base sequence amino acid sequence	GAC _____ LEU	AGA UCU _____	CTT GAA _____	CAC _____ VAL	TGA ACU THR
Species C	DNA base sequence mRNA base sequence amino acid sequence	GAC CUG LEU	TGC _____ THR	CAC GUG VAL	CTC _____ GLU	AGA UCU SER

98. Using the Universal Genetic Code Chart below, fill in the missing amino acid sequences in the table for species *A* and species *B*.

Universal Genetic Code Chart
Messenger RNA Codons and the Amino Acids for Which They Code

SECOND BASE					
	U	C	A	G	
FIRST BASE	U UUU } PHE UUC } UUA } LEU UUG }	UCU } UCC } SER UCA } UCG }	UAU } TYR UAC } UAA } STOP UAG }	UGU } CYS UGC } UGA } STOP UGG } TRP	U C A G
	C CUU } CUC } LEU CUA } CUG }	CCU } CCC } PRO CCA } CCG }	CAU } HIS CAC } CAA } GLN CAG }	CGU } CGC } ARG CGA } CGG }	U C A G
	A AUU } AUC } ILE AUA } AUG } MET or START	ACU } ACC } THR ACA } ACG }	AAU } ASN AAC } AAA } LYS AAG }	AGU } SER AGC } AGA } ARG AGG }	U C A G
	G GUU } GUC } VAL GUA } GUG }	GCU } GCC } ALA GCA } GCG }	GAU } ASP GAC } GAA } GLU GAG }	GGU } GGC } GLY GGA } GGG }	U C A G

99. Using the information given, fill in the missing mRNA ha'ie sequences in the table for species *B* and species *C*.

100State *one* specific effect on the protein produced if an mRNA code is changed from AGU to AGA.

Biology (Living Environment)

Name _____

Class _____

Date _____

1. _____	35. _____	69. _____
2. _____	36. _____	70. _____
3. _____	37. _____	71. _____
4. _____	38. _____	72. _____
5. _____	39. _____	73. _____
6. _____	40. _____	74. _____
7. _____	41. _____	75. _____
8. _____	42. _____	76. _____
9. _____	43. _____	77. _____
10. _____	44. _____	78. _____
11. _____	45. _____	79. _____
12. _____	46. _____	80. _____
13. _____	47. _____	81. _____
14. _____	48. _____	82. _____
15. _____	49. _____	83. _____
16. _____	50. _____	84. _____
17. _____	51. _____	85. _____
18. _____	52. _____	86. _____
19. _____	53. _____	87. _____
20. _____	54. _____	88. _____
21. _____	55. _____	89. _____
22. _____	56. _____	90. _____
23. _____	57. _____	91. _____
24. _____	58. _____	92. _____
25. _____	59. _____	93. _____
26. _____	60. _____	94. _____
27. _____	61. _____	95. _____
28. _____	62. _____	96. _____
29. _____	63. _____	97. _____
30. _____	64. _____	98. _____
31. _____	65. _____	99. _____
32. _____	66. _____	100. _____
33. _____	67. _____	
34. _____	68. _____	