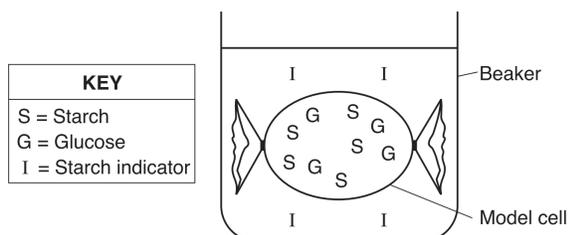


Name: _____

Date: _____

1. Base your answer(s) to the following question(s) on the diagram below and on your knowledge of biology. The diagram represents a model cell setup. The locations of three different substances are indicated in the diagram.



Which statement best describes what will most likely happen after several minutes?

- A. The contents of the model cell will change color.
- B. The liquid outside the model cell will change color.
- C. The model cell will shrink.
- D. The model cell will rupture.
2. A substance is most likely to diffuse into a cell when
- A. it is a large organic food molecule such as protein or starch
- B. it is enclosed in an organelle such as a vacuole
- C. the concentration of the substance is greater outside the cell than inside
- D. the pH of the substance is greater than the pH of the cell

3. What is the main function of a vacuole in a cell?

- A. storage
- B. coordination
- C. synthesis of molecules
- D. release of energy

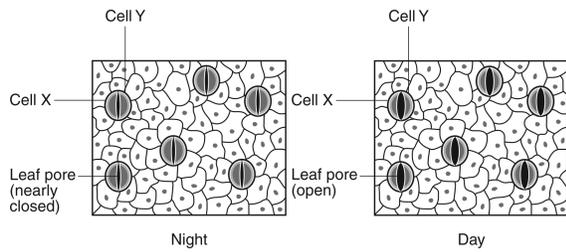
4. Which organelle is correctly paired with its specific function?

- A. cell membrane—storage of hereditary information
- B. chloroplast—transport of materials
- C. ribosome—synthesis of proteins
- D. vacuole—production of ATP

5. Muscle cells in athletes often have more mitochondria than muscle cells in nonathletes. Based on this observation, it can be inferred that the muscle cells in athletes

- A. have a smaller demand for cell proteins than the muscle cells of nonathletes
- B. reproduce less frequently than the muscle cells of nonathletes
- C. have nuclei containing more DNA than nuclei in the muscle cells of nonathletes
- D. have a greater demand for energy than the muscle cells of nonathletes

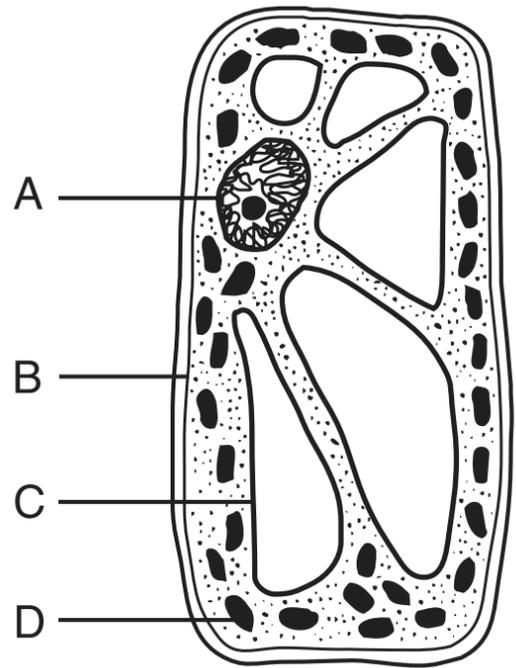
6. The diagram below represents changes in the sizes of openings present in leaves as a result of the actions of cells X and Y.



The actions of cells X and Y help the plant to

- A. maintain homeostasis by controlling water loss
- B. store excess heat during the day and remove the heat at night
- C. absorb light energy necessary for cellular respiration
- D. detect changes in the biotic factors present in the environment

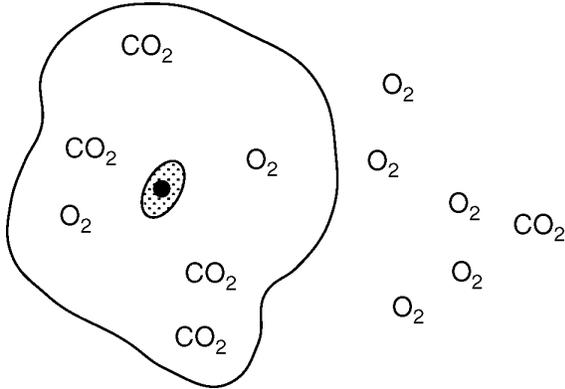
7. The diagram below represents a cell of a green plant.



Solar energy is used to produce energy-rich compounds in structure

- A. A
- B. B
- C. C
- D. D

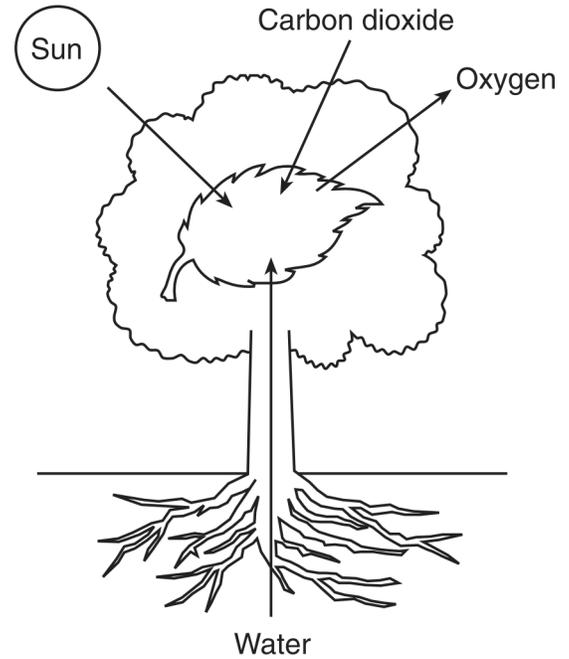
11. The accompanying diagram represents a cell in water. Formulas of molecules that can move freely across the cell membrane are shown. Some molecules are located inside the cell and others are in the water outside the cell.



Based on the distribution of these molecules, what would most likely happen after a period of time?

- A. The concentration of O_2 will increase inside the cell.
- B. The concentration of CO_2 will remain the same inside the cell.
- C. The concentration of O_2 will remain the same outside the cell.
- D. The concentration of CO_2 will decrease outside the cell.

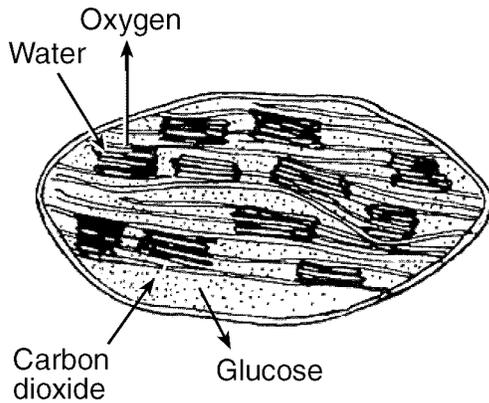
12. The diagram below represents events associated with a biochemical process that occurs in some organisms.



Which statement concerning this process is correct?

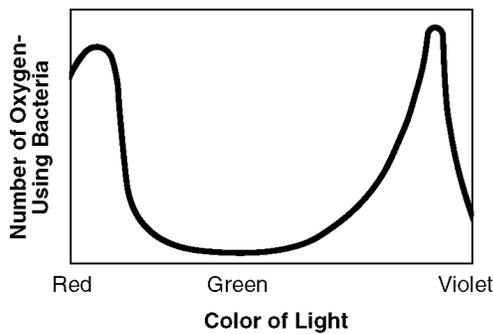
- A. The process represented is respiration and the primary source of energy for the process is the Sun.
- B. The process represented is photosynthesis and the primary source of energy for the process is the Sun.
- C. This process converts energy in organic compounds into solar energy which is released into the atmosphere.
- D. This process uses solar energy to convert oxygen into carbon dioxide.

13. The diagram below illustrates the movement of materials involved in a process that is vital for the energy needs of organisms.



The process illustrated occurs within

- A. chloroplasts B. mitochondria
C. ribosomes D. vacuoles
14. The graph below shows the results of an experiment in which a container of oxygen-using bacteria and strands of a green alga were exposed to light of different colors.



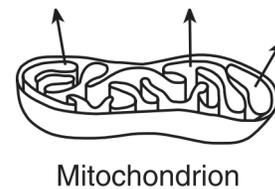
Which statement best explains the results of this experiment?

- A. The rate of photosynthesis is affected by variations in the light.
B. In all environments light is a vital resource.
C. The activities of bacteria and algae are not related.
D. Uneven numbers and types of species can upset ecosystem stability.

15. Energy from organic molecules can be stored in ATP molecules as a direct result of the process of

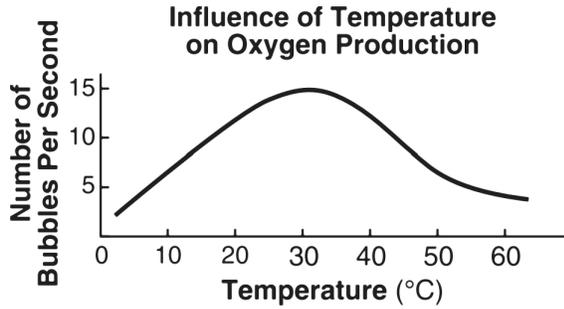
- A. cellular respiration
B. cellular reproduction
C. diffusion
D. digestion

16. The diagram below represents a structure involved in cellular respiration. The release of which substance is represented by the arrows?



- A. glucose B. oxygen
C. carbon dioxide D. DNA

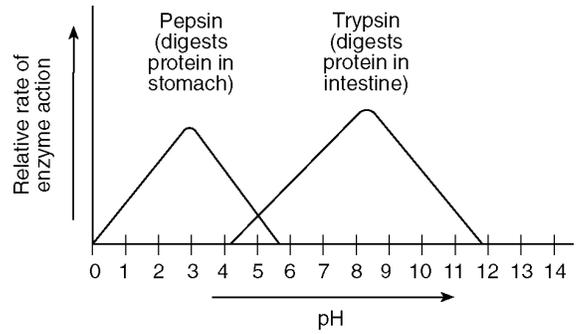
17. The graph below shows the results of an action of the enzyme catalase on a piece of meat. Evidence of enzyme activity is indicated by bubbles of oxygen. Which statement best summarizes the activity of catalase shown in the graph?



- A. The enzyme works better at 10°C than at 50°C.
 B. The enzyme works better at 5°C than at 65°C.
 C. The enzyme works better at 35°C than at either temperature extreme.
 D. The enzyme works at the same level in all environments.
18. Meat tenderizer contains an enzyme that interacts with meat. If meat is coated with tenderizer and then placed in a refrigerator for a short time, how would the enzyme be affected?

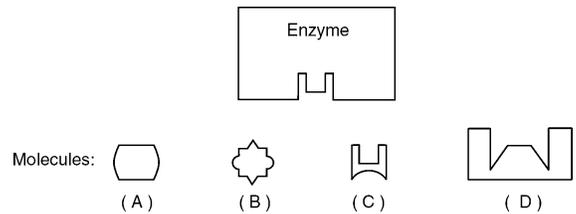
- A. It would be broken down.
 B. Its activity would slow down.
 C. Its shape would change.
 D. It would no longer act as an enzyme.

19. Base your answer(s) to the following question(s) on the graph below and on your knowledge of biology.



Neither enzyme works at a pH of

- A. 1 B. 5 C. 3 D. 13
20. An enzyme and four different molecules are shown in the accompanying diagram.



The enzyme would most likely affect reactions involving

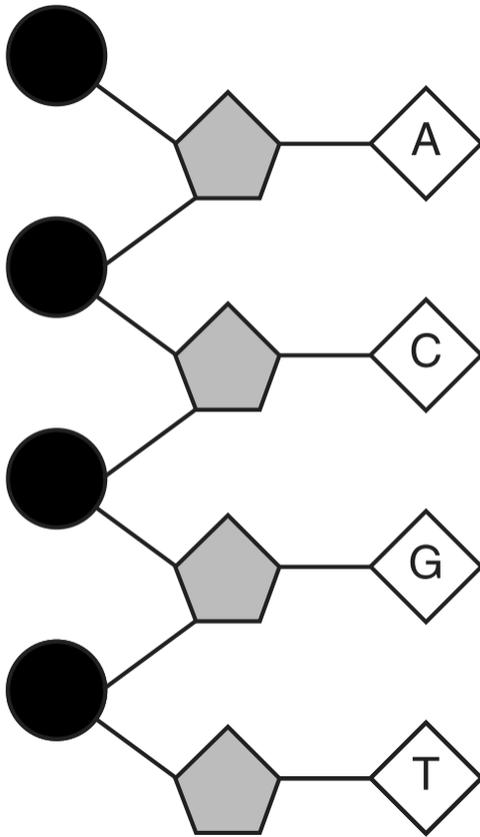
- A. molecule A, only B. molecule C, only
 C. molecules B and D D. molecules A and C
21. Four different segments of a DNA molecule are represented below.

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

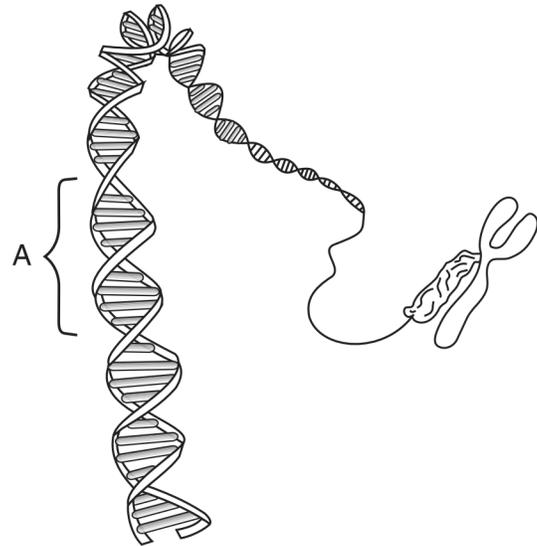
22. The diagram below represents a portion of a DNA molecule.



The letters represent different types of

- A. sugar molecules
- B. molecular bases
- C. enzymes
- D. proteins

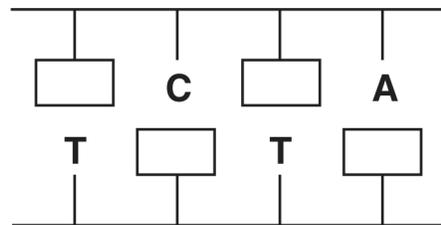
23. The diagram below represents a structure found in most cells.



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

24. The diagram below represents an incomplete section of a DNA molecule. The boxes represent unidentified bases.

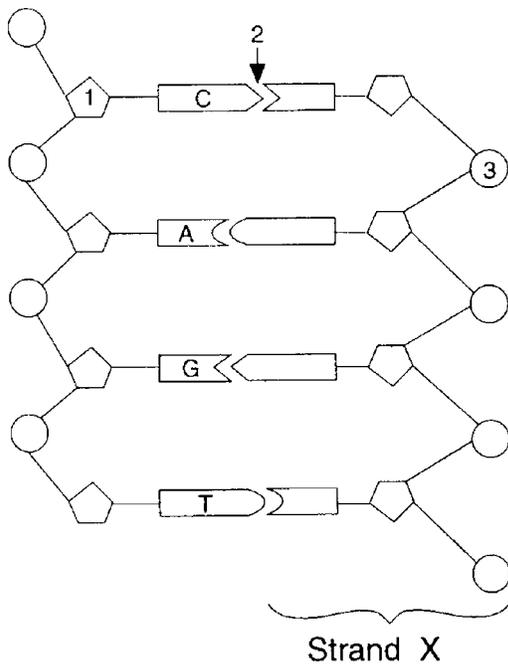


When the boxes are filled in, the total number of bases represented by the letter A (both inside and outside the boxes) will be

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

25. The instructions for the traits of an organism are coded in the arrangement of
- glucose units in carbohydrate molecules
 - bases in DNA in the nucleus
 - fat molecules in the cell membrane
 - energy-rich bonds in starch molecules

26. Base your answer(s) to the following question(s) on the diagram below of a DNA molecule and on your knowledge of biology.



What is the base sequence of strand X?

- | | |
|------------|------------|
| A. G-T-A-C | B. T-G-C-A |
| C. G-T-C-A | D. A-T-C-G |

27. The processes of deletion, insertion, and substitution can alter genes in a skin cell. The altered genes will most likely be passed on to
- sperm cells
 - egg cells
 - every cell that develops from that skin cell
 - only a few of the cells that develop from that skin cell

28. An alteration of genetic information is shown below.

A-G-T-A-C-C-G-A-T → A-G-T-G-A-T

This type of alteration of the genetic information is an example of

- | | |
|-----------------|------------------|
| A. deletion | B. insertion |
| C. substitution | D. recombination |
29. In sexually reproducing organisms, mutations can be inherited if they occur in
- the egg, only
 - the sperm, only
 - any body cell of either the mother or the father
 - either the egg or the sperm
30. A single gene mutation results from
- a change in a base sequence in DNA
 - recombination of traits
 - the failure of chromosomes to separate
 - blocked nerve messages

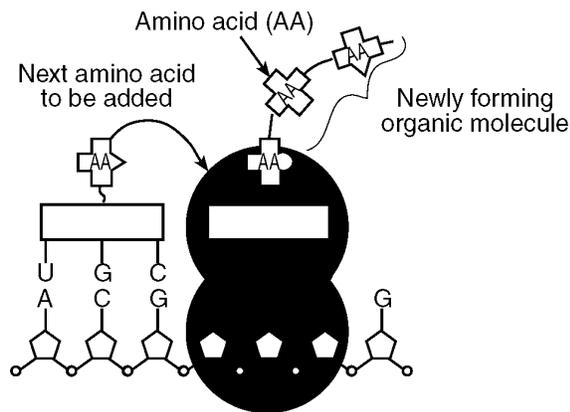
31. In a cell, protein synthesis is the primary function of

- A. ribosomes
- B. mitochondria
- C. chloroplasts
- D. vacuoles

32. Which statement best describes the relationship between cells, DNA, and proteins?

- A. Cells contain DNA that controls the production of proteins.
- B. DNA is composed of proteins that carry coded information for how cells function.
- C. Proteins are used to produce cells that link amino acids together into DNA.
- D. Cells are linked together by proteins to make different kinds of DNA molecules.

33. The accompanying diagram represents a process that occurs within a cell in the human pancreas.



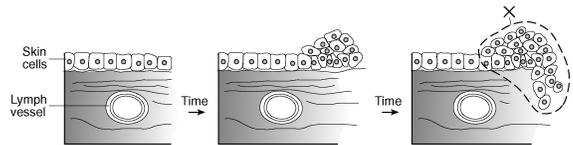
This process is known as

- A. digestion by enzymes
- B. protein synthesis
- C. energy production
- D. replication of DNA

34. Melanoma is a type of cancer in which abnormal skin cells divide uncontrollably. Some chemotherapy drugs, which stop the growth of the cancer, directly interfere with the process of

- A. meiosis
- B. coordination
- C. mitosis
- D. recombination

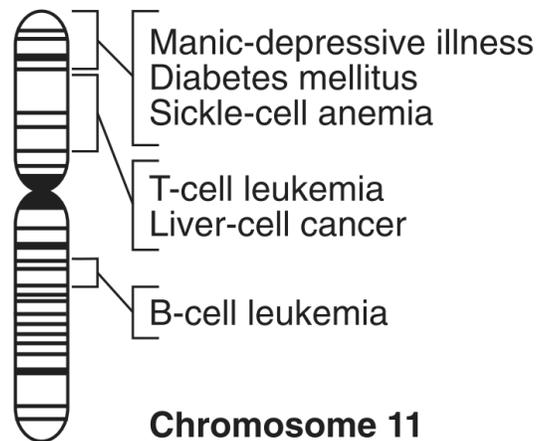
35. The diagram below shows the growth pattern of some skin cells in the human body after they have been exposed to ultraviolet radiation.



The cells in area X are most likely

- A. red blood cells
- B. cancer cells
- C. white blood cells
- D. sex cells

36. The diagram below represents the banding pattern for human chromosome 11, with some of the bands labeled.



The bands represent

- A. proteins
- B. genes
- C. starches
- D. enzymes

37. Base your answer(s) to the following question(s) on the chart below and on your knowledge of biology. The DNA Sequences chart shows a portion of the code for insulin in humans and cows. These DNA sequences are repeated in the Human Insulin and Cow Insulin charts.

In the DNA Sequences chart, circle the number over each three-letter portion of the DNA that is different in humans and cows.

		DNA Sequences							
		1	2	3	4	5	6	7	8
Human Insulin		CCA	TAG	CAC	CTT	GTT	ACA	ACG	TGA
Cow Insulin		CCG	TAG	CAT	CTT	GTT	ACA	ACG	CGA

For each number *circled* for the DNA sequences above, write the complementary mRNA base sequence in the Human Insulin and Cow Insulin charts that each of these circled portions would produce. Be sure to complete *only* the circled portions.

		Human Insulin							
		1	2	3	4	5	6	7	8
DNA Sequence		CCA	TAG	CAC	CTT	GTT	ACA	ACG	TGA
mRNA Sequence									
Amino Acid									

		Cow Insulin							
		1	2	3	4	5	6	7	8
DNA Sequence		CCG	TAG	CAT	CTT	GTT	ACA	ACG	CGA
mRNA Sequence									
Amino Acid									

38. Base your answer(s) to the following question(s) 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

Using the information given, fill in the missing mRNA base sequences in the table for species *B* and species *C*.

39. Base your answer(s) to the following question(s) on the Universal Genetic Code Chart below and on your knowledge of biology.

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

Endangered plant species	DNA base sequence	AAT	CCG	AGT	GGA
	mRNA base sequence	UUA	GGC	UCA	CCU
	amino acid sequence	LEU	GLY	SER	PRO
Plant species A	DNA base sequence	AAC	CCA	AGT	GGA
	mRNA base sequence	UUG	GGU	UCA	CCU
	amino acid sequence	_____	_____	_____	_____
Plant species B	DNA base sequence	ATA	CCC	AGG	GGA
	mRNA base sequence	_____	_____	_____	_____
	amino acid sequence	TYR	GLY	SER	PRO
Plant species C	DNA base sequence	CAT	CCT	ATA	GGA
	mRNA base sequence	GUA	GGA	UAU	CCU
	amino acid sequence	VAL	GLY	TYR	PRO

Complete the missing mRNA base sequences for plant species B in the table above.

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- 1. Answer: A
- 2. Answer: C
- 3. Answer: A
- 4. Answer: C
- 5. Answer: D
- 6. Answer: A
- 7. Answer: D
- 8. Answer: C
- 9. Answer: A
- 10. Answer: A
- 11. Answer: A
- 12. Answer: B
- 13. Answer: A
- 14. Answer: A
- 15. Answer: A
- 16. Answer: C
- 17. Answer: C
- 18. Answer: B
- 19. Answer: D
- 20. Answer: B

- 21. Answer: B
- 22. Answer: B
- 23. Answer: C
- 24. Answer: C
- 25. Answer: B
- 26. Answer: C
- 27. Answer: C
- 28. Answer: A
- 29. Answer: D
- 30. Answer: A
- 31. Answer: A
- 32. Answer: A
- 33. Answer: B
- 34. Answer: C
- 35. Answer: B
- 36. Answer: B
- 37. Answer: – Circl 1, 3, and 8.

– Indicate the mRNA sequences for the DNA sequences indicated by the student for question 83.

38. Answer:

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

39.
Answer:

Plant Species Table

Endangered plant species	DNA base sequence	AAT	CCG	AGT	GGA
	mRNA base sequence	UUA	GGG	UCA	CCU
	amino acid sequence	LEU	GLY	SER	PRO
Plant species A	DNA base sequence	AAC	CCA	AGT	GGA
	mRNA base sequence	UUG	GGU	UCA	CCU
	amino acid sequence	<u>LEU</u>	<u>GLY</u>	<u>SER</u>	<u>PRO</u>
Plant species B	DNA base sequence	ATA	CCC	AGG	GGA
	mRNA base sequence	<u>UAU</u>	<u>GGG</u>	<u>UCC</u>	<u>CCU</u>
	amino acid sequence	TYR	GLY	SER	PRO
Plant species C	DNA base sequence	CAT	CCT	ATA	GGA
	mRNA base sequence	GUA	GGA	UAU	CCU
	amino acid sequence	VAL	GLY	TYR	PRO