

Genetics

Name: _____

Date: _____

1. When the bacterium *Serratia marcescens* is grown on a sterile culture medium in a petri dish at 30°C, the bacterial colonies are cream colored. When this same bacterium is cultured under identical conditions, except at a temperature of 25°C, the colonies are brick red. This difference in color is most likely due to the

1. _____
 - a) type of nutrients in the culture medium
 - b) sterilization of the culture medium
 - c) effect of temperature on the expression of the gene for color
 - d) effect of colony size on the synthesis of color pigments

2. During the warm temperatures of summer, the arctic fox produces enzymes that cause its fur to become reddish brown. During the cold temperatures of winter, these enzymes do not function. As a result, the fox has a white coat that blends into the snowy background. This change in fur color shows that

2. _____
 - a) the genes of a fox are made of unstable DNA
 - b) mutations can be caused by temperature extremes
 - c) random alteration of DNA can occur on certain chromosomes
 - d) the expression of certain genes is affected by temperature

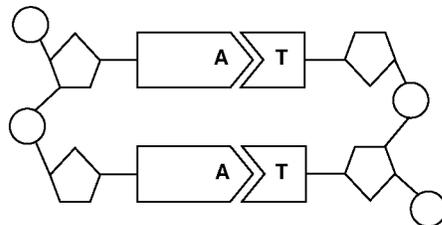
3. Genes are inherited, but their expressions can be modified by the environment. This statement explains why

3. _____
 - a) some animals have dark fur only when the temperature is within a certain range
 - b) offspring produced by means of sexual reproduction look exactly like their parents
 - c) identical twins who grow up in different homes have the same characteristics
 - d) animals can be cloned, but plants cannot

4. Most cells in the body of a fruit fly contain eight chromosomes. How many of these chromosomes were contributed by each parent of the fruit fly? 4. _____
- a) 8 b) 2 c) 16 d) 4

5. People with cystic fibrosis inherit defective genetic information and cannot produce normal CFTR proteins. Scientists have used gene therapy to insert normal DNA segments that code for the missing CFTR protein into the lung cells of people with cystic fibrosis. Which statement does *not* describe a result of this therapy? 5. _____
- a) Altered lung cells can produce the normal CFTR protein.
- b) Altered lung cells can divide to produce other lung cells with the normal CFTR gene.
- c) The normal CFTR gene may be expressed in altered lung cells.
- d) Offspring of someone with altered lung cells will inherit the normal CFTR gene.

6. A portion of a molecule is shown in the diagram below. 6. _____



Which statement best describes the main function of this type of molecule?

- a) It is a structural part of the cell wall.
- b) It stores energy for metabolic processes.
- c) It determines what traits may be inherited.
- d) It transports materials across the cell membrane.

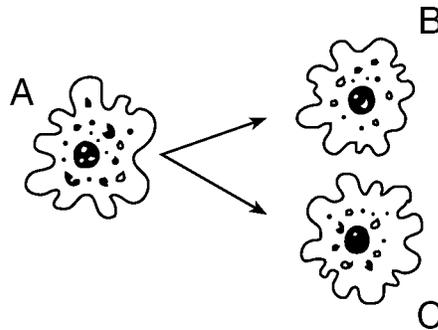
7. Hereditary information is stored inside the

7. _____

- a) ribosomes, which have chromosomes that contain many genes
- b) ribosomes, which have genes that contain many chromosomes
- c) nucleus, which has chromosomes that contain many genes
- d) nucleus, which has genes that contain many chromosomes

8. The diagram below represents single-celled organism *A* dividing by mitosis to form cells *B* and *C*.

8. _____

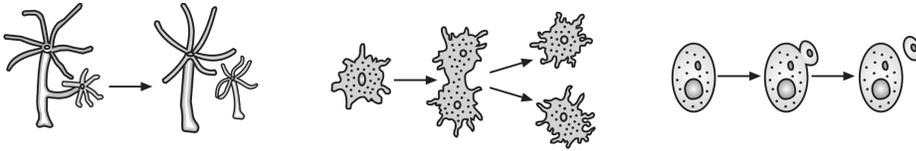


Cells *A*, *B*, and *C* all produced protein *X*. What can best be inferred from this observation?

- a) Protein *X* is found in all organisms.
- b) The gene for protein *X* is found in singlecelled organisms, only.
- c) Cells *A*, *B*, and *C* ingested food containing the gene to produce protein *X*.
- d) The gene to produce protein *X* was passed from cell *A* to cells *B* and *C*.

9. The diagrams below illustrate types of asexual reproduction.

9. _____

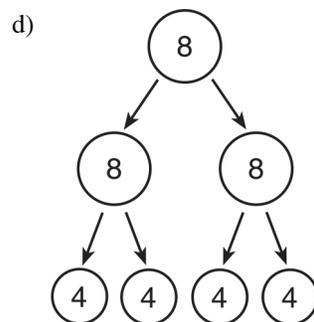
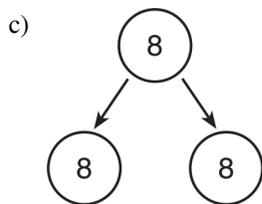
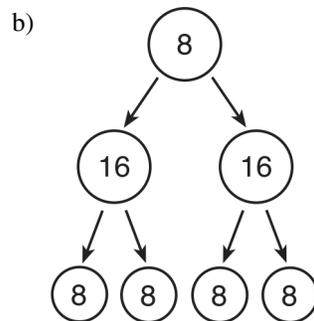
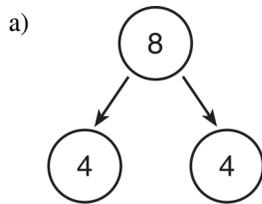


Which statement correctly describes the offspring?

- a) They vary genetically from the parent.
- b) They are produced by the union of gametes.
- c) They obtain nourishment from a placenta.
- d) They result without the union of gametes.

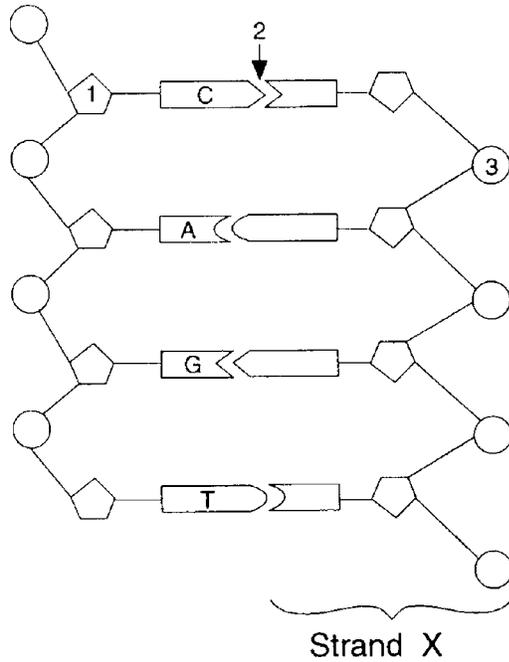
10. The number in each circle below represents the chromosome number of the cell. Which diagram represents the production of offspring by an asexually reproducing organism?

10. _____



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

11. _____



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

12. The instructions for the traits of an organism are coded in the arrangement of

12. _____

- 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

13. Base your answer(s) to the following question(s) on the information and chart below and on your knowledge of biology.

13. _____

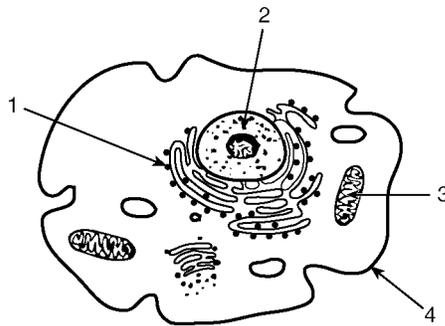
In DNA, a sequence of three bases is a code for the placement of a certain amino acid in a protein chain. The table below shows some amino acids with their abbreviations and DNA codes

Amino Acid	Abbreviation	DNA Code
Phenylalanine	Phe	AAA, AAG
Tryptophan	Try	ACC
Serine	Ser	AGA, AGG, AGT, AGC, TCA, TCG
Valine	Val	CAA, CAG, CAT, CAC
Proline	Pro	GGA, GGG, GGT, GGC
Glutamine	Glu	GTT, GTC
Threonine	Thr	TGA, TGG, TGT, TGC
Asparagine	Asp	TTA, TTG

Describe how a protein would be changed if a base sequence mutates from GGA to TGA.

14. Base your answer(s) to the following question(s) on the diagram of a cell below.

14. _____



Describe how structures 1 and 2 interact in the process of protein synthesis.

15. Animal cells utilize many different proteins. Discuss the synthesis of proteins in an animal cell. Your answer must include at least:

15. _____

- the identity of the building blocks required to synthesize these proteins
- the identity of the sites in the cell where the proteins are assembled
- an explanation of the role of DNA in the process of making proteins in the cell

19. Base your answer(s) to the following question(s) on the Universal Genetic Code Chart below and on your knowledge of biology. Some DNA, RNA, and amino acid information from the analysis of a gene present in five different species is shown in the chart on the next page.

19. _____

Universal Genetic Code Chart
Messenger RNA Codons and 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 } LEU CUC } CUA } CUG }	CCU } CCC } PRO CCA } CCG }	CAU } HIS CAC } CAA } GLN CAG }	CGU } CGC } ARG CGA } CGG }	U C A G
	A	AUU } ILE AUC } AUA } MET or START AUG }	ACU } ACC } THR ACA } ACG }	AAU } ASN AAC } AAA } LYS AAG }	AGU } SER AGC } AGA } ARG AGG }	U C A G
	G	GUU } VAL GUC } GUA } GUG }	GCU } GCC } ALA GCA } GCG }	GAU } ASP GAC } GAA } GLU GAG }	GGU } GGC } GLY GGA } GGG }	U C A G

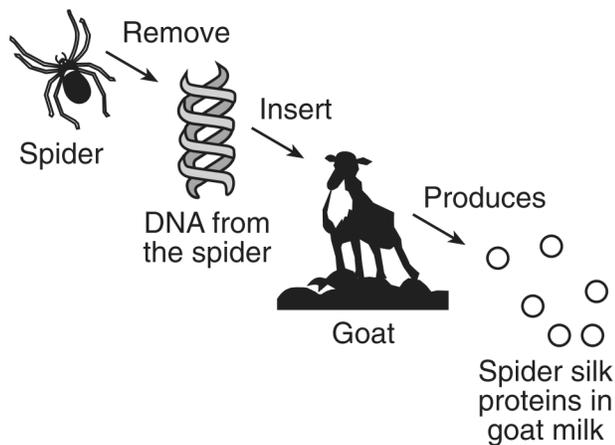
Species A	DNA strand: TAC CGA CCT TCA mRNA strand: AUG GCU GGA AGU Amino acid sequence: _____
Species B	DNA strand: TAC TTT GCA GGA mRNA strand: _____ Amino acid sequence: MET LYS ARG PRO
Species C	DNA strand: _____ mRNA strand: AUG UUU UGU CCC Amino acid sequence: MET PHE CYS PRO
Species D	DNA strand: TAC GTA GTT GCA mRNA strand: AUG CAU CAA CGU Amino acid sequence: MET HIS GLN ARG
Species E	DNA strand: TAC TTC GCG GGT mRNA strand: AUG AAG CGC CCA

24. For many years, humans have used a variety of techniques that have influenced the genetic makeup of organisms. These techniques have led to the production of new varieties of organisms that possess characteristics that are useful to humans. Identify one technique presently being used to alter the genetic makeup of an organism, and explain how humans can benefit from this change. Your answer must include at least:

- the name of the technique used to alter the genetic makeup
- a brief description of what is involved in this technique
- one specific example of how this technique has been used
- a statement of how humans have benefited from the production of this new variety of organism

24. _____

25. Which process is illustrated in the diagram below?



25. _____

- a) chromatography
- b) direct harvesting
- c) meiosis
- d) genetic engineering

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- | | |
|--|---|
| <p>1.
Answer: c</p> <p>2.
Answer: d</p> <p>3.
Answer: a</p> <p>4.
Answer: d</p> <p>5.
Answer: d</p> <p>6.
Answer: c</p> <p>7.
Answer: c</p> <p>8.
Answer: d</p> <p>9.
Answer: d</p> <p>10.
Answer: c</p> <p>11.
Answer: c</p> <p>12.
Answer: b</p> <p>13.
Answer: The shape of the protein may be changed. OR The amino acid sequence would be different. OR The protein would contain threonine instead of proline. OR The protein being synthesized may not work correctly. OR The protein will not be able to function.</p> <p>14.
Answer: Structure 2 provides the code for assembling a protein at structure 1.</p> <p>15.
Answer: <ul style="list-style-type: none"> ● amino acids ● ribosomes ● DNA codes for the amino acid sequence. OR DNA provides instructions for making proteins. </p> | <p>16.
Answer: b</p> <p>17.
Answer: b</p> <p>18.
Answer: b</p> <p>19.
Answer: MET or START ALA GLY SER</p> <p>20.
Answer: Their amino acid sequences are the same.</p> <p>21.
Answer: d</p> <p>22.
Answer: b</p> <p>23.
Answer: c</p> <p>24.
Answer: <ul style="list-style-type: none"> ● The name of the technique used to alter the genetic makeup (e.g., genetic engineering, genetic manipulation, selective breeding, gene therapy) [Note: Cloning is not acceptable because it represents duplication rather than alteration.] ● a brief description of what is involved in this technique (e.g., a segment of DNA is moved from one organism to another organism) ● one specific example of how this technique has been used (e.g., the gene for insulin production has been inserted into certain bacteria) ● a statement of how humans have benefited from the production of this new variety of organism (e.g., more insulin is readily available from these bacteria than from extractions from pancreases of animals) </p> <p>25.
Answer: d</p> |
|--|---|