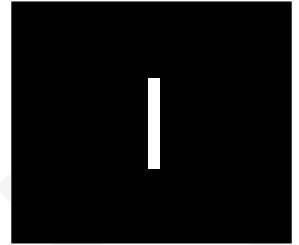


Name

RELEASED FORM

Biology

Form I



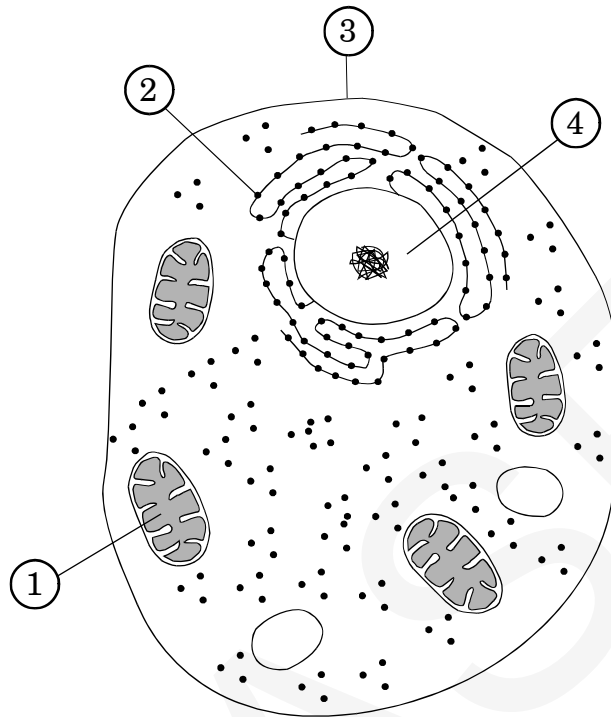
North Carolina Test of Biology

Public Schools of North Carolina
www.ncpublicschools.org
State Board of Education
Department of Public Instruction
Division of Accountability Services/North Carolina Testing Program
Raleigh, North Carolina 27699-6314



1. An iodine solution is placed on the cut side of a potato. Within seconds, a blue-black color appears. What is *most likely* occurring?
- A a positive test for proteins
 - B a positive test for starches
 - C a negative test for proteins
 - D a negative test for starches
2. A person with swollen gums rinses his mouth with warm salt water, and the swelling decreases. Which has occurred?
- A The swollen gums have absorbed the saltwater solution.
 - B The saltwater solution lowers the temperature of the water in the gums.
 - C The salt in the solution has moved against the concentration gradient.
 - D The water in the gums has moved from a high to a low concentration of water.

3. This diagram represents a cell.



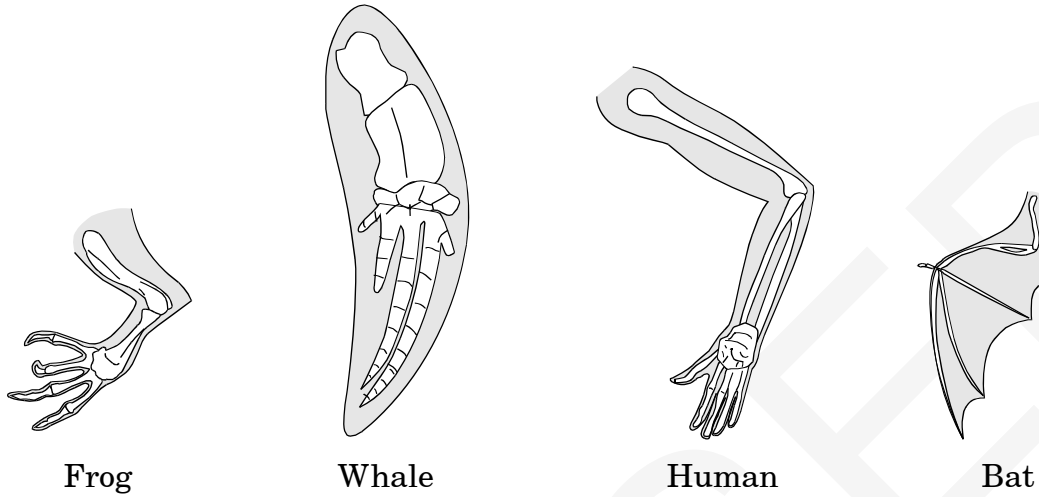
Which organelle is the site where amino acids are synthesized into proteins?

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

4. Which organism is ***most likely*** to use anaerobic respiration?
- A bird
 - B moss
 - C tree
 - D yeast

5. Plant cells that are specialized for cell division are ***most likely*** found in what part of a plant?
- A root tips
 - B leaf epidermis
 - C stem epidermis
 - D vascular tissue

6. This diagram represents the bone structures of the front limbs of four different animals.



What do the similarities of the structures suggest about these organisms?

- A They grow at the same rate.
- B They live in the same environment.
- C They live for the same length of time.
- D They evolved from a common ancestor.

7. This chart represents amino acids that are coded from different combinations of mRNA codons.

Codons in mRNA

First Base	Second Base							Third Base	
	U	C	A	G	U	C	A		G
	UUU	Phenylalanine	UCU	Serine	UAU	Tyrosine	UGU	Cysteine	U
U	UUC	Phenylalanine	UCC	Serine	UAC	Tyrosine	UGC	Cysteine	C
	UUA	Leucine	UCA	Serine	UAA	Stop	UGA	Stop	A
	UUG	Leucine	UCG	Serine	UAG	Stop	UGG	Tryptophan	G
	CUU	Leucine	CCU	Proline	CAU	Histidine	CGU	Arginine	U
C	CUC	Leucine	CCC	Proline	CAC	Histidine	CGC	Arginine	C
	CUA	Leucine	CCA	Proline	CAA	Glutamine	CGA	Arginine	A
	CUG	Leucine	CCG	Proline	CAG	Glutamine	CGG	Arginine	G
	AUU	Isoleucine	ACU	Threonine	AAU	Asparagine	AGU	Serine	U
A	AUC	Isoleucine	ACC	Threonine	AAC	Asparagine	AGC	Serine	C
	AUA	Isoleucine	ACA	Threonine	AAA	Lysine	AGA	Arginine	A
	AUG	Methionine or start	ACG	Threonine	AAG	Lysine	AGG	Arginine	G
	GUU	Valine	GCU	Alanine	GAU	Aspartic Acid	GGU	Glycine	U
G	GUC	Valine	GCC	Alanine	GAC	Aspartic Acid	GGC	Glycine	C
	GUA	Valine	GCA	Alanine	GAA	Glutamic Acid	GGA	Glycine	A
	GUG	Valine	GCG	Alanine	GAG	Glutamic Acid	GGG	Glycine	G

Which amino acid sequence can be coded from the DNA sequence CAG TAG CGA?

- A Valine – Isoleucine – Glycine
- B Valine – Aspartic Acid – Alanine
- C Valine – Isoleucine – Alanine
- D Valine – Phenylalanine – Alanine

8. Which set of parents can **most likely** produce a child with type O blood?
- A one parent with type AB blood, and the other parent with type A blood
 - B one parent with type AB blood, and the other parent with type O blood
 - C one parent with heterozygous type A blood, and the other parent with type O blood
 - D one parent with homozygous type A blood, and the other parent with homozygous type B blood

9. This diagram represents samples of DNA that were cut with a restriction enzyme during DNA fingerprinting in a crime lab.

Crime DNA	Suspects			
	1	2	3	4
	██████████			
██████████		██████████	██████████	
██████████	██████████	██████████		
			██████████	
██████████	██████████	██████████	██████████	██████████
				██████████
██████████		██████████	██████████	██████████
	██████████		██████████	

Which technique was used to produce these bands?

- A cloning
- B gel electrophoresis
- C gene splicing
- D genetic engineering

10. What process produces many variations in phenotypes?
- A independent assortment
 - B asexual reproduction
 - C regeneration
 - D cloning
11. One of the parents of a child has phenylketonuria (PKU), which is caused by recessive alleles. The other parent does not have the PKU alleles. What is the chance that the couple will have a child with phenylketonuria?
- A 0%
 - B 50%
 - C 75%
 - D 100%
12. Which disease *most likely* occurs after excessive exposure to ultraviolet radiation?
- A malaria
 - B asthma
 - C skin cancer
 - D polio
13. Why are humans important to the life cycle of malaria parasites?
- A Malaria parasites kill humans.
 - B Malaria parasites only live in human cells.
 - C Malaria parasites can live in mutual symbiosis with humans.
 - D Malaria parasites use humans for reproductive purposes.

14. This chart represents characteristics of four different plants.

Characteristics of Four Different Plants

	Vascular Tissue	Seeds	Flowers	Cones
Plant 1	X	X		X
Plant 2	X			
Plant 3				
Plant 4	X	X	X	

Which plant is *most likely* a gymnosperm?

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

15. In an experiment, Pavlov caused a dog to salivate when it heard the ring of a bell. Which type of learning was demonstrated by the dog?

- A habituation
- B imprinting
- C conditioning
- D trial and error

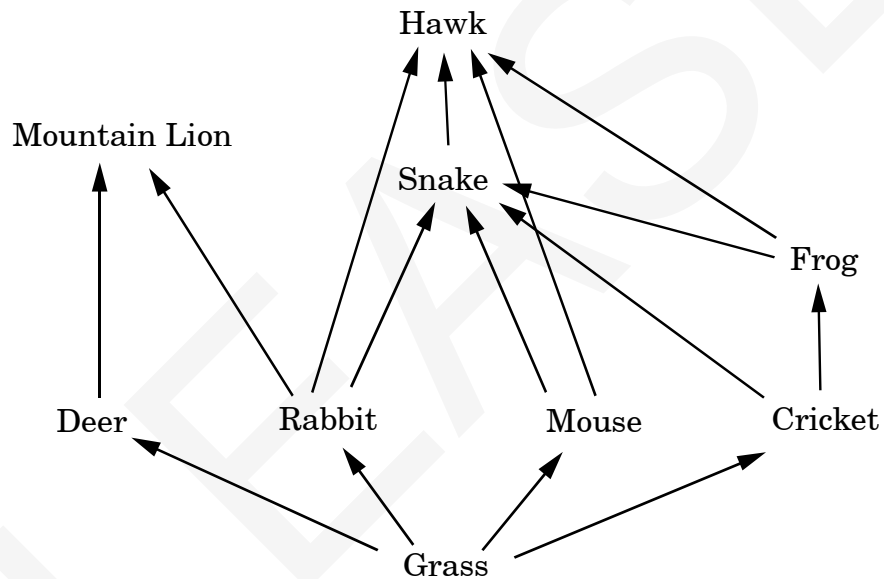
16. If the xylem in a young tree is damaged, which process is *first* affected?

- A performing photosynthesis
- B transporting sugar to the roots
- C transporting water to the leaves
- D absorbing water from the soil

17. A plant species lives in an area with limited sunlight. Which physical adaptation would be **most** useful to the plant?

- A colorful flowers
- B large leaves
- C deep roots
- D thin cuticle

18. This diagram shows a food web of a meadow.



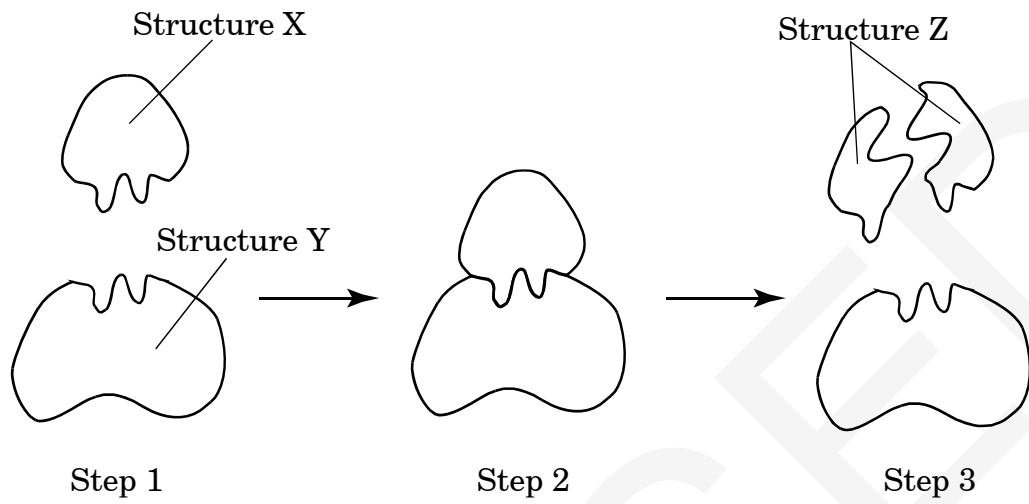
Due to insecticides, the cricket population is greatly reduced. Which population is **most** affected by this event?

- A Mouse
- B Hawk
- C Grass
- D Frog

19. The crab *Lybia tessellata* carries a pair of sea anemones on its claws. The crab uses the sea anemone's stinging tentacles as protection and the sea anemone obtains small food particles released by the crab as it feeds. Which type of symbiotic relationship does this **best** illustrate?
- A commensalism
 - B mutualism
 - C parasitism
 - D predation
20. Which substance is considered to be a factor affecting Earth's ozone layer?
- A chlorofluorocarbons
 - B ethyl alcohol
 - C nitrogen gas
 - D water vapor

21. RNA and DNA are which type of organic compound?
- A carbohydrate
 - B lipid
 - C nucleic acid
 - D protein
22. A scientist treats a cell with a chemical that destroys the ribosomes. As a result, which cell process will be stopped?
- A osmosis
 - B photosynthesis
 - C protein synthesis
 - D respiration
23. Which is an example of osmosis?
- A potassium ions moving in and out of an animal cell
 - B carbon dioxide moving into the leaf cells of a plant
 - C oxygen moving into the bloodstream from the lungs
 - D water moving into the root cells of a plant

24. This diagram shows an enzyme-substrate complex.



Which is represented by Structure X?

- A substrate
- B product
- C enzyme
- D complex

25. Two different species of bacteria are examined. Scientists find that Species X always produces CO_2 and H_2O during cellular respiration. Species Y always produces ethyl alcohol and CO_2 . Which conclusion can be made from these observations?
- A Only Species Y is aerobic.
 - B Only Species Y is anaerobic.
 - C Both Species X and Y are aerobic.
 - D Both Species X and Y are anaerobic.
26. Hitchhiker's thumb (H) is dominant to no hitchhiker's thumb (h). A woman who does not have hitchhiker's thumb marries a man who is heterozygous for hitchhiker's thumb. What is the probable genotypic ratio of their children?
- A 0% Hh : 100% hh
 - B 50% Hh : 50% hh
 - C 75% Hh : 25% hh
 - D 100% Hh : 0% hh
27. What advantage do sexually reproducing organisms have over asexually reproducing organisms?
- A genetic variation
 - B genetic stability
 - C increased fertilization rate
 - D increased reproductive rate

28. This chart shows a list of messenger RNA codons.

Codons in mRNA

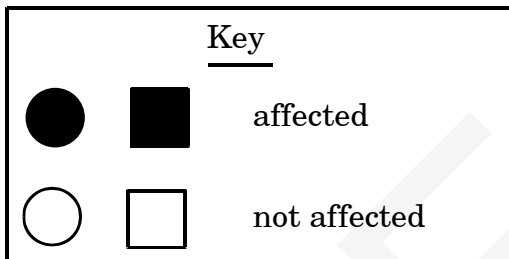
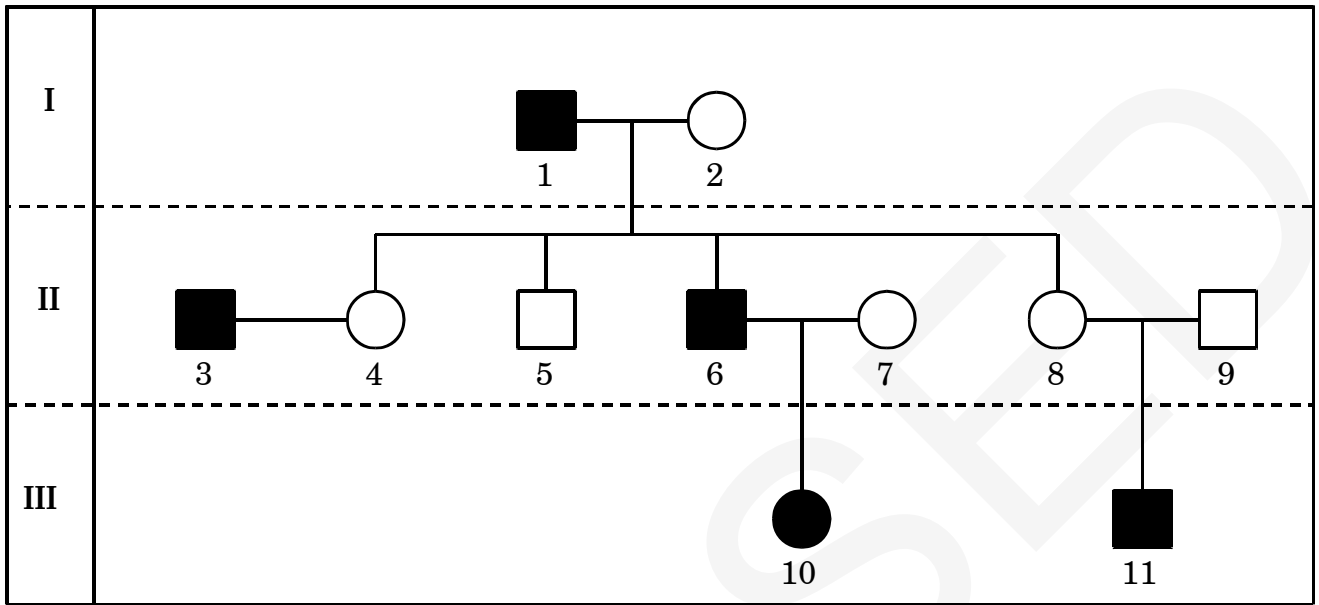
First Base	Second Base								Third Base
	U		C		A		G		
	UUU	Phenylalanine	UCU	Serine	UAU	Tyrosine	UGU	Cysteine	U
U	UUC	Phenylalanine	UCC	Serine	UAC	Tyrosine	UGC	Cysteine	C
	UUA	Leucine	UCA	Serine	UAA	Stop	UGA	Stop	A
	UUG	Leucine	UCG	Serine	UAG	Stop	UGG	Tryptophan	G
	CUU	Leucine	CCU	Proline	CAU	Histidine	CGU	Arginine	U
C	CUC	Leucine	CCC	Proline	CAC	Histidine	CGC	Arginine	C
	CUA	Leucine	CCA	Proline	CAA	Glutamine	CGA	Arginine	A
	CUG	Leucine	CCG	Proline	CAG	Glutamine	CGG	Arginine	G
	AUU	Isoleucine	ACU	Threonine	AAU	Asparagine	AGU	Serine	U
A	AUC	Isoleucine	ACC	Threonine	AAC	Asparagine	AGC	Serine	C
	AUA	Isoleucine	ACA	Threonine	AAA	Lysine	AGA	Arginine	A
	AUG	Methionine or start	ACG	Threonine	AAG	Lysine	AGG	Arginine	G
	GUU	Valine	GCU	Alanine	GAU	Aspartic Acid	GGU	Glycine	U
G	GUC	Valine	GCC	Alanine	GAC	Aspartic Acid	GGC	Glycine	C
	GUA	Valine	GCA	Alanine	GAA	Glutamic Acid	GGA	Glycine	A
	GUG	Valine	GCG	Alanine	GAG	Glutamic Acid	GGG	Glycine	G

A strand of DNA with the sequence AAC AAG CCC undergoes a mutation, and the first A is changed to a C. How will this mutation affect the amino acid sequence?

- A One amino acid will change.
- B Two amino acids will change.
- C All of the amino acids will change.
- D The amino acids will remain the same.

29. Which is a use of genetically engineered bacteria?
- A identifying the remains of an unknown person
 - B developing a DNA fingerprint for blood left at a crime scene
 - C making human insulin for diabetics
 - D producing corn that is resistant to herbicides
30. Which types of organisms developed first due to the early environmental conditions on Earth?
- A prokaryotic and aerobic
 - B prokaryotic and anaerobic
 - C eukaryotic and aerobic
 - D eukaryotic and anaerobic

31. This diagram shows a pedigree for a recessive genetic disorder.



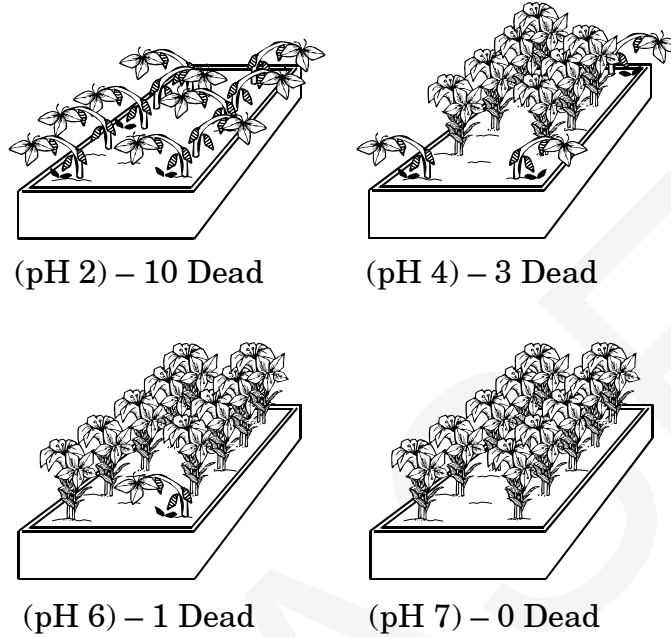
What is the genotype of individual 6?

- A $X^H X^H$
- B $X^H X^h$
- C $X^H Y$
- D $X^h Y$

32. Which is an example of a learned behavior?
- A A bear cub practices catching salmon the way its mother does.
 - B A baby gazelle rises to its feet within a few minutes of its birth.
 - C A baby kangaroo climbs into its mother's pouch as soon as it is born.
 - D An adult salmon returns to its freshwater stream when it is time to reproduce.
33. Sandworms are annelid worms that live on the seafloor. They absorb oxygen and excrete wastes through their skin. Which characteristic will **best** help the worm carry out these functions?
- A large number of hearts
 - B large diameter blood vessels
 - C large mouth compared to body volume
 - D large surface area compared to body volume
34. Which reproductive adaptation is more characteristic of mammals than amphibians?
- A external fertilization with internal development
 - B internal fertilization with internal development
 - C external fertilization with external development
 - D internal fertilization with external development
35. What kingdoms did Carolus Linnaeus originally use for his classification system?
- A Fungi and Protista
 - B Fungi and Animalia
 - C Plantae and Protista
 - D Plantae and Animalia

36. After an initial infection, B-cells recognize the measles virus. How is this helpful in human immune response?
- A The B-cells use this recognition to defend the body against other pathogens, such as bacteria.
 - B The B-cells more quickly recognize and respond to any other virus that invades the body.
 - C The B-cells produce antibodies more quickly if the measles virus is encountered again.
 - D The B-cells transfer this recognition to T-cells, which will then devour the viruses.
37. What is the main function of leaves?
- A Leaves provide support for growth and a place to store food.
 - B Leaves provide a place for photosynthesis to occur.
 - C Leaves absorb water and minerals and transport nutrients to the stem.
 - D Leaves create a barrier that prevents water in the plant's tissues from evaporating.
38. In an ecosystem, which is the *most likely* reason for an increase in the producer population if there is an increase in the carnivore population?
- A fewer herbivores
 - B higher temperatures
 - C less food
 - D more oxygen

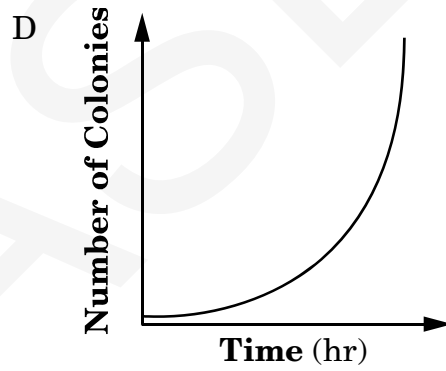
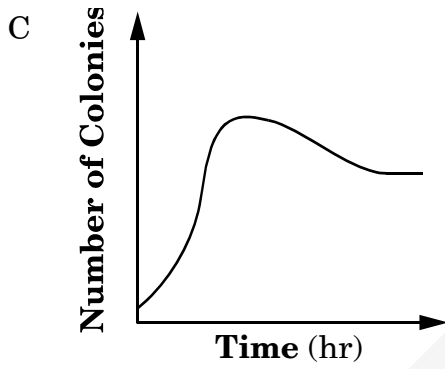
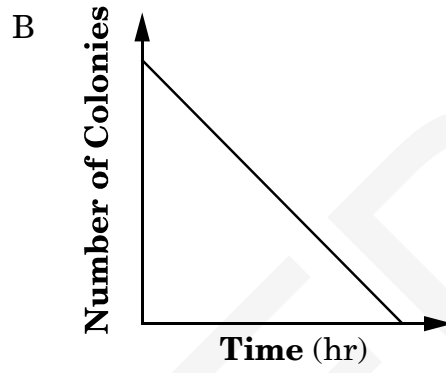
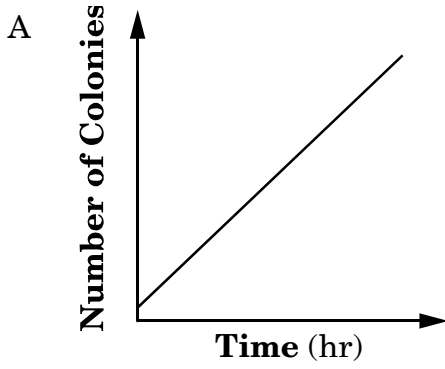
39. A scientist performs an experiment to see if acids have an effect on the health of a particular type of plant. Three sets of plants were treated with acidic solutions of known pH while the control set was treated with a solution of neutral pH 7.



Which is the **best** conclusion for this experiment?

- A Acid has no effect on the health of this type of plant.
- B High acidity is helpful to this type of plant.
- C Low acidity is harmful to this type of plant.
- D High acidity is harmful to this type of plant.

40. Which graph represents the maximum carrying capacity of a bacterial colony?



41. Which is the **most likely** function of a group of cells that contains a high number of chloroplasts?
- A respiration
 - B transpiration
 - C fermentation
 - D photosynthesis
42. What will **most likely** happen if an appropriate enzyme is added to a chemical reaction?
- A The reaction rate will increase.
 - B The equilibrium of the reaction will be maintained.
 - C The reaction rate will decrease.
 - D The reaction will stop.
43. In humans, glucose is kept in balance in the bloodstream by insulin. Which concept does this **best** illustrate?
- A adaptation
 - B homeostasis
 - C metabolism
 - D organization
44. A sugar, a phosphate group, and a nitrogen base form the building blocks of which organic compound?
- A carbohydrates
 - B lipids
 - C nucleic acids
 - D proteins
45. In which way are photosynthesis and cellular respiration different?
- A Cellular respiration stores ATP, while photosynthesis releases ATP.
 - B Cellular respiration produces oxygen, while photosynthesis uses oxygen.
 - C Photosynthesis releases energy, while cellular respiration stores energy.
 - D Photosynthesis uses carbon dioxide, while cellular respiration produces carbon dioxide.

46. This chart shows the results of several crosses with white-feathered chickens and dark-feathered chickens.

Cross	Parental Feather Colors	Offspring Feather Colors
1	White × White	100% White
2	White × White	75% White, 25% Dark
3	White × Dark	50% White, 50% Dark
4	Dark × Dark	100% Dark

Which cross would be represented as $Aa \times aa$, where (A) represents a dominant allele and (a) represents a recessive allele?

- A Cross 1
 - B Cross 2
 - C Cross 3
 - D Cross 4
-
47. A researcher sprays a new pesticide on thousands of insects of the same species that live in a large field. A few of the insects survive. What can be concluded by the researcher?
- A The species of insects will likely become resistant to the pesticide.
 - B The ideal interval between the first and second applications of the pesticide should be increased.
 - C The pesticide has no effect on the species.
 - D The concentration of the pesticide was too weak.
48. According to fossil records, the horses that lived 50 million years ago were much smaller, weaker, and slower than modern horses. Which process is **most likely** responsible for the changes that have led to the increased size, strength, and speed in horses?
- A commensalism
 - B inbreeding
 - C migration
 - D natural selection

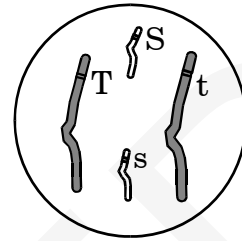
49. In a particular species of plants, when the soil pH is greater than 7, blue flowers are produced. However, when the soil pH is less than 7, pink flowers are produced. Which statement **best** explains the color change in the plant?

- A Multiple alleles determine the color of the flowers.
- B The change in flower color is a result of a mutation.
- C Polygenic inheritance produces the different flower colors.
- D The environment influences the expression of the gene for flower color.

50. A cloned plant has a diploid chromosome number of 12. What is the diploid chromosome number of the plant cell that was used to produce the cloned plant?

- A 6
- B 12
- C 18
- D 24

51. This diagram shows a diploid cell with two pairs of homologous chromosomes.



Due to independent assortment, what is the possible genetic make-up of gametes produced by this organism?

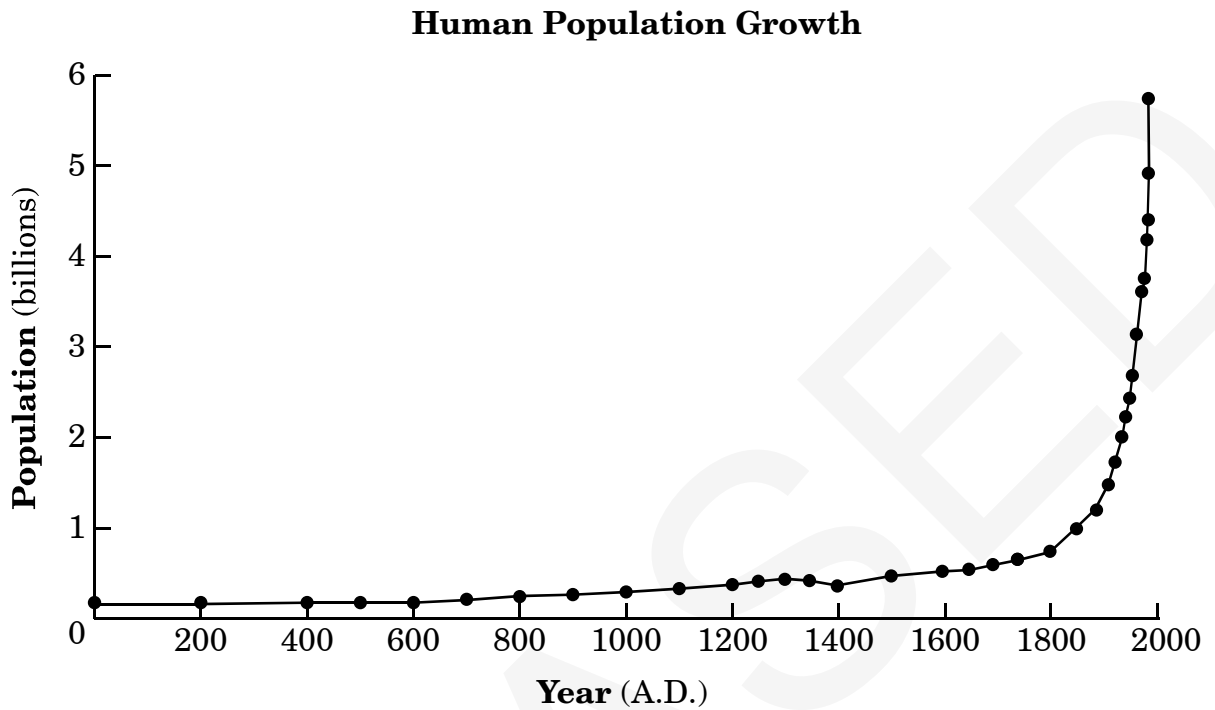
- A SsTt
- B Ss, Tt
- C S, s, T, t
- D ST, St, sT, st

52. When worker bees return to the hive, they perform a sequence of movements called a waggle dance to show other members of the colony where food is located. Which type of behavior does this **best** illustrate?

- A aggressive behavior
- B courtship behavior
- C social behavior
- D territorial behavior

53. Which process is an example of asexual reproduction?
- A An amoeba divides in half to form two amoebas.
 - B A bee transfers pollen from one flower to another.
 - C A female fish deposits eggs on a rock, then a male fish releases sperm on them.
 - D Earthworms exchange sperm.
54. Which genetic abnormality can be identified through karyotyping?
- A point mutation
 - B recessive allele
 - C extra chromosome
 - D sex-linked allele
55. Which structure in the leaf controls the opening and closing of the stoma?
- A cuticle
 - B epidermis
 - C guard cell
 - D spongy mesophyll
56. Which kingdoms have photosynthetic organisms?
- A fungi and plants
 - B fungi and protists
 - C protists and plants
 - D plants and animals
57. Which sequence shows increasing ecological levels of organization?
- A organism, population, community, ecosystem
 - B ecosystem, population, organism, community
 - C community, ecosystem, population, organism
 - D population, organism, ecosystem, community

58. This graph represents changes in human population over a period of 2,000 years.

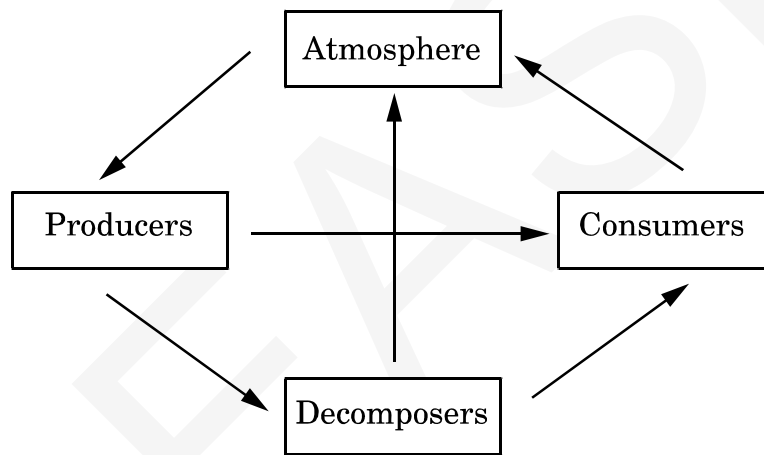


What can be concluded from the graph?

- A Human population grew at a constant rate over the last 2,000 years.
- B Human population grew exponentially over the past 200 years.
- C Human population reached its carrying capacity around the year 1900.
- D Human population will begin to level off around 2010.

59. Some birds live in close association with horses. These birds feed on insects that are parasites to horses. Which type of relationship between the horses and these birds does this illustrate?
- A commensalism
 - B mutualism
 - C parasitism
 - D predation

60. This diagram shows the flow of carbon in a terrestrial ecosystem.



Which will **most likely** happen if the decomposers are removed from the carbon cycle?

- A The amount of carbon dioxide in the atmosphere will increase.
- B The amount of carbon dioxide in the atmosphere will decrease.
- C The amount of carbon dioxide used by producers will increase.
- D The amount of carbon dioxide needed by consumers will decrease.



End of Biology Test

North Carolina Test of Biology
Form I RELEASED Fall 2009
Answer Key

Item Number	Correct Answer	Goal
1	B	2 — Physical, Chemical, Cellular Basis of Life
2	D	2 — Physical, Chemical, Cellular Basis of Life
3	B	2 — Physical, Chemical, Cellular Basis of Life
4	D	2 — Physical, Chemical, Cellular Basis of Life
5	A	2 — Physical, Chemical, Cellular Basis of Life
6	D	3 — Continuity of Life/ Changes of Organisms over Time
7	C	3 — Continuity of Life/ Changes of Organisms over Time
8	C	3 — Continuity of Life/ Changes of Organisms over Time
9	B	3 — Continuity of Life/ Changes of Organisms over Time
10	A	3 — Continuity of Life/ Changes of Organisms over Time
11	A	3 — Continuity of Life/ Changes of Organisms over Time
12	C	4 — Unity and Diversity of Life
13	D	4 — Unity and Diversity of Life
14	A	4 — Unity and Diversity of Life
15	C	4 — Unity and Diversity of Life
16	C	4 — Unity and Diversity of Life
17	B	4 — Unity and Diversity of Life
18	D	5 — Ecological Relationships among Organisms
19	B	5 — Ecological Relationships among Organisms
20	A	5 — Ecological Relationships among Organisms
21	C	2 — Physical, Chemical, Cellular Basis of Life
22	C	2 — Physical, Chemical, Cellular Basis of Life
23	D	2 — Physical, Chemical, Cellular Basis of Life
24	A	2 — Physical, Chemical, Cellular Basis of Life
25	B	2 — Physical, Chemical, Cellular Basis of Life
26	B	3 — Continuity of Life/ Changes of Organisms over Time
27	A	3 — Continuity of Life/ Changes of Organisms over Time
28	A	3 — Continuity of Life/ Changes of Organisms over Time
29	C	3 — Continuity of Life/ Changes of Organisms over Time
30	B	3 — Continuity of Life/ Changes of Organisms over Time
31	D	3 — Continuity of Life/ Changes of Organisms over

North Carolina Test of Biology
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Answer Key

		Time
32	A	4 — Unity and Diversity of Life
33	D	4 — Unity and Diversity of Life
34	B	4 — Unity and Diversity of Life
35	D	4 — Unity and Diversity of Life
36	C	4 — Unity and Diversity of Life
37	B	4 — Unity and Diversity of Life
38	A	5 — Ecological Relationships among Organisms
39	D	5 — Ecological Relationships among Organisms
40	C	5 — Ecological Relationships among Organisms
41	D	2 — Physical, Chemical, Cellular Basis of Life
42	A	2 — Physical, Chemical, Cellular Basis of Life
43	B	2 — Physical, Chemical, Cellular Basis of Life
44	C	2 — Physical, Chemical, Cellular Basis of Life
45	D	2 — Physical, Chemical, Cellular Basis of Life
46	C	3 — Continuity of Life/ Changes of Organisms over Time
47	A	3 — Continuity of Life/ Changes of Organisms over Time
48	D	3 — Continuity of Life/ Changes of Organisms over Time
49	D	3 — Continuity of Life/ Changes of Organisms over Time
50	B	3 — Continuity of Life/ Changes of Organisms over Time
51	D	3 — Continuity of Life/ Changes of Organisms over Time
52	C	4 — Unity and Diversity of Life
53	A	4 — Unity and Diversity of Life
54	C	4 — Unity and Diversity of Life
55	C	4 — Unity and Diversity of Life
56	C	4 — Unity and Diversity of Life
57	A	5 — Ecological Relationships among Organisms
58	B	5 — Ecological Relationships among Organisms
59	B	5 — Ecological Relationships among Organisms
60	B	5 — Ecological Relationships among Organisms

**North Carolina Test of Biology
Form I RELEASED Fall 2009
Raw to Scale Score Conversion**

Raw Score	Scale Score
0	123
1	124
2	124
3	125
4	125
5	126
6	126
7	127
8	128
9	129
10	129
11	130
12	131
13	132
14	133
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24	143
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26	145
27	146
28	146
29	147
30	148
31	149
32	149
33	150
34	151
35	151
36	152
37	153
38	153
39	154
40	155
41	155

**North Carolina Test of Biology
Form I RELEASED Fall 2009
Raw to Scale Score Conversion**

42	156
43	157
44	157
45	158
46	159
47	159
48	160
49	161
50	162
51	163
52	164
53	165
54	166
55	168
56	169
57	171
58	173
59	175
60	178