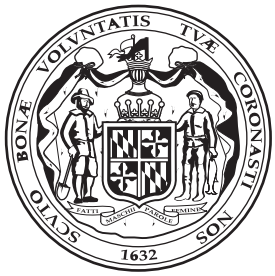
Biology



Maryland High School Assessment

Public Release, Fall 2003

CTB/McGraw-Hill

A Division of The McGraw-Hill Companies

20 Ryan Ranch Road
Monterey, California 93940-5703

Session 1

Sample A

Which of these instruments should a student use to measure the length of a housefly?

A microscope

B metric ruler

C funnel

D graduated cylinder

Sample B

Which of these systems in the human body is directly involved in movement?

F skeletal system

G excretory system

H endocrine system

J reproductive system

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STOP

Notice that the answer choices for Sample B are FGHJ. Selected response answer choices will alternate ABCD and FGHJ.

In addition to selected response questions such as Sample A and Sample B, there will be constructed response questions that require a written answer. Brief constructed response questions, which require a short written answer, are labeled "BCR" below the question number in the Student Test Book. The Rubric Sheet provides information about how constructed response questions will be scored. You may refer to the Rubric Sheet during the test.

Remember, read all directions and questions very carefully and choose the best answer for each question. If you are not sure about an answer, do the best you can, but don't spend too much time on any one question.

Answer all questions until you come to the end of Session 1, where you will see a stop sign. If you finish early, you may check your answers in Session 1, but do not go on to Session 2. You have 65 minutes to complete Session 1.

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GO ON

1 **A student wants to examine chromosomes from animal cells. Which of these would be the best tool for the student to use?**

A litmus paper

B thermometer

C dissecting microscope

D compound microscope

2 **Scientists have altered crop plants to make them more resistant to insects and disease. Which of these processes makes it possible for scientists to alter plants?**

F natural selection

G gene splicing

H adaptation

J chemosynthesis

3 **A student wants to perform an investigation to determine the heart rate of a rabbit. The teacher tells her the heart rate should be about 100 beats per minute. How could this information affect the investigation?**

A It could introduce bias.

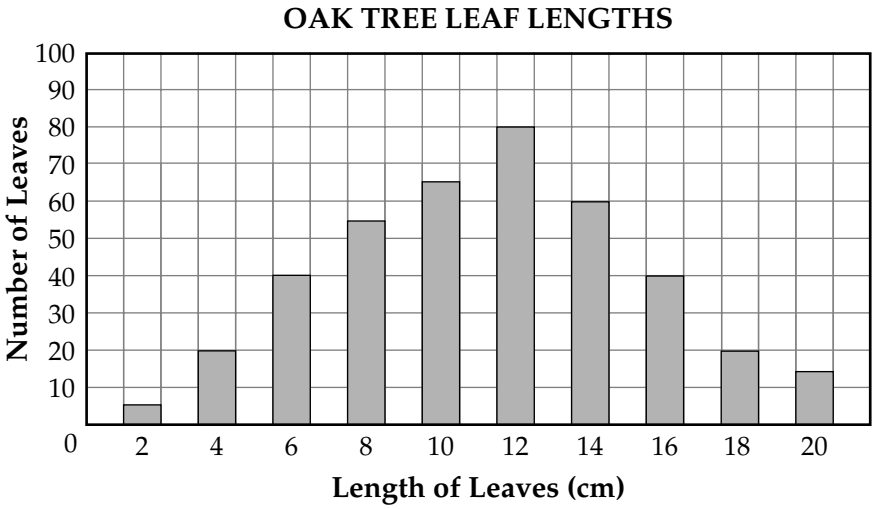
B It could remove experimental error.

C It could increase the accuracy of the data.

D It could reduce the number of measurements needed.

GO ON

4 **Students collected 400 oak leaves for a research project. The graph below shows the lengths of the leaves they collected.**



According to the graph, what proportion of the leaves have a length of 12 centimeters?

F $\frac{1}{10}$

G $\frac{1}{5}$

H $\frac{3}{10}$

J $\frac{2}{5}$

GO ON

5
BCR

Researchers tested a new product designed to remove mildew from household surfaces. They gave free samples of the product to 100 different households. They collected these data: 70 households reported that the product was effective in removing mildew; 30 households reported that the product was not effective in removing mildew. From these data, the researchers concluded that the product was 70% effective in removing mildew from household surfaces.

- **Why is this a misleading conclusion?**
- **In your response, discuss how this experiment could be designed to give more reliable results.**

Write your answer in your Answer Book.

GO ON

6 **Which of these supply the main energy source used in cellular respiration?**

F lipids

G amino acids

H nucleic acids

J carbohydrates

7 **The cell wall of a plant helps the plant cell maintain its shape. What is the main structural component of the cell wall of a plant?**

A lipid

B cellulose

C amino acid

D nucleic acid

GO ON

Directions

Use the technical passage below to answer Numbers 8 through 10.

SCIENTISTS EXPLORE AN ASPECT OF FISH MIGRATION

Toxic pollutants from agriculture and industry have been found worldwide, even in areas that are far from pollution sources. Until now, scientists have blamed air currents for spreading toxins far from their sources. However, a recent study indicates that fish can transport toxins over long distances.

Scientists developed this hypothesis when toxins were mysteriously found in a remote lake in Sweden. A team of scientists from Lund University hypothesized that salmon accumulated and stored toxins in their fatty tissues when they were in the Baltic Sea. The salmon migrated upstream, spawned, and then died in the lake, releasing toxins as their bodies decomposed.

To test this hypothesis, the scientists traveled to Alaska, where they carried out an experiment in two neighboring lakes, Lower Fish Lake and Round Tangle Lake. Lower Fish Lake is open to migrating salmon, while Round Tangle Lake is closed to migrating salmon because of numerous waterfalls and rapids. A small fish, the arctic grayling, lives in both lakes. Fish eggs are a large part of its diet. When the scientists examined the arctic grayling from both lakes, the arctic grayling in Lower Fish Lake had more than twice the concentration of toxins in their bodies as the arctic grayling in Round Tangle Lake. Since both lakes are exposed to similar levels of air pollution, the difference in toxin levels found in the arctic grayling must be due to other factors.

In a related experiment, scientists caught salmon throughout their migration and tested their fatty tissues for toxins. Even though the fatty tissue deposits were gradually used up, toxin levels remained about the same throughout the 400-kilometer journey up the Copper River from the Gulf of Alaska to Lower Fish Lake. Instead of metabolizing the toxins, the salmon stored them in other body tissues that also contain fat, and in their eggs.

Both of these studies support the hypothesis that migrating salmon can transport pollutants to new areas.

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GO ON

8 **According to the passage, what question is being asked by Lund University researchers?**

F What are the migrating habits of salmon in Alaska and Sweden?

G Are increasing levels of air pollution affecting salmon migration?

H What are the diets of the arctic grayling and the migrating salmon found in the two Alaskan lakes?

J Are migrating salmon responsible for transporting toxins from the sea to freshwater lakes?

9 **Which of these locations was used as the control in the experiment?**

A Lower Fish Lake

B the Gulf of Alaska

C the Copper River

D Round Tangle Lake

10 **In addition to eating fish eggs, the arctic grayling also eats insects and small fish. What is the ecological role of the arctic grayling?**

F herbivore

G decomposer

H omnivore

J carnivore

GO ON

11 **The ability of the human body to regulate the level of blood glucose is an example of**

A osmosis

B homeostasis

C binary fission

D aerobic respiration

12 **BCR**

The rain forests of South America are rapidly being destroyed. They are cut for lumber or burned to make land available for raising cattle or growing crops.

What are the negative effects of this destruction on the global environment as well as on the local environment?

Write your answer in your Answer Book.

13 **When the cells of most organisms freeze, they burst. Which property of water causes this to occur?**

A Water is a universal solvent.

B Water changes temperature rapidly.

C Water is less dense as a solid than as a liquid.

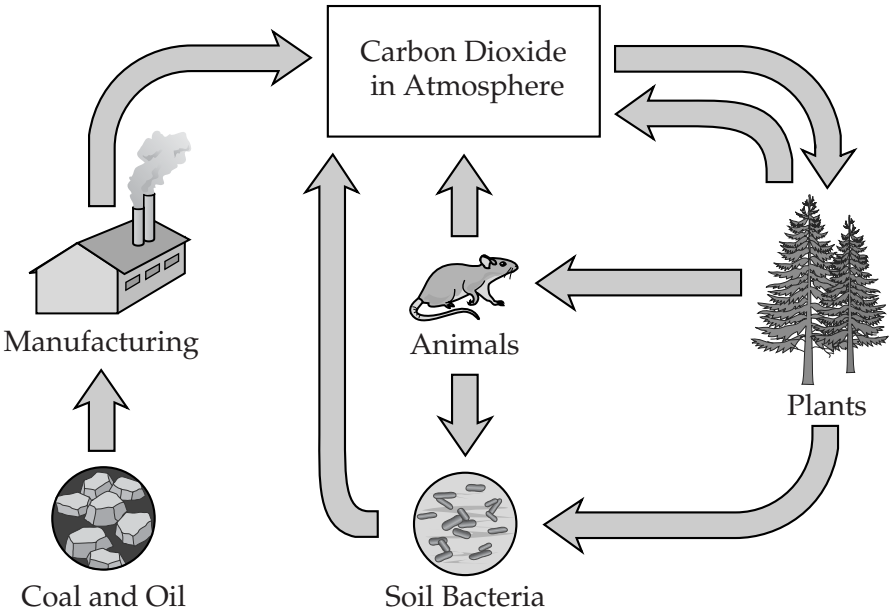
D Water is a nonpolar molecule.

GO ON

Directions

The diagram below shows part of the carbon cycle. Use the diagram to answer Numbers 14 and 15.

CARBON CYCLE



14 **Which of these would lead to an increase in carbon dioxide in the atmosphere?**

F a decrease in respiration

G a decrease in the ozone layer

H an increase in photosynthesis

J an increase in the burning of fossil fuels

15 **During photosynthesis, trees convert carbon dioxide and other materials to**

A lipids

B amino acids

C nucleic acids

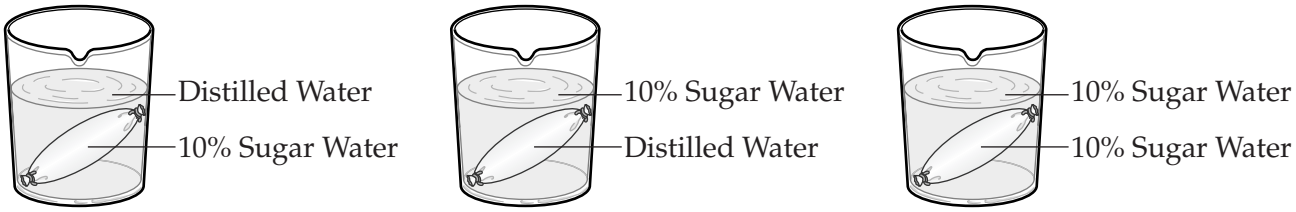
D sugars

GO ON

16 **BCR**

A student is setting up an experiment using a type of bag that is permeable to water, but not to sugar. She will fill and weigh three bags and place each bag into a different beaker. The diagram below shows the contents of the bags and the beakers at the start of the experiment.

INITIAL CONTENTS OF BEAKERS AND TUBES



Beaker 1 Beaker 2 Beaker 3

Predict whether after 15 minutes each bag will weigh less, the same, or more than it did at the beginning of the experiment. Provide reasons for each of your predictions.

Write your answer in your Answer Book.

GO ON

Directions

Use the information and the table below to answer Numbers 17 and 18.

A group of students wanted to determine how the ability to taste PTC, a nontoxic chemical, is passed from one generation to the next. The students decided to test families in their community for this ability. The students gave each family member a paper strip coated with a small amount of PTC. Those who experienced the bitter taste of PTC when they touched the paper strips to their tongues were called "tasters"; those who could not taste the PTC were called "nontasters."

The results of the experiment are shown in the table below.

ABILITY TO TASTE PTC IN CHILDREN OF THREE GROUPS OF PARENTS

Parent Group	Children of Each Parent Group	
	Percent Tasters	Percent Nontasters
Both parents tasters	85	15
One parent taster, one parent nontaster	62	38
Both parents nontasters	0	100

17 **Which of these explains how two taster parents could produce a nontaster child?**

A Both parents are heterozygous and produce a homozygous recessive child.

B Both parents are homozygous recessive and produce a homozygous dominant child.

C Both parents are heterozygous and produce a heterozygous child.

D Both parents are homozygous dominant and produce a homozygous recessive child.

18 **Based on the data the students collected, the allele for tasting PTC is <u>most likely</u>**

F dominant

G heterozygous

H recessive

J sex-linked

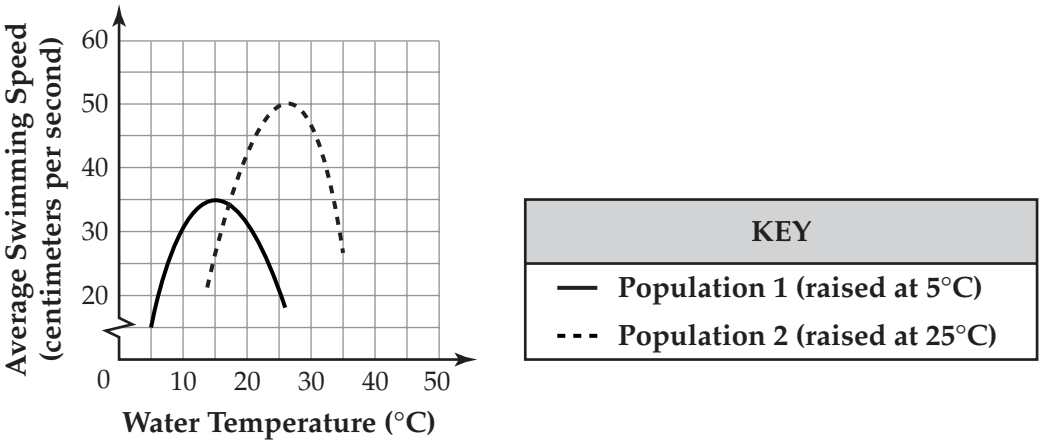
GO ON

Directions

Use the information and the graph below to answer Numbers 19 through 22.

Scientists wanted to study the effect of water temperature on the swimming speed of goldfish. They set up an experiment in which they raised populations of goldfish in two different aquariums. Population 1 was raised at 5°C. Population 2 was raised at 25°C. All other variables were constant in both aquariums. The results of this experiment are shown in the graph below.

SWIMMING SPEEDS OF TWO GOLDFISH POPULATIONS



19 **If the temperature of the water increases from 5°C to 10°C, the goldfish in Population 1 would most likely**

A produce less carbon dioxide

B eat less food

C use more oxygen

D excrete more salt

GO ON

20 **According to the graph, both populations of goldfish swim at the same speed at which of these temperatures?**

F 12°C

G 17°C

H 22°C

J 27°C

21 **According to the graph, as the water temperature increases from 5°C to 25°C, the average speed of the goldfish in Population 1**

A increases

B decreases

C first increases, then decreases

D first decreases, then increases

22 **Which of these is <u>most</u> affected in the cells of the goldfish when the water temperature is lowered?**

F enzyme activity

G pH level

H DNA base sequence

J salt concentration

GO ON

23
BCR

A student is studying the relationship between a leafy plant and a species of beetle. He divided 20 plants into two groups. He planted each group in a separate planter box. He then released 50 beetles into one of the planter boxes. The beetles fed on the leaves and left a white substance around the plant, changing the pH of the soil. He recorded the average height of the plants at the end of three months. His data are shown below.

PLANT DATA

Group	Average Height (cm)
1 (Grown with beetles)	12
2 (No beetles)	36

- **How did the substance probably affect the growth of the plants in Group 1?**
- **Describe how changes in pH may affect the metabolic rates of cells.**
- **Describe how other environmental factors could affect growth in plants.**

Write your answer in your Answer Book.

GO ON

Directions

Use the information below to answer Numbers 24 through 28.

Scientists have recently discovered a new species that lives attached to the side of a tree. An organism from this new species

- **is multicellular**
- **has cell walls**
- **has vascular tissues**
- **makes its own food**
- **has structures that absorb moisture from the air**

24 **Which of these describes the function of the vascular tissues in this organism?**

F to promote reproduction

G to control movement

H to transport materials

J to produce energy

25 **The scientists put the organism in a sealed glass container and placed it in the sunlight for several hours. Which of these increased inside the container?**

A water

B nitrogen gas

C oxygen gas

D carbon dioxide gas

26 **Which of these is <u>not</u> true about cells in the new organism?**

F They contain nuclei.

G They use vacuoles for storage.

H They contain mitochondria.

J They use pseudopodia to move.

27 **The scientists learned that this organism produces a special protein that prevents it from freezing in cold weather. Which of these contains the information for making this protein?**

A a vacuole

B a lipid

C a vitamin

D a gene

GO ON

28 **Which of these terms best describes this new organism?**

F omnivore

G eukaryote

H herbivore

J prokaryote

STOP

Session 2

Answer all questions until you come to the end of Session 2, where you will see a stop sign. If you finish early, you may check your answers in Session 2, but do not go back to Session 1. You have 55 minutes to complete Session 2.

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29 **Which of these is an example of feedback in a biological system?**

A the movement of salts from cells into the bloodstream

B the release of insulin into the bloodstream when blood sugar increases

C the decrease in oxygen levels in the blood after vigorous exercise

D the use of energy when muscles contract

GO ON

30 **Which of these is not a direct function of the skeletal system?**

F blood circulation

G muscle attachment

H support of the body

J protection of the organs

31 **Which of these is an environmental factor that causes damage to chromosomes?**

A acid rain

B lead paint

C methane gas

D ultraviolet light

32 **Look at the DNA sequence below.**

GAA TTC GCA

What do the G and A represent in the DNA sequence?

F sugars

G amino acids

H phosphates

J nitrogen bases

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GO ON

33 **BCR**

- **Name the different types of RNA found in the cytoplasm of cells.**
- **Explain the role of each in protein synthesis.**

Write your answer in your Answer Book.

GO ON

34 **Which of these is the process by which water moves across a selectively permeable membrane?**

F osmosis

G transpiration

H capillary action

J active transport

35 **Which of these represents the number of chromosomes in cells before and after the process of meiosis?**

A $n \rightarrow n$

B $n \rightarrow 2n$

C $2n \rightarrow n$

D $2n \rightarrow 2n$

36 **In humans, the allele for dimples (D) is dominant. The allele for not having dimples (d) is recessive. A woman (DD) and a man (Dd) have four children. Which of these is the predicted ratio of the children with dimples to the children without dimples?**

F 1:0

G 1:1

H 1:3

J 3:1

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GO ON

37 **Which of these is necessary for natural selection to occur?**

A genetic engineering

B genetic variation

C asexual reproduction

D environmental stability

38 **An Olympic gold medalist in cross-country skiing has a gene which causes him to produce 50% more hemoglobin than the average person. Which of these most likely caused this trait?**

F a special diet designed for the skier

G the climate where the skier lives

H the training routine of the skier

J a mutation carried by the skier

39 **Botulism, a type of food poisoning, is caused when bacteria release a poisonous substance. Eating even a small amount of food that contains the poisonous substance can cause death.**

This poisonous substance is called

A a virus

B a toxin

C a parasite

D a scavenger

GO ON

40 **Rabbits that live in warm climates have larger ears than rabbits that live in cold climates. Larger ears allow rabbits to cool themselves by releasing body heat. Which term describes this characteristic?**

F alteration

G mutation

H adaptation

J recombination

41 **In humans, the allele for unattached earlobes (E) is dominant. The allele for attached earlobes (e) is recessive. A woman who is heterozygous for this trait marries a man who has attached earlobes. What is the probability that this couple's child will have unattached earlobes?**

A 25%

B 50%

C 75%

D 100%

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GO ON

42
BCR

Biologists have discovered an animal called a cloudrunner, shown in the figure below.

CLOUDRUNNER

Biologists are now trying to determine the cloudrunner's evolutionary relationship to other animals.

- **What kinds of evidence and scientific techniques could the biologists use to determine the evolutionary relationship of the cloudrunner to other animals?**
- **How does this evidence demonstrate evolutionary relationships between the cloudrunner and other animals?**

Write your answer in your Answer Book.

GO ON

43 **Students collected leaves from four maple trees. They measured the length and width of each leaf. Then they calculated the average values for each tree. The data are shown in the table below.**

LEAF SIZE OF MAPLE TREES

Tree	Average Length (cm)	Average Width (cm)
1	16.0	9.0
2	10.0	5.0
3	19.0	10.0
4	15.0	8.0

According to the data, which tree has a selective advantage in capturing sunlight?

A 1

B 2

C 3

D 4

44 **Which of these describes a mutation that can be inherited?**

F random breakage in a liver cell's DNA

G abnormal lung cells produced by toxins in smoke

H a nitrogen base substitution in a gamete cell

J ultraviolet radiation damage to skin cells

GO ON

45 **What is the primary role of the endocrine system?**

A to produce chemicals that affect other parts of the body

B to remove waste products from the blood

C to defend the body against illness and infection

D to coordinate movement of the body

46 **The mole rat is an animal that avoids predators by living underground. Its long claws and teeth allow it to dig deep holes. Scientists believe the ancestors of the mole rat lived above ground and had shorter claws and teeth.**

Which of these processes resulted in the long claws and teeth found in the modern mole rat?

F natural selection

G selective breeding

H genetic engineering

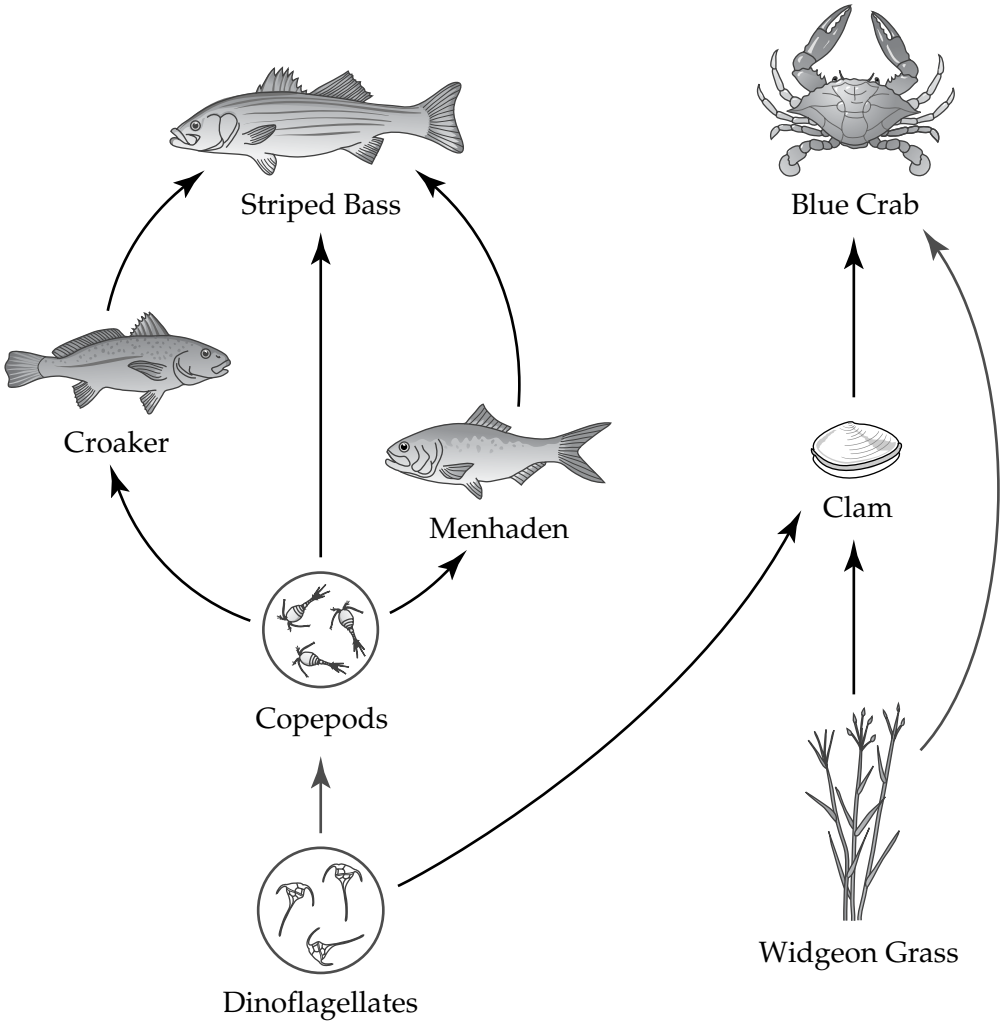
J asexual reproduction

GO ON

Directions

The diagram below shows the relationships among organisms living in an Atlantic coast estuary. Use the diagram to answer Numbers 47 through 49.

ESTUARY ECOSYSTEM



47 **Which of these best describes the role of the blue crab in the estuary ecosystem?**

A carnivore

B herbivore

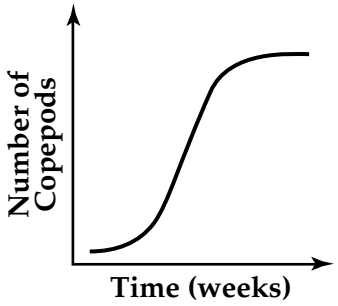
C producer

D omnivore

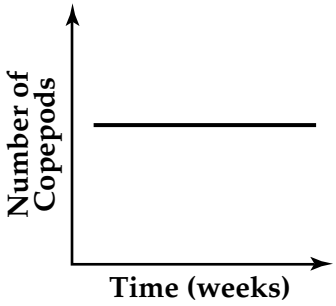
GO ON

48 **The croaker, menhaden, and striped bass are fished for food. Which of these graphs shows how a decrease in the fish populations would most likely affect the copepod population?**

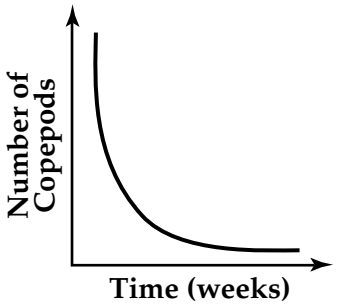
F



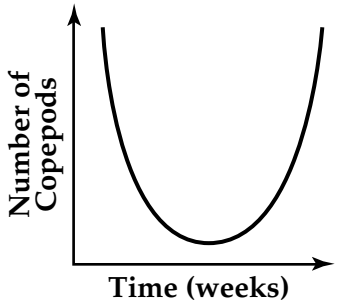
H



G



J



49 **Which of these is an abiotic factor that affects the organisms in the estuary ecosystem?**

A the amount of bacteria in the water

B the number of copepods

C the amount of salt in the water

D the number of scavengers

GO ON

50
BCR

A lichen is comprised of a fungus and an alga growing together. The fungus provides a protective structure for the alga, and the alga provides food and other nutrients for the fungus. As part of the lichen, the alga is able to live in dry environments that it would not normally be able to inhabit. Their relationship allows them to live in some of the harshest environments in the world.

When environmental conditions are mild, the alga does not need the protective structure of the fungus to survive. The alga grows slower with the fungus than it would alone. This relationship between the alga and fungus can be described as either mutualism or parasitism.

Describe the similarities and differences between mutualism and parasitism. In your response, be sure to include

- **why lichens can be examples of both types of relationships**
- **other examples of mutualism or parasitism**

Write your answer in your Answer Book.

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GO ON

51 **Which of these shows how energy is usually transferred in a food chain?**

A herbivore → producer → carnivore

B producer → carnivore → herbivore

C carnivore → herbivore → producer

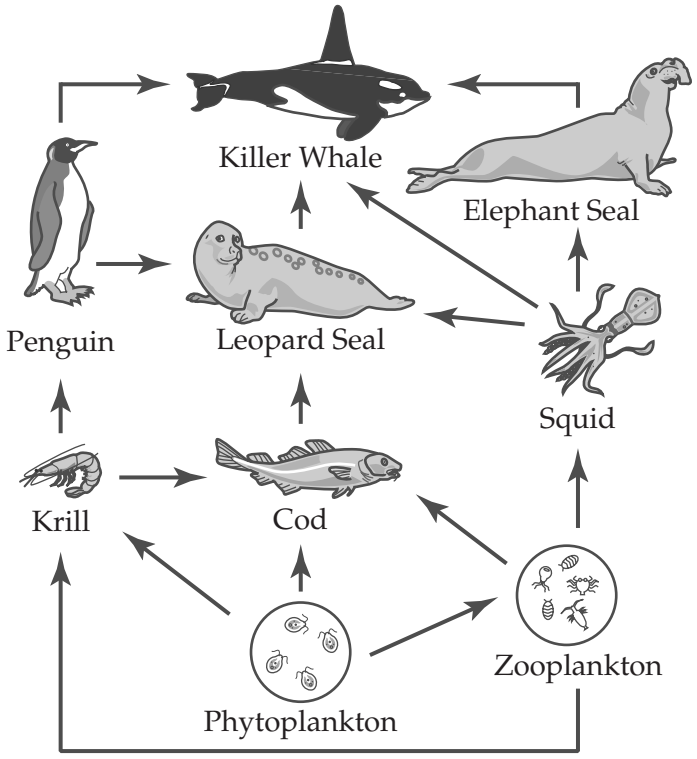
D producer → herbivore → carnivore

GO ON

Directions

Use the diagram of the marine food web below to answer Numbers 52 through 55.

MARINE FOOD WEB



52 **Which of these best describes the role of the krill in this food web?**

F decomposer

G consumer

H producer

J parasite

53 **Which of these best describes the relationship between the phytoplankton and zooplankton?**

A producer–consumer

B mutualism

C parasite–host

D commensalism

GO ON

54 **How would the food web be affected if the phytoplankton were removed?**

F Only organisms that feed directly on the phytoplankton would be affected.

G Only organisms that feed directly on the zooplankton would be affected.

H Only the killer whale and the seals would be affected.

J All the organisms would be affected.

55 **Cod is a popular fish in the human diet. If too many cod were removed due to overfishing, which of these would most likely occur?**

A The penguins would become extinct.

B The phytoplankton population would decrease.

C The leopard seals would eat more squid.

D The killer whale population would increase.

STOP