

**VIRGINIA
STANDARDS OF LEARNING ASSESSMENTS**

Spring 2002 Released Test

**END OF COURSE
BIOLOGY**

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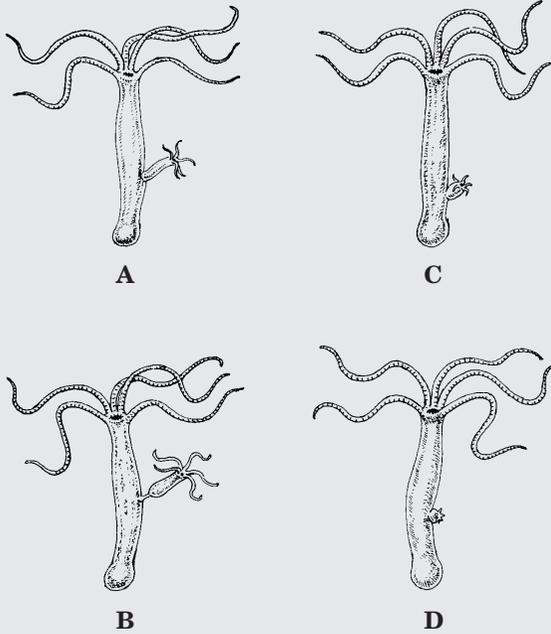
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DIRECTIONS

Read each question carefully and choose the best answer. Then mark the space on the answer sheet for the answer you have chosen.

SAMPLE

The following pictures show some stages during asexual reproduction of a hydra. Which picture shows the first step?

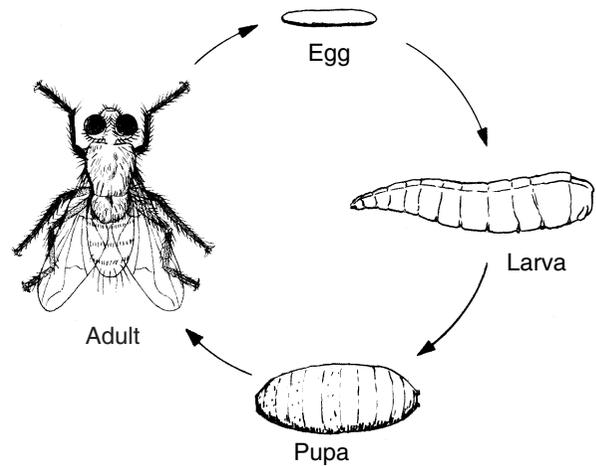


1 **Himalayan rabbits are white with black fur on their ears and the tips of their feet. If an icepack is placed on a rabbit's back, the fur will grow in black. In this case, hair color is determined by —**

- A length of fur
- B competition
- C environmental conditions
- D predation pressure

2

Life Cycle of a Fly



Which animal develops in a cycle most similar to the one shown above?

- F A bird
- G A moth
- H A hydra
- J A grasshopper

3 DNA that is derived from the DNA of two or more different species is called —

- A recombinant DNA
- B mitochondrial DNA
- C chloroplast DNA
- D plasmid

4 In 1928, the scientist Alexander Fleming was trying to grow the bacterium *Staphylococcus*, and by chance, discovered that it would not grow in the presence of a mold that he named *Penicillium*. In 1939, Ernst Chain and Howard Florey purified penicillin, and in 1941, penicillin was first used to treat bacterial diseases. In 1945, Alexander Fleming, Ernst Chain, and Howard Florey received the Nobel Prize in medicine for the discovery and isolation of penicillin. These facts show that —

- F Florey and Chain unfairly used Fleming's work and should not have received the Nobel Prize
- G chance plays no role in scientific discoveries
- H scientific progress often requires the efforts of many people working together
- J whenever possible, the Nobel Prize should be given to more than one person

5 Long ago, people thought that the smallpox virus could be carried through the air. For this reason, many people moved from crowded cities to the more open country during smallpox epidemics, carrying with them family members who had the virus but had not yet contracted the disease. When the pox erupted on these family members, other members living in the home soon contracted the disease too. Which of these was then discovered to be the means of transmission?

- A Drinking water from local wells
- B Directly contacting a person with smallpox
- C Being bitten by mosquitoes that carry the virus
- D Eating food that contains the virus

6



The picture shows an x-ray diffraction of DNA. The x-ray diffraction of DNA led to the idea that DNA —

- F is a double helix
- G contains paired bases
- H can copy itself
- J is a very long molecule

7 Which of the following statements describes the process of natural selection?

- A Farmers select animals with desirable variations for breeding.
- B Populations sharing the same gene pool interbreed and create new species.
- C Individuals survive that have inherited traits adapted to their environment.
- D New species are formed via genetic engineering.

8 **Plant Characteristics**

Plant	Type of Growth	Leaves	Flowers	Fruit
Cucumber	sprawling vines	fuzzy, dark green, 3-5 lobes	yellow	long and spiny
Eggplant	erect, bushy stems	fuzzy, large ovate	violet	large, egg-shaped berry, varying in color
Pumpkin	sprawling vines	large, fuzzy, triangular, lobed	yellow	large (2-20 lb), oblate to oblong, smooth rind
Pepper	straight and woody	slick, medium green	white	juiceless berries or pods, varying shape, size, and color
Okra	erect, shrub-like	heart-shaped and 3-5 lobes	yellow, crimson center	hairy, tapering capsule, 4-10 inches long

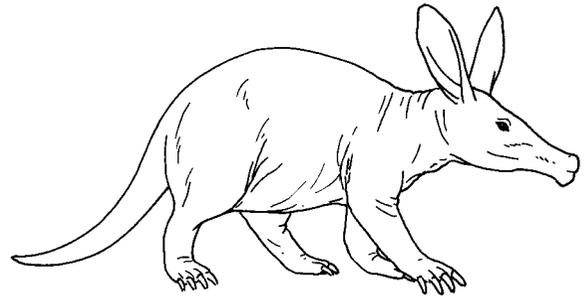
The cucumber belongs to the Cucurbitaceae family and is recognized by its long, trailing vines with fuzzy, three- to five-pointed leaves and long, spiny fruit. Using the characteristics in the chart above, which plant is most closely related to the cucumber?

- F Eggplant
- G Pumpkin
- H Pepper
- J Okra

9 Which of these does *not* depend on muscle contraction?

- A Eye movement
- B Arm movement
- C Reflexes
- D Pain perception

10



Which of these hypotheses is *best* supported by observations of this animal?

- F This animal spends much of its time digging.
- G This animal usually hunts for food at night.
- H This animal is herbivorous.
- J This animal has poor hearing.

11

	F	f
F	FF	Ff
f	Ff	ff

In rabbits, short fur (F) is dominant to long fur (f). According to the Punnett square, what is the chance of two heterozygous short-haired rabbits having offspring with short fur?

- A One in four
- B Two in four
- C Three in four
- D Four in four

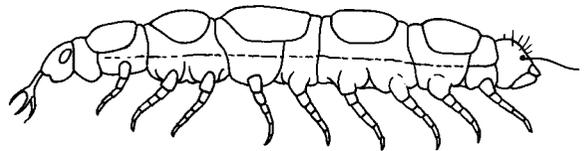
12 If a student needs to do research on heredity for a science project, which of these sources is the most reliable resource?

- F A weekly news magazine
- G A newspaper tabloid
- H A national newspaper
- J A professional journal

13 The island of Aldabra lies 400 kilometers off the coast of Africa and is home to the Aldabra Rail, a long-legged wetland bird. The Aldabra Rail is flightless and much different from the rails living on the mainland. This bird became a distinctly different species through —

- A reproductive isolation
- B adaptive radiation
- C convergence
- D geographic isolation

14



This organism is most closely related to animals in the Phylum Arthropoda, the phylum that contains beetles, because it has —

- F legs
- G antennae
- H jointed appendages
- J an elongated body

15

“I took a good clear piece of Cork and with a Pen-Knife sharpen’d as keen as a razor . . . cut off . . . an exceeding thin piece of it. For upon examination with my Microscope, I could exceedingly plainly perceive it to be all perforated and porous . . . These pores, or cells, were not very deep, but consisted of a great many little Boxes.”

These words were written by Robert Hooke in 1665. The pores or cells that Hooke described were really —

- A cell walls
- B nuclei
- C cell membranes
- D mitochondria

16

Effects of Ultraviolet Light on Wheat Crop Production

Experimental Plot (4m X 15m)	Wavelength (nm)	Wave Intensity (Joules/m ²)	Crop Yield (g/m ²)
A	357.6	0	110
B	357.6	8	110
C	357.6	20	30
D	357.6	25	20

Which of these statements is best supported by these data?

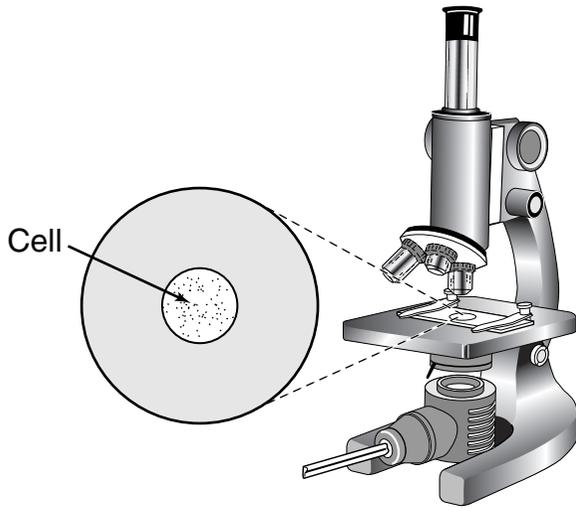
- F Wheat plants exposed to high-intensity ultraviolet light produce fewer seeds.
- G Chloroplasts of wheat are able to filter out low-intensity ultraviolet light.
- H High-intensity ultraviolet light may be used to control weed growth.
- J No exposure to ultraviolet light increases pollination in wheat plants.

17

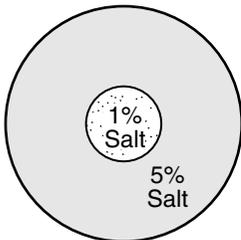
Unknown animal: Met-Gly-Ser-Tyr-Tyr-Arg-His-His-Glu-Lys-Asp

One method of determining the classification of an animal is by comparing the amino acid sequence. Which of these animals most closely resembles the unknown animal?

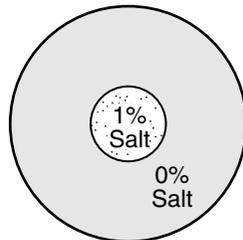
- A Horse: Met-Gly-Ser-Ser-Tyr-Arg-Arg-Asp-His-Glu-Lys-Asp
- B Dog: Met-Gly-Ser-Tyr-Tyr-Arg-His-Asp-Glu-Lys-Asp
- C Cat: Met-Gly-Ser-Tyr-Tyr-Arg-His-His-Arg-Cys-Thre-Asp
- D Mouse: Met-Gly-Ser-Tyr-Tyr-Arg-His-Glu-Val-Val-Leu



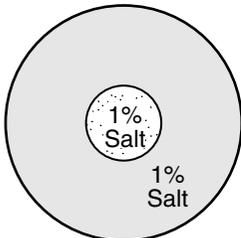
A student was studying the responses of cells to solutions of varying salt concentrations. Which solution below would cause no change in cell size?



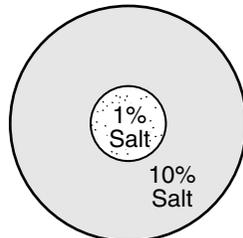
F



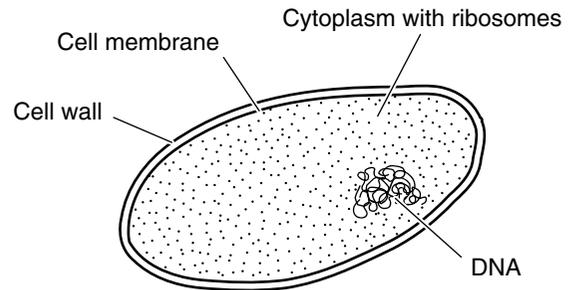
H



G



J



How is the prokaryotic bacterium in the diagram different from a eukaryotic cell?

- A It has ribosomes to make proteins.
- B It stores its genetic information in DNA.
- C It has no membrane-bound nucleus.
- D It has a cell membrane.

20 Cells are the functional units that make up tissues. Tissues then become the functional units that make up —

- F enzymes
- G organs
- H other cells
- J DNA

21 The concentration of glucose must be maintained within a fairly narrow range in most vertebrates. This statement is an example of —

- A homeostasis
- B excretion
- C glycolysis
- D fermentation

22 Peroxidase is an enzyme that breaks down hydrogen peroxide in cells. It accomplishes this because of its structure. What part of the enzyme is involved in catalytic activity?

- F Binding pocket
- G Pleated sheet
- H Active site
- J Quaternary structure

23 Which of these processes is carried out in the same way in both plants and animals?

- A Cellular respiration
- B Asexual reproduction
- C Circulation of body fluids
- D Excretion of metabolic waste

24 What is the main cause of fish kills in rivers polluted by fertilizers?

- F Decreased mineral sources
- G Decreased oxygen levels
- H Increased water temperatures
- J Increased water levels

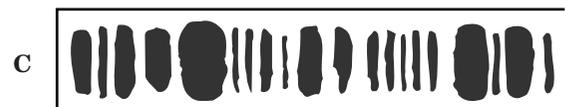
25

Puppy



The DNA fingerprints were made from blood samples taken from a puppy and four possible sires of this puppy in an effort to determine the puppy's pedigree. According to this information, which sire was probably the father of this puppy?

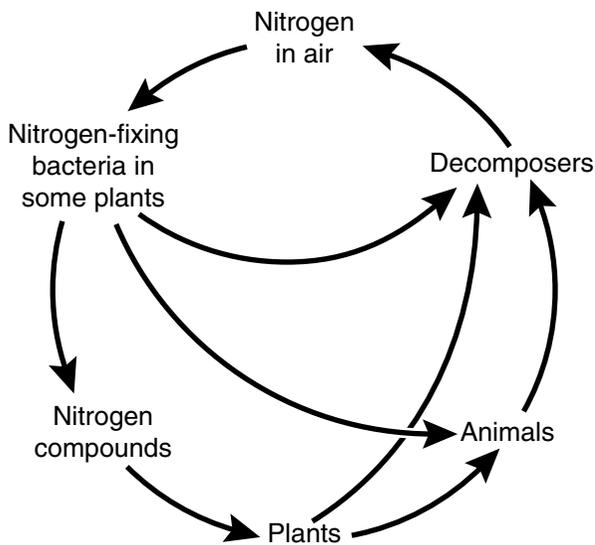
Possible Sires



26 Bacteria are tremendously successful unicellular organisms, yet all large organisms are multicellular. Unicellular organisms cannot grow very large because the —

- F energy expenditures would be too great
- G locomotion of the organisms would be too slow
- H diffusion of nutrients into the cell's interior would be too slow
- J respiratory rate would be too high

27



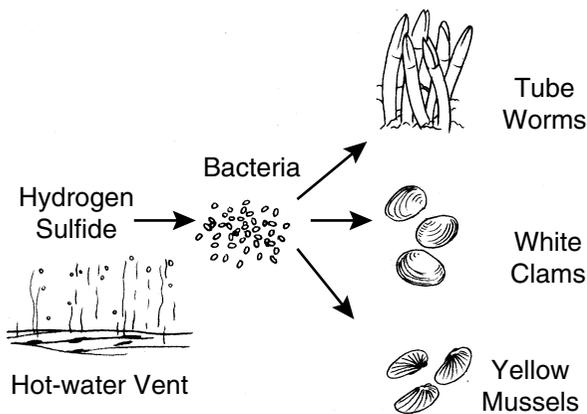
Which of these is a decomposer in a Virginia forest?

- A A pine tree
- B A mushroom
- C A dandelion
- D A caterpillar

28 In cows, long hair is dominant to short hair. In a cow that is heterozygous for long hair, what percentage of the cells undergoing meiosis will carry the dominant allele?

- F 25%
- G 50%
- H 75%
- J 100%

Deep-Ocean Organisms



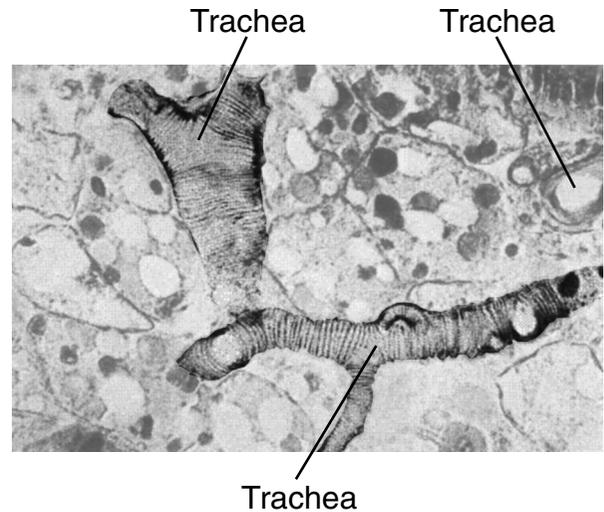
Around hot-water vents deep in the ocean live specialized communities. Bacteria turn hydrogen sulfide into sugars by a chemical process. The bacteria then provide food to other life forms, as shown in the diagram. Compared to food chains on land, the bacteria fill the same role as —

- A hawks
- B rabbits
- C green plants
- D mushrooms

30 During a trip to a rain forest, a scientist discovered a new organism living near some rotting logs. The scientist observed that the organism had moist skin, no hair, and an internal skeleton and that it laid its eggs under the logs. This organism was probably a new species of —

- F invertebrate
- G amphibian
- H mammal
- J reptile

31



The picture shows the trachea and surrounding tissue of a flea. Which of these best describes the shape of the flea trachea?

- A A single, coiled tube
- B A double-helix shape
- C A long, branched tube
- D A six-sided cylinder

Experimental Results

Fertilizer	Plant 1	Plant 2
1	10 mm	8 mm
2	6 mm	3 mm
3	13 mm	10 mm
4	9 mm	4 mm

The data show the growth of two bean plants over several weeks using four different fertilizers. The experimental data would be more valid if which of the following variables was included in the experiment?

- F A fifth fertilizer was tested.
- G Only one plant was tested.
- H The plants were grown at variable temperatures.
- J A control without fertilizer was included for each plant.

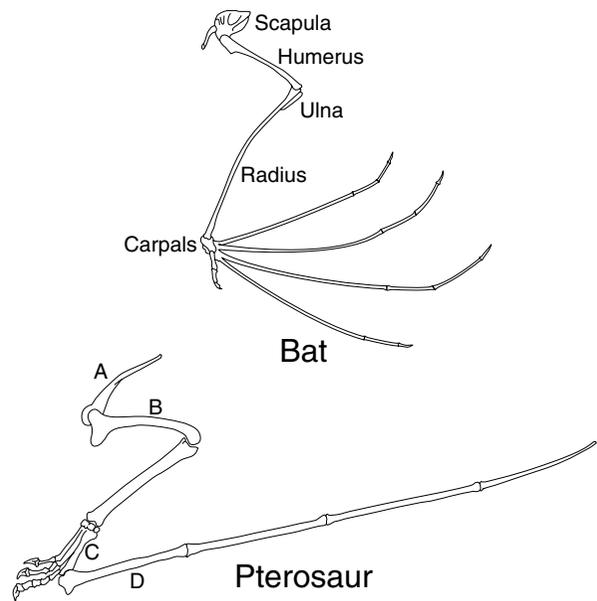
33 Many of the forests of Virginia have been cleared for farmland. Which of these would *least* affect the time it would take to return a farm to forest conditions?

- A The number of viable tree seeds on the land
- B The amount of available nutrients in the soil
- C The density of the original forest on the farm
- D The ability of the farmland to retain moisture

34 Human red blood cells that lack sufficient hemoglobin would have a low amount of what substance?

- F Hydrogen
- G Nitrogen
- H Calcium
- J Oxygen

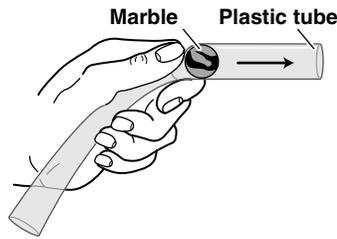
35



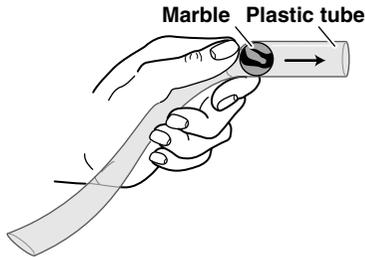
The picture above shows part of the pectoral girdle and limb of two flying vertebrates known as the bat and the prehistoric pterosaur. Which bone of the pterosaur corresponds to the humerus of the bat?

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

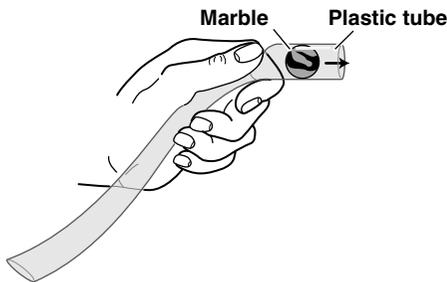
Picture 1



Picture 2



Picture 3



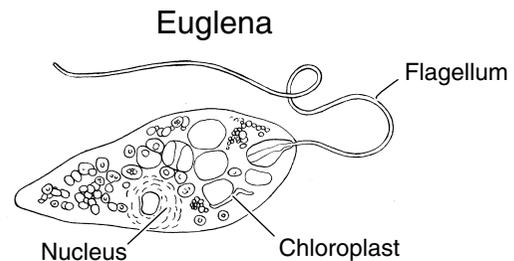
The picture shows a model being used to explain how food is moved through the gastrointestinal (GI) tract. What do the fingers pushing the marble along represent?

- F The pressure of blood vessels surrounding the GI tract
- G The production of fluids by the GI tract
- H The contraction of muscles in the GI tract
- J The electrical impulses from the nervous system to the GI tract

37 Tuberculosis is caused by a bacterium, *Mycobacterium tuberculosis*. Many years ago, streptomycin easily controlled the bacterium. Now streptomycin is much less effective against the resistant *M. tuberculosis*. The increasing resistance of *M. tuberculosis* to streptomycin is most likely due to the increased —

- A use of streptomycin for bacterial infections
- B numbers of alternatives to streptomycin
- C artificial production of streptomycin
- D early detection of bacterial infections

38



What is the purpose of the flagellum?

- F Circulation
- G Catching prey
- H Movement
- J Attachment

39

Hypothesis: More pine seeds germinate after a forest fire.

The most valid and reliable test of this hypothesis would include an experimental group of pine seeds that was recovered from a fire area and pine seeds that were —

- A germinated after a fire
- B tolerant of fire
- C found before a fire
- D placed in a fire

40 A student wanted to study the effect of temperature on algae levels in a local stream. Which items are *most* useful for gathering data and *most* appropriate for communicating the results of her observations?

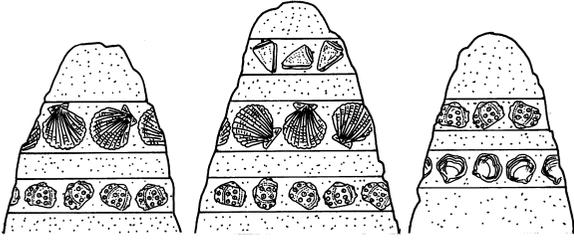
- F Research on the Internet and videotapes of water samples
- G Microscopes and written descriptions of weather patterns
- H pH strips and written observations of stream water
- J Test tubes, thermometers, and graphs of results

41 Which characteristic do viruses possess in common with living cells?

- A They contain a nucleus and organelles.
- B They make their own food.
- C They contain nucleic acids such as DNA or RNA.
- D They are inactive outside the body of living cells.

42 The triplet code of bases for RNA may be represented by all of the following *except* —

- F CGT
- G CGA
- H CGG
- J CGU



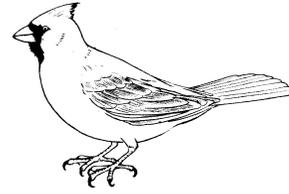
The picture shows three columns of exposed rock that are within a three-kilometer area. According to this information, the dominant past environment of this area has been —

- A arctic tundra
- B shallow marine
- C deciduous forest
- D tropical desert

44 People who have been exposed to excessive radiation often experience mutations. If these mutations only occur in somatic (body) cells, these people may —

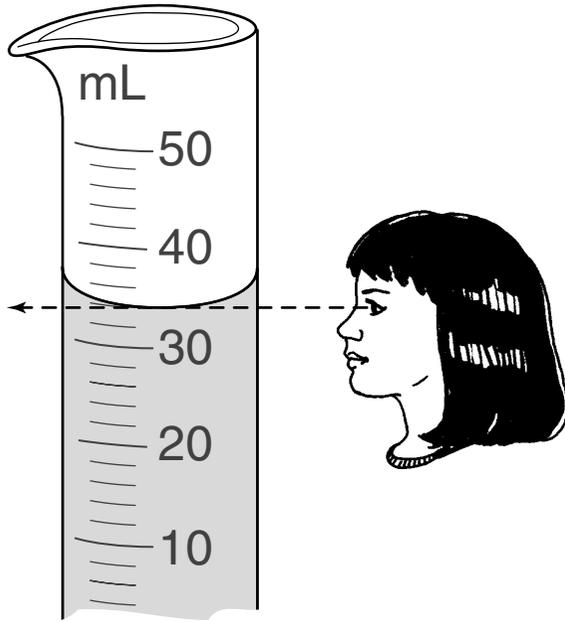
- F pass on these mutations to their offspring
- G experience an increased risk of cancer
- H develop entirely new DNA sequences in all cells
- J experience difficulties replicating RNA

Red Cardinal



Which characteristic supports the hypothesis that this bird spends a great deal of time in the trees and shrubs?

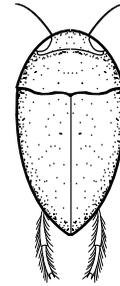
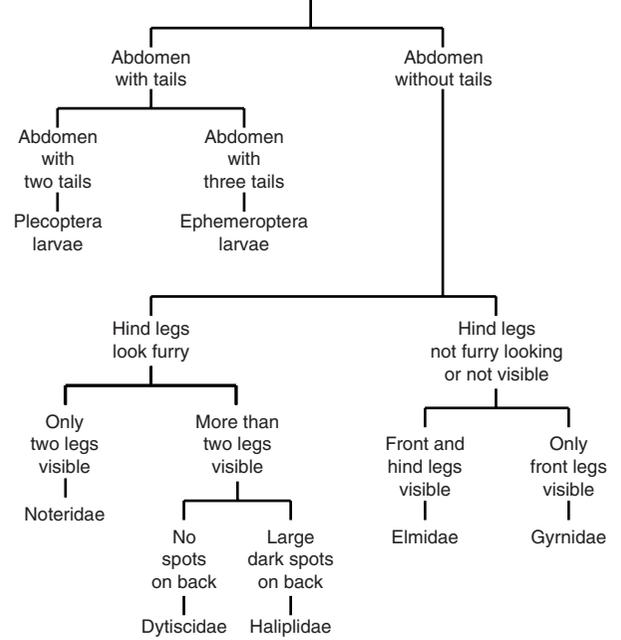
- A The thickness of its bill
- B The crest of feathers on its head
- C The shape of its feet
- D The color of its wings



Jan consistently read the volume of liquids as shown. How would this practice impact her work?

- F Her measurements would lack precision.
- G Her measurements would be too high.
- H Her measurements would be too low for less dense liquids.
- J Her measurements would be very accurate.

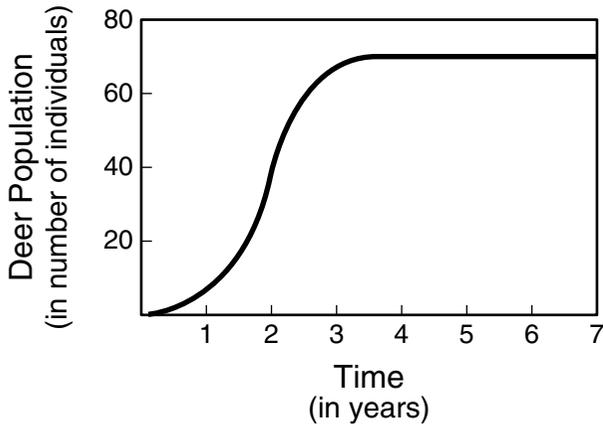
47 Key to Some Common Aquatic Insect Types



According to this key, to what family does the insect above belong?

- A Dytiscidae
- B Haliplidae
- C Gyrnidae
- D Noteridae

48



In the graph above, what is the population of deer at the carrying capacity of the environment?

- F 10
- G 30
- H 50
- J 70

49 Photosynthesis is important for almost all life on Earth because it —

- A produces oxygen
- B uses simple elements
- C is responsible for most decay
- D releases usable forms of nitrogen

50 A student wants to view cells under the compound microscope at a total magnification of 400X. If the eyepiece is 10X, which of the following objective lenses should be used?

- F 4X
- G 10X
- H 40X
- J 100X

Answer Key

Test Sequence	Correct Answer	Reporting Category	Reporting Category Description
1	C	004	Interaction of Life Forms
2	G	003	Life at the Systems and Organisms Level
3	A	002	Life at the Molecular and Cellular Level
4	H	001	Scientific Investigation
5	B	004	Interaction of Life Forms
6	F	002	Life at the Molecular and Cellular Level
7	C	004	Interaction of Life Forms
8	G	003	Life at the Systems and Organisms Level
9	D	003	Life at the Systems and Organisms Level
10	F	001	Scientific Investigation
11	C	003	Life at the Systems and Organisms Level
12	J	001	Scientific Investigation
13	D	004	Interaction of Life Forms
14	H	003	Life at the Systems and Organisms Level
15	A	002	Life at the Molecular and Cellular Level
16	F	001	Scientific Investigation
17	B	002	Life at the Molecular and Cellular Level
18	G	003	Life at the Systems and Organisms Level
19	C	002	Life at the Molecular and Cellular Level
20	G	002	Life at the Molecular and Cellular Level
21	A	003	Life at the Systems and Organisms Level
22	H	002	Life at the Molecular and Cellular Level
23	A	003	Life at the Systems and Organisms Level
24	G	004	Interaction of Life Forms
25	C	002	Life at the Molecular and Cellular Level
26	H	003	Life at the Systems and Organisms Level
27	B	004	Interaction of Life Forms
28	G	002	Life at the Molecular and Cellular Level
29	C	004	Interaction of Life Forms
30	G	003	Life at the Systems and Organisms Level
31	C	001	Scientific Investigation
32	J	001	Scientific Investigation
33	C	004	Interaction of Life Forms
34	J	003	Life at the Systems and Organisms Level
35	B	004	Interaction of Life Forms
36	H	001	Scientific Investigation
37	A	003	Life at the Systems and Organisms Level
38	H	002	Life at the Molecular and Cellular Level
39	C	001	Scientific Investigation
40	J	001	Scientific Investigation
41	C	002	Life at the Molecular and Cellular Level
42	F	002	Life at the Molecular and Cellular Level
43	B	004	Interaction of Life Forms
44	G	002	Life at the Molecular and Cellular Level
45	C	003	Life at the Systems and Organisms Level
46	J	001	Scientific Investigation
47	D	003	Life at the Systems and Organisms Level
48	J	004	Interaction of Life Forms
49	A	002	Life at the Molecular and Cellular Level
50	H	001	Scientific Investigation