1. If a couple has a one-in-four risk of having a child with an inheritable disease, then_____.

    a. the second-born child born will have a reduced risk of inheriting the disease if their firstborn child has the disease.

    b. the firstborn child has the highest risk of inheriting the disease when compared to the second-born child.

    c. each child born to this couple will have a one-in-four risk of inheriting the disease.

    d. the chances of inheriting the disease will depend on the gender of the child.

2. Mutations that occur in DNA sequences during replication are_____.

    a. usually harmless to the individual who inherits the mutation.

    b. usually harmful to the individual who inherits the mutation.

    c. mistakes that are always fixed through cellular processes.

    d. often related to disease.

3. In a rose population there are two variants for thorn length, short thorns and long thorns. Long thorns help protect the roses from being eaten by deer. Given this information, please indicate which of the following a biologist would infer about the way short thorns are inherited?

    a. It is a dominant inheritance pattern because short thorns have an adaptive advantage.

    b. It is a recessive inheritance pattern because short thorns are more widespread in the population.

    c. It is a co-dominant inheritance pattern because both long and short thorns are found in the population.

    d. It is impossible to determine.

Use the diagram below to answer question 4.

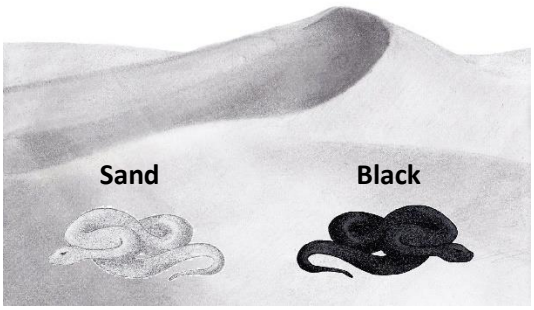
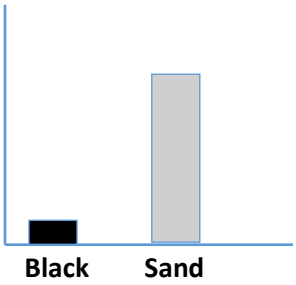
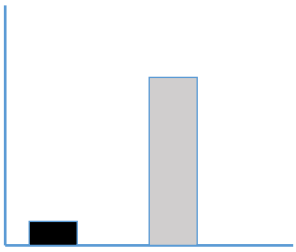


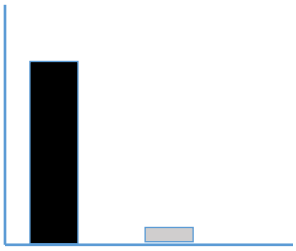
Illustration by Joshua M. Roth



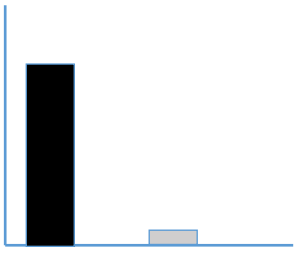
4. There is a population of sand and black colored snakes that live on the sand dunes. When a sand colored snake mates with a sand colored snake only sand colored snakes are produced. However, if a black colored snake mates with a sand colored snake, the baby snakes can either be all black or both black and sand. The present distribution of genes in the population is shown on the graph at the right. After 1000 years, what will the distribution of genes look like if the area remains a desert?



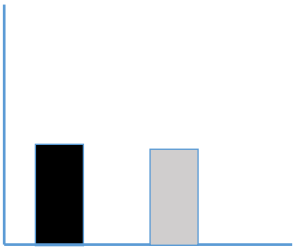
a. Because the population has been around for a while the gene distribution won't change.



b. Because the black color is darker than the sand color, it is stronger and will spread.



c. Because the black color gene is dominant to the sand color gene, it will become more frequent.



d. Because there is no selective advantage, the black and sand color genes will reach equilibrium.

5. As a human ages from birth to adulthood, the increase in body size is mostly the result of_____.

    a. cells growing larger.

    b. new cells created from existing ones.

    c. new cells entering the body from food.

    d. dead cells taking up space.

    e. cells changing shape and moving.

6. Plants reproduce_____.

    a. only sexually through the use of flowers and fertilized seeds.

    b. only sexually through generating a genetically identical clone.

    c. either sexually or asexually depending on the type of plant.

    d. either sexually or asexually, the plants can choose depending on its needs.

7. Animals reproduce_____.

    a. only sexually which involves mating between a male and a female animal.

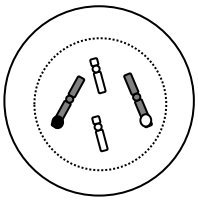
    b. sexually and asexually depending on the type of animal.

    c. either sexually or asexually depending on an individual animal's choice.

    d. only asexually if a single animal has the reproductive organs of both sexes.

Use the diagram below to answer question 8.

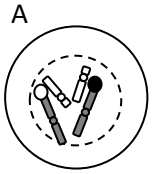
A cell that is not currently dividing contains two different versions of the same genetic material as shown in the cell and table below.



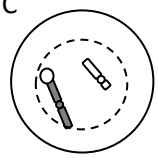
Chromosome 1	**Chromosome 2**
	

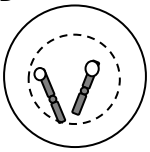
Gene 1: Variant 1	**Gene 2**: Variant 2
○	●

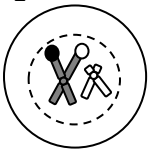
Below are 6 possible products of the cell division of the original cell above. These 6 representations are not currently dividing.

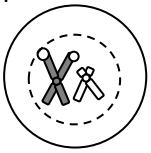
A 

B 

C 

D 

E 

F 

8. Which of the 6 representations above best represents the product of the cell division if the division produced an egg cell?

    a. A

    b. B

    c. C

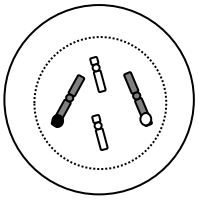
    d. D

    e. E

    f. F

Use the diagram below to answer question 9.

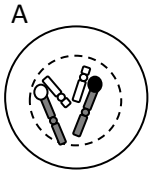
A cell that is not currently dividing contains two different versions of the same genetic material as shown in the cell and table below.



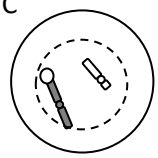
Chromosome 1	**Chromosome 2**
	

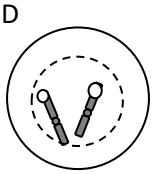
Gene 1: Variant 1	**Gene 2**: Variant 2
○	●

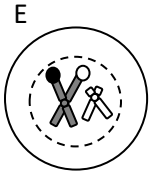
Below are 6 possible products of the cell division of the original cell above. These 6 representations are not currently dividing.

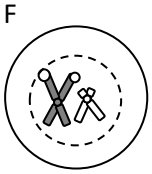
A 

B 

C 

D 

E 

F 

9. Which of the 6 representations above best represents the product of the cell division if the division produced a skin cell?

    a. A

    b. B

    c. C

    d. D

    e. E

    f. F

10. Competition for food, space, water, shelter, and light_____.

    a. involves only direct, aggressive interaction between individual organisms.

    b. involves individual organisms that depend on the same resources.

    c. does not affect plant populations since they do not need many resources.

    d. does not occur between organisms in the same population.

Use the diagram below to answer question 11.

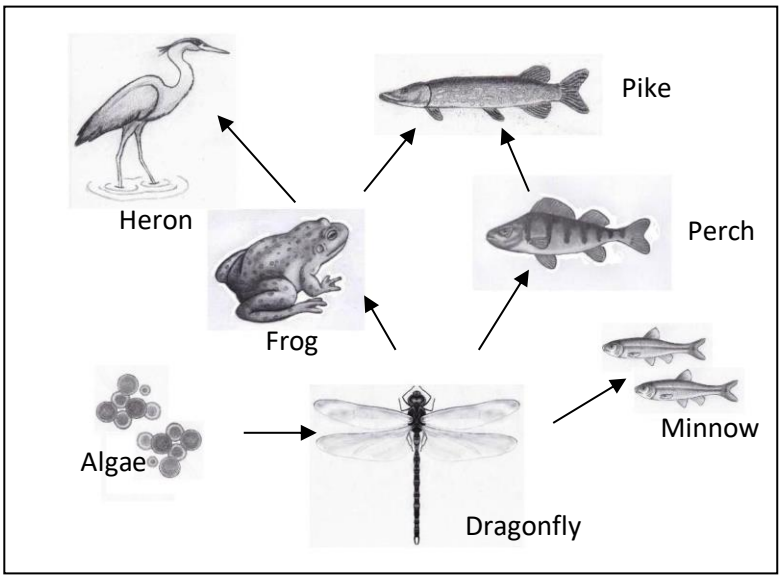


Illustration by Joshua M. Roth

11. Varying the size of the frog population_____.

    a. affects the populations that are directly connected to the frog population.

    b. affects the entire ecosystem to some degree in varying ways.

    c. does not affect the entire ecosystem because some populations are not important.

    d. will affect all other populations within the ecosystem to the same degree.

12. An ecosystem contains both living organisms (e.g. deer, grass) and nonliving objects (e.g. gases, water, soil, rocks). Which of the following general statements can be made about the effect of an ecosystem's living organisms and nonliving objects on the deer population? Both living and nonliving factors are_____.

    a. limit-less and provide an opportunity for limit-less growth of the deer population.

    b. limit-less and allow the deer population to grow and decline depending on their position in the food chain.

    c. limited and affect the maximum population size for the deer population.

    d. limited and allow the deer population to continuously grow and decline depending on their position in the food chain.

13. When comparing plant-eaters and meat-eaters, which of the following choices is most correct?

    a. Meat-eaters are more aggressive than plant-eaters.

    b. Plant-eaters are smaller than meat-eaters.

    c. Meat-eater and plant-eater size and behavior are related to their place in the food chain.

    d. Plant-eaters are less able to protect themselves from larger meat-eaters.

    e. Meat-eaters and plant-eaters differences vary greatly between species.

Use the diagram below to answer question 14.

Slug → Toad → Bird → Cat

14. The highest organisms (cats) in this food chain_____.

    a. eat everything that is lower on the food chain.

    b. have more energy per pound of biomass than those lower in the food chain.

    c. have cells that can harvest energy as efficiently as those lower in the food chain.

    d. accumulate all of the energy that exists in the organisms that are lower in the food chain.

15. All species on Earth alive today_____.

    a. arose independently from each other.

    b. arose from sexual reproduction.

    c. arose from preexisting species.

    d. arose from asexual reproduction.

Use the diagram below to answer question 16.

On an island with dense grass, you find the following population of mice. Initially, these mice had few predators.

100 Big Mice

Stronger than small mice and find it hard to move quickly through dense grass

100 Small Mice

Can move quickly through dense grass

16. Another animal population arrived on the island. This animal while it could move fast in open areas it moved slowly through the dense grass that populated the island. What would happen to the population of mice over 1000 generations if this animal equally preferred eating both big and small mice?

    a. The frequency of big mice in the population will increase relative to the small mice because they are stronger and more likely to defend themselves.

    b. The frequency of small mice in the population will increase relative to the big mice because they can move quickly and are more likely to escape being eaten.

    c. The frequencies will remain the same because being stronger and quicker are characteristics that are balanced between the mice and will help them survive in their environment.

    d. The frequencies will remain the same because all organisms are equally able to survive and reproduce under most conditions.

17. Suppose that on the same island with big and small mice, you find 5 small mice whose tails have been lost when they escaped from predators. You note that these mice can move through the thick undergrowth even faster than other small mice with tails. Does this change your prediction about the population over 1000 generations?

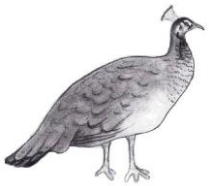
    a. Yes, because tailless mice are better able to survive. How they acquired the tailless feature is irrelevant.

    b. Yes, because tailless mice are better able to survive so they will pass the tailless trait down to more offspring.

    c. No, because tailless mice might be better able to survive but they can't pass the tailless trait down to their offspring.

    d. No, because organisms are equally able to survive and reproduce under most conditions.

Use the diagram below to answer question 18.

Female Peahen	
	- Selects mates based on the size, color, and quality of peacocks' tails

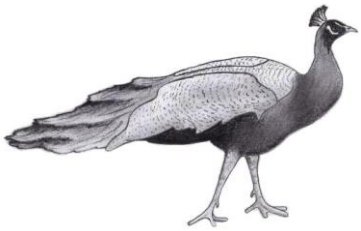
Male Peacock	
	- Smaller body masses - Bigger and more colorful tails
	- Larger body masses - Smaller and less colorful tails

Illustration by Joshua M. Roth

18. A population of peacocks has two types of male peacocks with characteristics summarized in the table above. What will happen to the population over thousands of generations?

    a. There will be a greater percentage of strong peacocks with small tail because according to survival of the fittest, the male peacocks that are strongest are better able to survive and reproduce and pass on that trait to more offspring.

    b. There will be a greater percentage of small peacocks with large colorful tails because according to survival of the fittest, the male peacocks that have a trait that aids in attracting females which allows them to reproduce better will and pass on that trait to more offspring.

    c. There will be a greater percentage of peacocks with large colorful tails, because according to survival of the fittest the male peacocks will adapt to the female choice by moving to an area with more food so they can grow a bigger tail and pass that on to their offspring.

    d. There will be the same percentage of small peacocks with large tails and big peacocks with small tails because all of the peacocks are equally able to reproduce and survive under these conditions.

19. Which of the following organism(s) share a common ancestor with humans?

    a. Chimpanzees

    b. Bees

    c. Oak tree

    d. All of the above

    e. None of the above

20. The original source of the energy found in all organisms can be traced to_____.

    (Circle <u>all</u> that apply):

    a. The sun

    b. Plants

    c. Animals

    d. Oxygen

    e. Water

    f. Soil

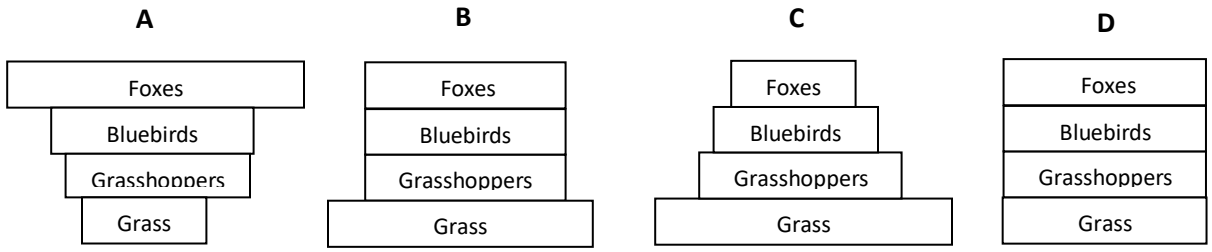
Use the diagram below to answer question 21.

A scientist has enclosed the hunting area of a den of foxes as soon as a litter of baby foxes are born. This netted enclosure is a 10 mile by 10 mile plot of grassland with few trees. The food chain for the foxes inside the enclosure is:

Foxes → Bluebirds → Grasshoppers → Grass

In one year, when the baby foxes reach adult weight the scientist decides to weigh everything in the enclosure. She weights all of the grass, all of the grasshoppers, all of the bluebirds and all of the foxes within the enclosure.

21. Which image would show how the weights of each group of living things compare to one another?



a. Image A because foxes are bigger in mass than the other organisms.

b. Image B because consumers have the same amount of chemical energy.

c. Image C because producers contain more chemical energy than consumers.

d. Image D because producers and consumers contain the same amount of chemical energy.

e. None of the images because there is not enough information provided.

22. In which of the following structures can the original source of its carbon be traced all the way back to carbon dioxide in the atmosphere (air) _____.

    a. leaves of a flower because plants take in carbon dioxide during photosynthesis.

    b. muscle of a rabbit because animals consume food that contains carbon that originated from carbon dioxide.

    c. cell wall of a bacterium because bacteria decompose food that contains carbon that originated from carbon dioxide.

    d. all of the above.

    e. none of the above.

23. In all living organisms, the functions necessary to sustain life _____.

    a. depend on creating energy molecules because food is a source of chemical energy.

    b. depend on food as a source of molecules because they provide building materials and chemical energy.

    c. depend on the intake of a healthy diet because nutrients are sources of building materials.

    d. depend on food absorption because water, air, and minerals are needed from the environment.

24. In which way are plants and animals different in how they use (transfer) energy?

    a. Plants initially use energy to build molecules for their food; animals cannot.

    b. Animals initially use energy to break down food molecules; plants cannot.

    c. Animals initially use energy to move; plants do not.

    d. Plants initially use energy directly; animals initially must transfer it.

25. A scientist weighed a seed and found that it was less than 1 gram. She planted the seed. When the seed grew into a plant that was a height of 10 meters, she weighed it using a really big crane. She found it weighed over a ton. What do you think contributes most to this huge increase in weight?

    a. Absorption of mineral substances from the soil via the roots.

    b. Absorption of organic substances from the soil via the roots.

    c. Absorption of carbon dioxide into molecules by leaves.

    d. Absorption of water from the soil into molecules by leaves.

    e. Absorption of solar radiation from the sun by leaves.