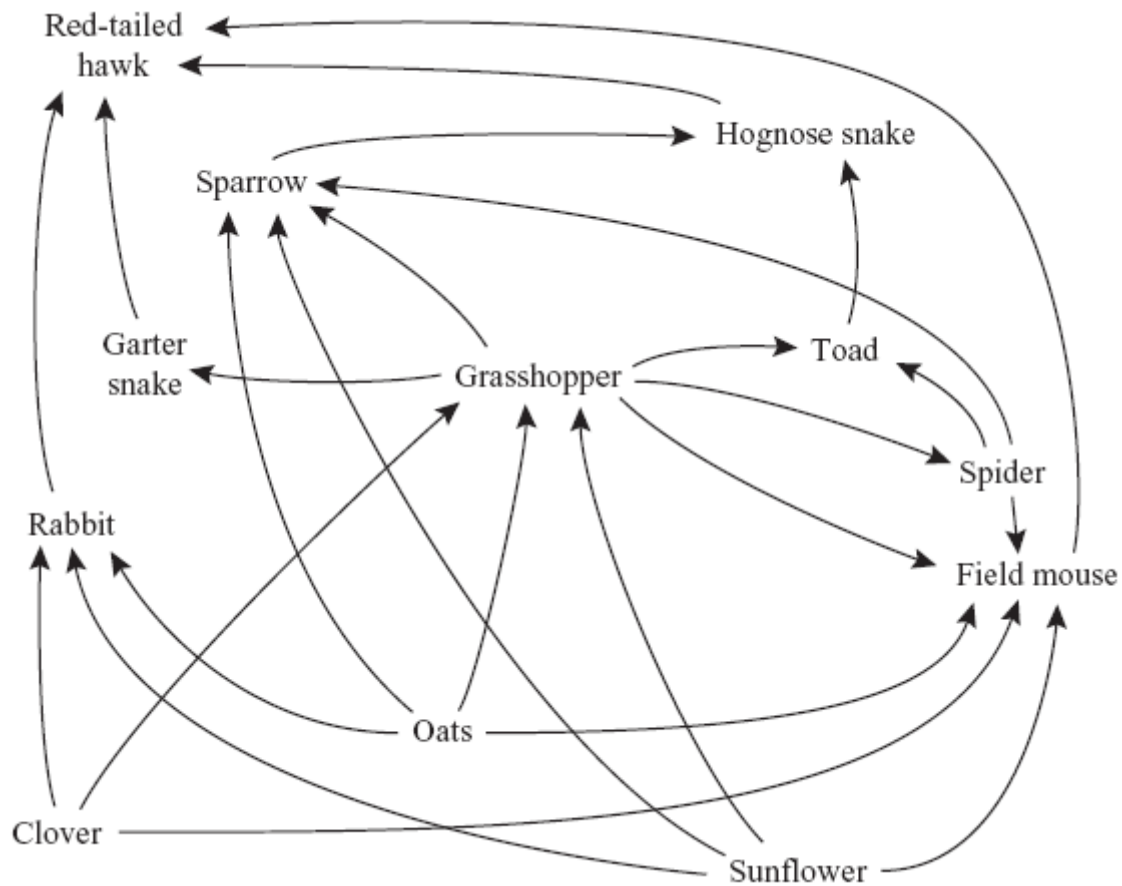


**PREPARATION FOR
END OF COURSE
BIOLOGY EXAM**

OPEN ENDED QUESTIONS

END OF COURSE BIOLOGY TEST PREP - BIOLOGY

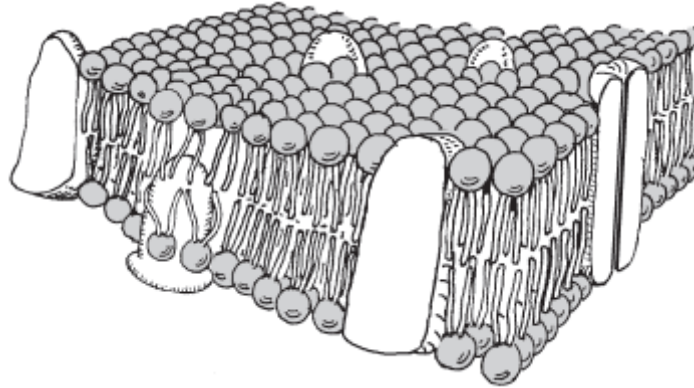
1. Please answer the question using the diagram above:
 - a. Identify the producers and the consumers in this food web.
 - b. In this ecosystem, is more energy available to the field mouse population from eating spiders or from eating oats? Explain your answer.

2. The Corn snakes show variety in their skin color pattern. While the complete genetics of corn snake color are complex, the most common colors on normal corn snakes—red and black— are each coded by one gene.

For the red gene, the allele for the presence of red pigment (**R**) is dominant and the allele for the absence of red pigment (**r**) is recessive. Likewise, for the black gene, the allele for the presence of black pigment (**B**) is dominant and the allele for the absence of black pigment (**b**) is recessive.

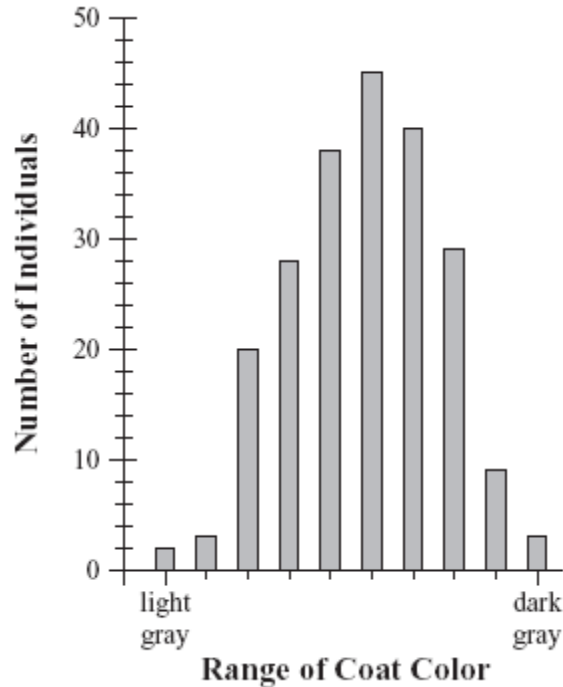
- a. Draw the Punnett square for the cross of a snake that is homozygous dominant for the red color with a snake that is heterozygous for the red color. What percentage of the offspring is expected to have red pigment in their skin?
- b. Draw the Punnett square for the cross of two snakes that are heterozygous for the black color. What percentage of the offspring is expected to have black pigment in their skin?
- c. The parent snakes in part (b) that are heterozygous for black color are both homozygous recessive for the red gene. Each parent has genotype **rr** for the red gene. Based on this information, what percentage of their offspring is expected to lack both the red and black pigments in their skin? Explain your reasoning.

3. The diagram below shows a cross section of part of a cell membrane.



- a. Describe the basic structure of the cell membrane.
- b. Describe **two** primary functions of the cell membrane.
- c. Explain how the structure of the cell membrane allows it to perform the functions described in part (b).

4. The graph below relates the number of gray squirrels in a small population to their coat colors.



This squirrel population has been separated from other squirrel populations by a new highway and several construction sites. The main predators of these squirrels are cats and hawks.

- Assume that dark gray squirrels are very visible in this new environment. What is likely to happen to the distribution of coat color in this squirrel population over several generations?
- Sketch a graph in your Answer sheet to show the predicted distribution, and explain your answer.
- Assume that dark gray squirrels are very visible on the ground, and light gray squirrels are very visible in the trees. Explain what is likely to happen to the distribution of coat color in the squirrel population over several generations. You may sketch a graph in your Student Answer Booklet as part of your explanation.

5. You mate a red-flowered plant with a white-flowered plant. You expect all the offspring to be red, but you find that half of them are white.
- a. Explain why and use a Punnett square to explain further.

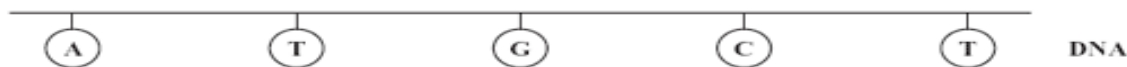
 - b. What genotype would the parents have been in order for the results to be those you had expected? Explain and show the Punnett square.

 - c. If the genes for color had been incomplete dominance, what results would you have obtained and why?

 - d. Explain what a mutation is.

6. Being an albino is a recessive trait in which no color is produced in the skin or eyes. Could an albino child be produced by two normally-pigmented parents? Explain.

7. In 1950, Erwin Chargaff and colleagues examined the chemical composition of DNA and demonstrated that the amount of adenine always equals that of thymine, and the amount of guanine always equals that of cytosine. This observation became known as Chargaff's rule.
- Based on current knowledge of the structure of DNA, explain the basis of Chargaff's rule.
 - The diagram below represents a single-stranded segment of DNA. In your Student Answer Booklet, write the complementary DNA strand that would form from this strand during replication. Use the letters A, C, G, and T to designate the bases: A = adenine; C = cytosine; G = guanine; T = thymine.



- How would the sequence change if the single strand was: T G C A A? If this change had occurred naturally, what would it be called?

8. The gene for fur texture in a species of hamster is represented by the letters H and h.

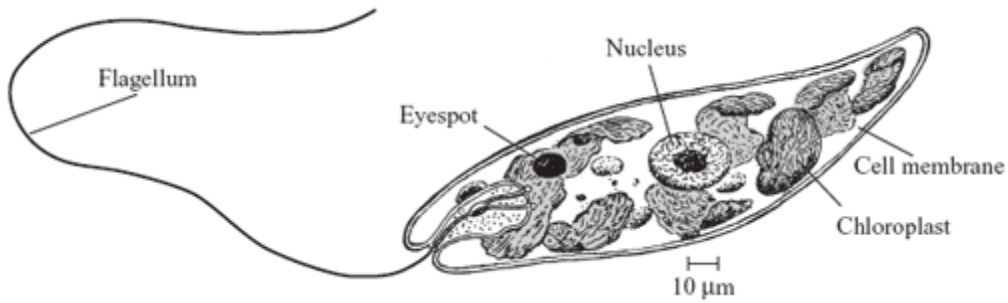
- H = straight
- h = curly
- This particular trait shows complete dominance in this type of hamster.
- It is common (and socially okay) for hamsters to mate with their siblings.

A purebred recessive male hamster is crossed with a female hamster with an unknown genotype. They have 12 offspring. 6 of the offspring have curly fur and the other 6 have straight fur.

- a. Illustrate, with a Punnett square, the necessary genotype of the mother hamster to obtain $\frac{1}{2}$ curly-furred and $\frac{1}{2}$ straight-furred offspring with this particular father. Make sure you clearly indicate the genotype of the mother.

- b. If you were a hamster breeder and the market was good for only curly-furred hamsters, determine how you could selectively breed the hamsters from the previous question to produce mostly or all curly-furred hamsters. Draw a Punnett square to further explain.

9. The drawing below represents an organism that a student observed when examining a sample of pond water with a light microscope.



The student identified this organism as a prokaryote.

- Is the student's identification accurate? Explain your answer using information from the diagram.
- Identify **three** similarities between the cells of prokaryotes and eukaryotes.

10. The illustrations below show a South American finch and some of the species of finches found on the Galápagos Islands. The map shows the relationship of the Galápagos Islands to the west coast of South America.



There are 13 species of finches found on the Galápagos Islands. These finches have a wide variety of food sources and beak shapes. There is one genetically similar species of finch found on the South American mainland. This finch eats small seeds.

Use the map and the bird illustrations to identify and explain **two** ways that these finches provide evidence that supports the theory of evolution.