AP® BIOLOGY
2007 SCORING GUIDELINES (Form B)

Question 1

Without adaptive behaviors, animals would not survive.

(a) **Describe** what innate and learned behaviors are. **Explain** the adaptive value of each of these two categories of behavior to an individual animal.

One point for each of the following explanations/identifications (4 points maximum):

- Description or definition of innate behavior
- Description or definition of learned behavior (change with experience/trial and error)
- Explanation of how innate behavior is adaptive
- Explanation of how learned behavior is adaptive

(b) During mating season, male snakes exhibit tracking behavior when they follow chemical pheromone trails deposited on the ground by females. **Design** a controlled experiment to determine whether a male garter snake will track only a female of his species or will also follow the female of a related species.

One point for each of the following explanations/identifications (7 points maximum):

- Hypothesis/prediction of results
- Description of the independent variable (female of same species and female of different species)
- Description of how to measure movement (e.g., sensors, observation)
- Description of how to measure male's choice (e.g., Y-maze, *in situ* observation)
- Verification of results (e.g., repetitions, number of snakes)
- Statistical analysis
- Control group (no female snakes)
- Control of at least one variable (e.g., sexually mature snakes, temperature, light, mating season)

innate 1A1
instinct
bird example

BIOLOGY
SECTION II
Time—1 hour and 30 minutes learned
habituation

Directions: Answer all questions.

Answers must be in essay form. Outline form is not acceptable. Labeled diagrams may be used to supplement discussion, but in no case will a diagram alone suffice. It is important that you read each question completely before you begin to write. Write all your answers on the pages following the questions in this booklet.

1. Without adaptive behaviors, animals would not survive.

   (a) **Describe** what innate and learned behaviors are. **Explain** the adaptive value of each of these two categories of behavior to an individual animal.

   (b) During mating season, male snakes exhibit tracking behavior when they follow chemical pheromone trails deposited on the ground by females. **Design** a controlled experiment to determine whether a male garter snake will track only a female of his species or will also follow the female of a related species.

a. Innate behavior is a natural inherited behavior such as an instinct. There are two types of this instinct. Human behavior such as sympathetic muscle activity during flight-or-fight situations is one type of instinct. The female bird's instinct to incubate an egg with its body is another type of instinct. The environment has little or no effect on innate behavior, only the genetics. Learned behavior is less based on hereditary behavior but on that of the environment. There are several types of this learned behavior. When an animal is first born it is in a stage of ~~extensive~~ learning from its parents. Walking for recently ~~=~~ conceived deer is an example. Habituation is a second type of learning that is achieved through repeated example. A similar type is associative learning behavior where an object is associated with a behavior. A dog can be taught to salivate when a bell rings if it is fed every day after a bell rings.
As far as adaptive value is concerned, each of

ADDITIONAL PAGE FOR ANSWERING QUESTION 1

these behavior types is valuable in a different way. Innate behavior is very directly related to survival and reproduction. With enough innate behavior an animal can survive immediately without a learning curve. Animals in a burning forest rely on instincts to escape quickly since otherwise they face extinction. The survival of each animal in a species depends on innate behavior, however it does not allow much in the form of adaptation. It is difficult to change or adapt these innate behaviors and if they lead to death then it cannot be avoided. If an animal is innately running away from the flames of hunters placing a bait-of-safety, than the animal cannot adapt easily to not fall for the trap.

learned behavior adapts quickly and is very valuable to adaptations. This behavior is flexible with the environment since each offspring can learn different behaviors according to the adaptations necessary in its environment. Humans are far more sophisticated because much of our behavior is learned in schools or by parents so we adapt quickly.

b. The purpose for this experiment is to determine whether a male garter snake will track only a female of his species or will follow any female of related species. Hypothesizing that the male follows only Garter snakes since it only reproduces with those.

GO ON TO THE NEXT PAGE.

ADDITIONAL PAGE FOR ANSWERING QUESTION 1

materials include a square mile of natural Garter snake habitat, 3 male Garter snakes, a female Garter snake, and a female snake of a relative species.
The independent variable would be the type of female snake used. The dependent variable would be the path of the male snake after its release.
Constants include the time of year and climate, the location, the sizes of the snakes (all adults), time of tracking, etc.
Procedure: in each trial a garter snake is first allowed to roam free beginning at a designated point A. This is a control to see that the snake doesn't travel to the same place every time even without a female.
Next, the Garter snake is picked up and a female is released at a point B close to A. Then the male is released at A and is tracked. Lastly the experiment is reset again and the procedure is repeated with a female snake of relative species.
These 3 tests are one trial. The trial is repeated 2 more times with the different male Garter snakes.

1B 1

BIOLOGY
SECTION II
Time—1 hour and 30 minutes

Directions: Answer all questions.

Answers must be in essay form. Outline form is not acceptable. Labeled diagrams may be used to supplement discussion, but in no case will a diagram alone suffice. It is important that you read each question completely before you begin to write. Write all your answers on the pages following the questions in this booklet.

1. Without adaptive behaviors, animals would not survive.
   (a) **Describe** what innate and learned behaviors are. **Explain** the adaptive value of each of these two categories of behavior to an individual animal.
   (b) During mating season, male snakes exhibit tracking behavior when they follow chemical pheromone trails deposited on the ground by females. **Design** a controlled experiment to determine whether a male garter snake will track only a female of his species or will also follow the female of a related species.

a) Innate behaviors include those that are acquired at birth. They are like natural, instinctive behaviors. Learned behaviors are those that one acquires through experience and observation. Innate behaviors are important because it is essential that when an animal is born, it already have some necessary behaviors to signal any wants or needs it may have. For example, a baby cries when it is hungry, sick, or tired. If the baby did not cry, it would be hard to give proper care to it if one did not know that it needed anything. Learned behaviors are also crucial to animals because it helps it develop complex behaviors that were not present at birth. By watching a parent, an animal learns the proper way to clean, feed, and take care of itself - which is necessary for survival.

b) Experiment: To begin this experiment, we must have a variable and a control. The control will be a female garter of the same species of the male snake and the variable will be a female garter snake of a different species to the male snake. ⇒

ADDITIONAL PAGE FOR ANSWERING QUESTION 1

To begin the experiment, the female and male garter of the same species should be placed in the same vicinity. Then, the female snake will have to deposit its phermones and we will have to see if the snake will track the female. Most likely it will because they are of the same species. Then, the male snake and the female snake of the different species will be placed in the same vicinity (and the vicinity will be constant with the one earlier). We will then allow the female to deposit her phermones. Then, we will have to see if the snake will track her phermones. If the snake does track the phermones of the female snake of a different species, then we can conclude that the snake is capable of tracking pheromones of different female species other than its own. However, if the male garter snake did not track the pheromones of the female garter snake of a different species, then we can conclude that the male snake does not track pheromones of different female snake species. Also, to ensure this experiment's validity, it would be necessary to perform this experiment numerous times to see if the results are constant or not. If the results are constant, the conclusion is valid. If the results are not constant, the conclusion is invalid and new experiment should be devised

1C1

BIOLOGY
SECTION II
Time—1 hour and 30 minutes

Directions: Answer all questions.

Answers must be in essay form. Outline form is not acceptable. Labeled diagrams may be used to supplement discussion, but in no case will a diagram alone suffice. It is important that you read each question completely before you begin to write. Write all your answers on the pages following the questions in this booklet.

1. Without adaptive behaviors, animals would not survive.

   (a) **Describe** what innate and learned behaviors are. **Explain** the adaptive value of each of these two categories of behavior to an individual animal.

   (b) During mating season, male snakes exhibit tracking behavior when they follow chemical pheromone trails deposited on the ground by females. **Design** a controlled experiment to determine whether a male garter snake will track only a female of his species or will also follow the female of a related species.

Without adaptive behaviors, most animals would not survive. Many animals must change their behaviors along with the climate and environment changes. Innate behaviors, staying with old ways, can cause an animal to die in new conditions. Learned behaviors, changing along with everything around you, can help animals better adapt to the surrounding environments. One animal, that doesn't adapt to ~~the~~ its surroundings, would die very quickly due to the level of changes in the environment. An animal, that follows the changes in the environment, would live much longer because they had adapted to everything around them. Without being able to adapt to the surrounding environments, animals would not survive.

Take two large containers, holding rooms. In each container create the natural habbitat for ~~each~~ the snakes. In one tank, place the male garder snake along

GO ON TO THE NEXT PAGE.

1C2

ADDITIONAL PAGE FOR ANSWERING QUESTION 1

with a female garder snake. In the other tank, place a male garder snake, and another female snake, but of a diffrent breed but related species. Within the tanks, create the mating season time of year. Monitor both male snakes. In the first tank, the male should be atracted to the female. In the second tank, the actions of the snake are unknown. Monitoring the snakes will only tell if the male garder snake would be attracted to a female of a diffrent breed, but same species.

AP® BIOLOGY
2007 SCORING COMMENTARY (Form B)

Question 1

Sample: 1A
Score: 9

Part (a) earned 4 points. Understanding of the concept of innate behavior is reflected in the use of the words "inherited," "instinct," and "genetics" (1 point), and understanding of how it is adaptive by the explanation that it is performed "immediately without a learning curve" (1 point). Understanding of learned behavior is reflected in the use of the terms "environment," "from . . . parents," and "associative" (1 point), and understanding of how it is adaptive by the explanation that it is "flexible with the environment" and that "each offspring can learn different behaviors" (1 point).

Part (b) earned 5 points. The design of the experiment is well focused on the relevant experimental variables, with clear attention to controlling other variables—all potentially relevant. The independent variable is properly identified as the "type of female snake" (1 point); the dependent variable is defined as the "path" of the male, which "is tracked" by the experimenter (1 point). Attention is also directed to the comparative behavior of the male without the female (the null control) (1 point), as well as to ensuring that "the time of year and climate, the location, the sizes of the snakes (all adults)" are constant (regulative control) (1 point). Finally, the student recognizes the importance of repeating the experiment—moreover, with different snakes (sample size) (1 point). The hypothesis is presented with a clear biological rationale, but because the information is incomplete, no point was earned.

Sample: 1B
Score: 6

In part (a) the student discusses the difference between innate and learned behavior. One point was earned for the statement that "Innate behaviors include those . . . acquired at birth," and 1 point was awarded for the understanding that learned behaviors are not present at birth but acquired through experience or instruction by another animal. The student does not adequately account for the adaptive values of these types of behavior, giving examples of them rather than an explanation of the generalized adaptive value of the *categories* of behavior. Because this student does not explain that innate behaviors convey immediate responses before there is time for learning, contrasted with the flexibility of learned responses, no other points were received.

In part (b) 1 point was earned for understanding that a garter snake of a different species is a variable, although the student does not specify "independent" variable. Using a female of the same species as the male for comparison is included in this point. Although the student refers to placing the snakes "in the same vicinity," this was regarded as a constant, not a control. The relevant variables are not explicit enough to earn a point for understanding controls. The answer also received 1 point for "tracking" by the male (the dependent variable) and for correctly referring to the male's *following* the pheromone trail, not simply finding the female. The student gives a valid interpretation of the alternative possible results by concluding that "If the snake does track the phermones [*sic*] of the female snake of a different species, then we can conclude that the snake is capable of tracking pheromones of different female species other than its own. However, if the male garter snake did not track the pheromones of the female garter snake of a different species, then we can conclude that the male snake does not track pheromones of different female snake species." This explanation received 1 point. Finally, the student earned 1 point for verification of results, noting that the "experiment's validity" depends on performing it "numerous times."

AP® BIOLOGY
2007 SCORING COMMENTARY (Form B)

Question 1 (continued)

Sample: 1C
Score: 2

Part (a) addresses the topic with insufficient clarity and precision. Learned behaviors are associated with change, but the student's use of the term "adapt" and the response's other remarks do not distinguish between species-level adaptation and organism-level learning. The student suggests necessity (twice), rather than trial and error as a mechanism. No points were earned.

Part (b) shows understanding of the independent variable: the different species releasing the pheromone (1 point). Another point was earned for identifying an important background variable—mating season—as a control, although it was not explicitly labeled as such. The references to "[m]onitoring" the snake's behavior to see if he is "attracted" to the females are too vague to earn points.