AP Biology
2000 Student Samples

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4. To survive, organisms must be capable of avoiding, and/or defending against, various types of environmental threats. Respond to **each** of the following.

   a) Describe how adaptive coloration, mimicry, **or** behavior function as animal defenses against predation. Include **two** examples in your answer.

   b) Describe how bacteria **or** plants protect themselves against environmental threats. Include **two** examples in your answer.

   c) Compare the human primary immune response with the secondary immune response to the same antigen.

a) There are two kinds of adaptive colouration; cryptic colouration and aposematic colouration. Cryptic colouration is essential camouflage, where the organism is colored in such a way that it blends in with its surroundings. Such colouration makes it difficult for predators to identify the prey. A good example of such colouration, is in snow hares. During the winter, their fur is white to blend in with the snow. During the [redacted] seasons when snow is not on the ground, their coats are a dirty brown colour, which allows them to blend in with their rocky, sandy surroundings. Aposematic coloration, or warning coloration, is the use of vivid colours to warn a predator that the prey is poisonous or toxic in some way. This colouration is used by monarch butterflies. Their bright orange and black markings, indicate to potential predators that they are poisonous, and therefore non edible. Predators tend to stay away.

b) Plants employ a variety of mechanisms for defense against environmental threats. The use of thorns, spikes, and other stiff

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fibrous projections, make them difficult for animals to eat without being hurt in the process. Take blackberry bushes for example. The ~~for~~ prominent thorns and tangle of spiny branches make it difficult for easily scratched and torn animals to get at the berries. Another defense used by plants are secondary chemical compounds. These are toxins that can harm the creatures that try to eat them. Milkweed is a plant that contains a highly toxic chemical that has an adverse affect on animals. This chemical helps to keep potential nibblers away.

C) The primary immune response is a chain reaction of events within the body that occurs when the antigen (the foreign body) has never been encountered before. The presence of an antigen, begins the cell-mediated immune response, where leukocytes (white blood cells), especially T cells begin an attack mode against the foreign body. Helper t cells indicate the presence of an antigen and promote the production of cytotoxic t-cells which actually ~~destroy~~ obstruct the foreign body. Helper t-cells also ~~help~~ induce the beginning of the humoral immune response. The humoral ~~immune~~ system activates B cells and β-cells produce Plasma cells, which ~~then~~ in turn release antibodies that are specific ~~to~~ for marking the specific antigen. Both t-cells and b-cells, also produce memory B and T cells. These cells are specifically made to circulate through the body even after

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the infection has ended. ~~They~~ they remember the specific antigen.

The secondary immune response occurs when the same antigen becomes present again. However, this time, the body does not ~~have~~ have to go through the whole cell-mediated and humoral response systems again. Because memory B and T cells for the specific antigen are already present, the immune system can immediately identify the antigen and secrete the proper antibodies and cytotoxic t cells to defeat and kill the antigen. The secondary response is much more immediate and effective in eliminating the antigen today.

4C1

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a) Adaptive coloration defends animals against predation by preventing them from being seen or identified as prey. One example is a moth that lands on a tree to rest during the day. If its coloration is good, it will not be seen by most predators and thus has a good chance to survive until night. Adaptive coloration may also be used as a warning to predators that have the ability to learn. Many South American frogs are quite poisonous and have bright warning coloration. Any predator that has previously tried to eat such a frog will remember and associate the warning coloration with the pain or bad taste of its earlier experiences. The predator will help the frog by helping itself, and not eat the frog.

b) Plants may protect themselves from such environmental threats as water loss, excessive sun, and others by many intriguing methods. One important thing to protect against, however, is the animals with which it shares its environment. It cannot directly attack or defend against this threat from the environment. However, animals with the capacity to learn will be wary of trying to eat the acacia's thorny branches. Also, poison ivy has a potent defense against being eaten: the venom with which it coats its leaves, which discourages animals from even touching it.

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Mimicry is a mechanism of defense against predation. By mimicing another organism, the second may find that it is less appealing to predators or that the predators cannot tell which they are (which also refers to (doration).

One examples of mimicry involves the Monarch butterfly and another butterfly that has taken up the same wing pattern. It did this to avoid being eaten by birds. Monarch butterflies taste terrible to birds, so once they've eaten one, they don't want another. In this way, the Monarch mimic is able to avoid being eaten. The wing pattern is associated with a bad taste.

A second example involves moths (the peppered moth) This moth mimics the color of the bark of certain trees and this makes it difficult to spot. The birds in the area are less likely to eat these moths that are camoflaged because they cannot find them.

Plants must protect themselves from many environmental threats. The most important is water loss. They protect themselves

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from water loss by the formation of a cuticle on the outside of the plant. An example of a plant which must protect itself from water loss is a cactus. The cuticle on the cactus is thick and allows no water to escape into the air.

Plants have also had to adapt ways to keep moisture in when stoma are open. In some plants, the wet habitat may mean that there is little to ~~to~~ no water loss. However, plants that lose water during the day in warm temperatures have adapted to only open stoma at night for gas exchange.

Sensitive plants also protect themselves from physical harm by closing leave structures when touched. This may fright a predator or make the plant difficult to eat. Thorns that grow on certain plants are also an example of the physical mechanisms by which plants defend themselves from predators and environmental threats.

In humans, the primary response to an antigen is to make antibodies that will seek and destroy the virus or bacteria that is causing illness. While this is occurring, the person is sick with ~~with~~ whatever illness the antigen is causing. However, once the antibodies are made to fit the antigen, the person will begin to get ~~get~~ well. This is the primary immune response - make the antibodies.

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The secondary immune response occurs if the person is infected with the same virus or bacteria a second time. In this case, the antibodies have already been made. These antibodies will then multiply and destroy the antigens. Because the body does not have to wait for the antibodies to form, the person may be less affected by the illness or may not even get sick at all. This is a way for humans to defend themselves against diseases that would otherwise be upon them constantly.

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a) Adaptive [redacted] coloration is an animal defense against predation. The animals use color to avoid being seen by a potential predator. An example of this is the moths that mentioned in nearly every biology textbook. The trees were lightly colored, and when a dark moth landed on it, it was easy to see, so the population of dark moths wasn't very high. But as human pollution increased, the trees got darker and then it was the light moths that stood out. They were eaten and the dark moth was colored like the tree, so it survived. Another example is the Cameleon.

b) Plants protect themselves by producing chemicals. A poison ivy or poison oak does not like to be molested by animals, so it produces a irritant, and many humans don't want to have anything to do with a poison ivy plant.

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c) The primary human immune response consists of the skin and mucous membranes. They serve to keep the antigen out of the body. But if it does get in, the secondary immune response, phagocytes and inflammatory response will serve to destroy it and to keep it from doing any damage to the body.

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