



AP[®] Biology 2002 Scoring Commentary

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Question 1

Sample 1R (6 points)

The student begins by repeating the question. On the plasmid procedure, the student earns a point for the bacteria dividing and therefore amplifying the recombined sequence. Then 1 explanation point is given for the application to sickle cell anemia. On the RFLP procedure, the student receives points for use of restriction enzymes, separation by electrophoresis, and explanation of the application in mutation detection. In part (b), the student is able to earn a point for the use of restriction enzymes to identify the individuality of the fingerprint.

Sample 1S (8 points)

The student earns the maximum 4 points for the description of the plasmid procedure: both the plasmid and gene are cut with corresponding restriction enzymes and ligated together; the technique is used to produce insulin. In describing the use of PCR, the student recognizes the need for nucleotides and polymerase, and describes the use of the technology to produce large amounts of a particular sequence. In part (b), the student describes the differences in restriction sites in different individuals as well as the redundancy in the code for amino acids.

Sample 1T (9 points)

This student has an excellent description of procedures. For bacterial plasmid cloning, the student expresses an understanding of the use of the procedure for amplification of a particular gene, describes the use of restriction enzyme to cut the sample and a corresponding one to cut the plasmid, and uses ligase to join the two. The student therefore has the maximum 4 points, but goes on to describe the bacterial reproduction of the fragment and the application to the production of desired proteins, even though these gain no further points. In RFLP analysis, the student describes the use of restriction enzymes, electrophoresis to separate fragments, and the dye to visualize the bands. The application scored is the use of the procedure to distinguish closely related members of a family, etc., but the student might also receive a point for the use of a double digest if the section was not already at maximum point value. The student describes the variation in non-coding (“junk”) DNA sequences as opposed to coding sequences. A tenth point is missed only because the student, in trying to describe the redundancy of the code, substitutes protein for amino acid.

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Question 2

Sample 2R (10 points)

In part (a), the student picked up a point for an accurate description of the activity cycle and 3 more points for giving reasonable cause and effect descriptions for how food availability, temperature, and predators might affect the physiology and/or behavior of the bombats to result in the activity pattern. In part (b), following a proper hypothesis, the student used the natural environment as a control and then changed the light pattern to see if the change in light affected the bombats' effectiveness as a predator. With 5 strong points in the experimental design (a control, good sample size, controlling confounding variables, measuring the dependent variable, and manipulating the light), the student accumulated the 10-point maximum before ever stating the results.

Sample 2S (8 points)

In part (a), the student failed to describe the cycle of activity for the bombats, but successfully earned 3 points for giving reasonable cause and effect descriptions for how temperature, food availability, and predators might affect the physiology and/or behavior of the bombats to result in the activity pattern. In part (b), the student earned a total of 4 points for the hypothesis, controlling confounding variables, manipulating the independent variable (light), recording the dependent variable. Because the student earned at least 3 points in the experimental results section, he/she became eligible for the results point and earned it with a plausible statement of expectations.

Sample 2T (5 points)

In part (a), the student picked up a point for an accurate description of the activity cycle and 3 more points for giving reasonable cause and effect descriptions for how temperature, food availability, and predators might affect the physiology and/or behavior of the bombats to result in the activity pattern. In part (b), the student misses the opportunity to earn 4 or 5 additional points when he/she proposed a hypothesis and designed an experiment using an independent variable other than light as required by the question. Because the student's experimental design did satisfy at least three of the experimental design standards, he/she was allowed to earn 1 point in part (b).

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Question 3

Sample 3R (5 points)

This paper discussed response to stimuli and locomotion. For response to stimuli, structure/function points were awarded for cnidarians, annelids, and chordates. The structure used for all three phyla was a receptor and the description of how it functioned in each phylum was done well. A point was not awarded for description of a structure due to omissions in this area.

For locomotion, structure/function points were awarded in annelids and chordates. Bristle structures in annelids and bones/muscles in chordates were the structures linked correctly to functions. Adaptive value points were not awarded. The student omitted this part of the question.

Sample 3S (7 points)

This paper discussed gas exchange and locomotion. For gas exchange in cnidarians, no point was awarded in the structure/function category. No specific structure was given. For annelids, epithelium was given as a structure but “gas exchange” was listed as its function. When the function was simply a repetition of the question, no point was awarded. In chordates, 1 point for alveoli involved in the diffusion of oxygen and carbon dioxide was awarded, as well as 1 point for a description of alveoli.

For locomotion, a point for structure/function in cnidarians was not awarded. One point was awarded for structure function, and 1 for description of setae in annelids. In chordates, a structure/function point was awarded for bone in association with muscles and muscle contraction.

Two adaptive value points were given in gas exchange and locomotion. For chordates, the alveoli are described as useful in helping increase the surface area through which gases can be exchanged and for locomotion, legs are described as useful in being able to find prey or escape from predators.

Sample 3T (9 points)

This paper discussed transport of materials and gas exchange. For transport of materials, a point was awarded for structure/function in cnidarians because nutrients were identified as the material being transported through the body wall. One point was awarded for the description of the body wall. In annelids, 1 point was awarded for the idea of nutrients diffusing through intestinal cells.

For gas exchange, a point was not awarded in cnidarians because the student did not identify a specific structure. In annelids, 1 point was awarded for structure/function of the epidermis, and another for describing the epidermis. In chordates, 1 point was awarded for the structure/function of the lung.

In the adaptive value section, 1 point was awarded for maximizing surface area with the thin-walled cnidarian body. One point was also awarded for the skin giving high surface area for gas exchange in annelids, and a third point was awarded for the lungs in chordates being extensively branched with alveoli to maximize gas exchange.

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Question 4

Sample 4R (10 points)

Part (a) of this essay received all 3 points and part (b) received 1 point for graphing the prediction lines. In part (b), the essay received a point for stating that, for the bag with 0% NaCl, there are no solutes to diffuse. The explanations for the 1% and 10% NaCl correctly relate the diffusion rate to the concentration of NaCl and thus earned 1 point each. In part (c), 3 points were awarded: 1 point for explaining loss of water from the cell in regards to water potential; 1 point for connecting this water loss to plasmolysis of the cell; and, 1 point for explaining that the decreased crop production is due to a drop in photosynthesis.

Sample 4S (8 points)

This essay received the orientation and plotting points from part (a) but did not receive the graphing skills point because the x axis does not contain units. In part (b), the essay received a point for correct predictions for the 1%, 5%, and 10% NaCl lines and for recognizing that if there was no NaCl there could be no diffusion. The explanation for the 10% NaCl correctly related the diffusion rate to the concentration of NaCl and received a point. Part (c) demonstrates an understanding of the concept of osmosis and was thus awarded a point. A second point was awarded in part (c) for recognition that plant cells will shrink as they lose water, and a final point was earned for explaining that this will decrease photosynthesis and affect crop production.

Sample 4T (6 points)

Part (a) of this essay received all 3 points and part (b) received one point for graphing the prediction lines. In part (b), the essay received a point for stating that if there is no NaCl, then none can diffuse. The explanation for the 10% NaCl correctly related the diffusion rate to the concentration of NaCl and received a point. No points were awarded for part (c).