



AP[®] Biology 2004 Scoring Commentary

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Question 1

Sample: 1R

Score: 9

For part 1(a), the student earned one point for stating that reduction involved two cell divisions without DNA replication in between, and one point for description of the ploidy at different stages of meiosis, as well as one point for stating that crossover within the tetrad results in more genetic variability.

In part 1(b), one point was earned for naming Down syndrome, one point for stating nondisjunction of chromosome 21 can result in Down syndrome, one point for a description of nondisjunction, and one point for giving the phenotype of Down syndrome. In part 1(c), one point was earned for comparing the genomes of parent and offspring after cloning, and one point for giving an example of cloning in a plant species.

Sample: 1S

Score: 7

For part 1(a), the student earned one point for naming crossing over as a mechanism of genetic rearrangement during meiosis, one point for noting chromosome separation during anaphase I, and another point for noting sister chromatid separation during meiosis II as responsible for the reduction in chromosome number that occurs during meiosis.

In part 1(b), one point was earned for naming trisomy 21/Down syndrome as a condition resulting from an abnormal number of chromosomes, one point for describing (without naming) nondisjunction as an event leading to Down syndrome, and one point for stating some phenotypic features of Down syndrome. In part 1(c), one point was earned for stating that, due to cloning, the offspring share identical genomes with the parents. The diagram at the end of the response was not described or referred to in the essay. It earned no points.

Sample: 1T

Score: 6

For part 1(a), the student earned one point for stating that during anaphase, homologous pairs of chromosomes separate and move to the ends of the cell, and one point for naming and describing crossing over as a source of generating genetic variation.

In part 1(b), one point was earned for naming Down syndrome as an example of a chromosome disorder, one point for describing the phenotype for Down syndrome, and one point for describing (but not naming) nondisjunction as a mechanism leading to Down syndrome.

In part 1(c), one point was earned for a comparison of the DNA between parent and offspring due to cloning.

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Question 2

Sample: 2R

Score: 10

This student earned the maximum 8 points on part (a) of the exam. In each of the four contributions by Darwin an appropriate example was given along with a brief explanation demonstrating an understanding of the concept. Notice that the points for nonconstancy were gained in a unique way. The example, from a more conceptual view, was based on sexual reproduction. Most students gained this point with more concrete examples, but this question invited a variety of responses reflective of many levels of understanding.

In part (b), the student wrote on only one topic. Points were earned for an understanding of Hardy-Weinberg equilibrium and a depth-of-discussion point for the five correct assumptions. Students are not penalized for failing to do two examples in the (b) section of the exam.

Sample: 2S

Score: 7

In part (a), the student earned 4 out of 8 possible points. Points were earned for the definition of nonconstancy, definition and example points for branching evolution, and the definition point for natural selection. Points were not earned for gradual change even though the fossil record could have served as an example. The student failed to show change over time in the fossil record. In both nonconstancy and natural selection a definition point was earned but the student did not attempt an example.

In part (b), the Hardy-Weinberg example did not meet the minimum requirements for a definition point, as the explanation never indicated whether the student knew that allelic frequency remained constant over time. Points were earned for modification of Darwin and an expansion point for listing the five conditions or assumptions of H-W equilibrium.

Sample: 2T

Score: 4

In part (a), the student earned 3 out of 8 points. Both definition and example points were given for branching evolution and one point was earned for an understanding of gradual change.

In part (b), the final point was given for modification of Darwin's ideas in the genetic engineering section. This point looks for a comparison between natural selection as explained by Darwin and how it has been modified by genetic engineering.

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Question 3

Sample: 3R

Score: 10

- (a) The graph earned “axes,” “plot,” and “accuracy” points. Subtotal for (a) is 3 points.
- (b) The essayist earned the “identify,” “justify,” and “compare” points. Subtotal for (b) is 3 points.
- (c) The essay earned points for “chlorophyll,” “water is split,” “elaboration, PS-I,” and “boiling denatures proteins.” If more than one elaboration point were available, the essay would have gained a point for the elaboration that removing the foil from the darkened sample might have resulted in a small amount of photosynthesis. Subtotal for (c) is 4 points.

Sample: 3S

Score: 7

- (a) The graph earned “axes” and “plot” points. Subtotal for (a) is 2 points.
- (b) The “identify,” “justify,” and “compare” points were earned. Subtotal for (b) is 3 points
- (c) The two clear points were given for “water is split” and “boiling denatures proteins.” Incorrect reference to the phosphorylation of electrons prevented the earning of a point for linking photosynthesis and electron generation. Subtotal for (c) is 2 points.

Sample: 3T

Score: 6

- (a) The graph earned “axes,” “plot,” and “accuracy” points. Subtotal for (a) is 3 points.
- (b) The “identify” and “justify” points were earned. Subtotal for (b) is 2 points.
- (c) A point was earned for “light energizes electrons,” but only after reading all of the text. The subtotal for (c) is 1 point.

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Question 4

Sample: 4R

Score: 9

- For plant root nodules, points were earned for participants (snow peas/legumes and bacteria), mutualism, and discussion of how bacteria receive nutrients, moisture, and shelter, while the plant receives a form of nitrogen necessary for growth and development.
- For digestion of cellulose, points were earned for participants (cow and bacteria), a correct symbiotic relationship being described in the discussion of how bacteria release and consume nutrients from the breakdown of cellulose and the cow receives protection from harmful bacteria that would otherwise reside in the digestive tract. In this paper, the discussion and description of the symbiotic relationship were written together.
- For AIDS, points were earned for participants (virus and human), and a correct symbiotic relationship was described in the discussion of how the virus benefits from its replication in the host and the host suffers from a weakened immune system that leads to death.
- For anthrax, no points were earned. A fungus does not cause this disease. Since the participant listed is incorrect, the description of the symbiotic relationship and its discussion is incorrect.

Sample: 4S

Score: 7

- For digestion of cellulose, points were earned for mutualism and discussion of how bacteria help the organism to break down cellulose into nutrients while the organism provides the bacteria with shelter and food. A point was not earned for participants because one was not listed and “organism’s intestine” is too vague to describe a symbiotic relationship.
- For plant root nodules, no points were earned because the participants listed are incorrect for the relationship with the root nodule. Any discussion with the wrong participants would make an incorrect description and discussion of the relationship.
- For AIDS, points were earned for participants (virus and person) and parasitism. The benefit to the virus is not correctly given, so no point is earned for discussion.
- For anthrax, points were earned for participants (bacteria and cattle), parasitism, and discussion of the anthrax organism receiving nutrients and a warm, wet environment, while the host is killed.

Sample: 4T

Score: 6

- For plant root nodules, no points were awarded because fungus was given as a participant with the root nodule. Discussion of this relationship did describe a symbiotic relationship between fungus and plants, but this would not apply to the root nodule therefore a point was not earned.
- For digestion of cellulose, points were given for mutualism and discussion of how bacteria break down cellulose and aid the animal in digestion, while the organism’s digestive system contains the right pH for bacteria to thrive in. A point was not earned for the participants since bacteria and “organism” were listed. This was not considered a specific group of organisms.
- For AIDS, points were earned for parasitism and discussion of how the virus is able to reproduce at the expense of the cell. No points for participants were earned because none were listed.
- For anthrax, points were earned for parasitism and discussion of anthrax spreading and thriving inside the body, while the organism dies as a result.