# AP® Environmental Science
# 2003 Scoring Commentary



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## Question 1

Sample 1A (10 points)

In part (a), one point is earned for stating that leaf litter reduces soil erosion, and one point is earned for stating that leaf litter helps prevent "other shrubbery" from competing with the trees, thereby allowing the native vegetation to remain. In part (b), one point each is earned for a description of the following abiotic changes: a lack of moisture in the soil, increased susceptibility to erosion, and a lack of nutrient-rich humus in the soil. In part (c), one point is earned for explaining how exotic species, such as Japanese stilt grass, might not require as much moisture as native species, and therefore would be at an advantage. In part (d), one point is earned for providing a control group, an experimental group, and a specific area component in the design of the experiment. One point is earned for stating what data would be collected (mass of leaf litter), and one point is earned for proposing a specific and testable hypothesis. One additional point is earned for noting that multiple trials of this experiment would be conducted to ensure accurate results.

Sample 1B (Score 8)

In part (a), one point is earned for stating that leaf litter serves as a food source for bacteria and other decomposers, and one point is earned for stating that decomposed leaf litter will produce the nutrients to help plants grow. In part (b), one point each is earned for describing a decline in soil nutrients, increased erosion/loss of soil depth, and an increase in sedimentation in waterways as a result of the increase in eroded soil. In part (c), one point is earned for explaining how an exotic species, such as Japanese stilt grass, might be able to thrive in soils that have experienced a reduction in nutrients. In part (d), one point is earned for a specific and testable hypothesis, and one point is earned for describing the data that would be collected. Neither of the two points related to the experimental design or protocol were earned.

Sample 1C (Score 6)

In part (a), one point is earned for describing leaf litter decomposing and providing nutrients in the soil for plant growth. One point is also earned for stating that leaf litter serves as habitat for insects and microorganisms. In part (b), one point is earned for each of the following: a decline in soil nutrients, and decreased habitat area that was previously provided by leaf litter. In part (c), no points are earned because the student did not explain how one of the abiotic changes identified in part (b) might set the stage for the takeover by an exotic species. In part (d), one point is earned for providing a control group, an experimental group, and an area component in the design of the controlled experiment. One point is earned for stating a specific and testable hypothesis. The data collection point could have been earned by providing a more specific response; the data mentioned for collection is too general in nature. Also, the response could have earned one additional point if it had provided one other specific experimental design component.

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## Question 2

Sample 2A (Score 10)

Three points are earned in part (a) for scaling and labeling the axes, plotting the birth rate data and death rate data, and labeling both curves. One point is earned in part (b) for calculating the growth rate in 1950, and one point is earned for calculating the birth rate in 1977: the work is shown for both calculations. Four points are earned in part (c). One point is earned in part (d); the student solved for *t* and *r*, and applied the rule of 70.

Sample 2B (Score 8)

Three points are earned in part (a) for scaling and labeling the axes, plotting the birth rate data and death rate data, and labeling both curves. One point is earned in part (b) for calculating the growth rate in 1950 and showing the work. Four points are earned in part (c). No point is earned in part (d).

Sample 2C (Score 6)

Three points are earned in part (a) for scaling and labeling the axes, plotting the birth rate data and death rate data, and labeling both curves. No points are earned in part (b). Three points are earned in part (c): two points for two factors that might have accounted for the rapid decline in the death rate, and one point for a reason why the birth rate might have been so high. No point is earned for a reason why the birth rate was so slow to decrease. No point is earned in part (d).

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## Question 3

Sample 3A (Score 10)

In part (a), one point is earned for clearly discussing the role of high and low tides in causing the increase and decrease in salinity levels. One point is earned for discussing the role of seasonal solar influx (solar radiation) in the explanation of seasonal temperature variations. Four points are earned in part (b). In part (c), development is mentioned but the explanation is not fully developed; there is no specific reference to habitat destruction or loss of native flora and fauna. The response has an allusion to industrial effluent and, more specifically, to thermal pollution and the resulting disruption of the ecosystem through species loss, and thus earns one point. Also, one point is earned for the discussion of overhunting in terms of its impact on food webs. In part (d), one point is earned for suggesting an environmental policy that involves passing laws to prevent development, and one point is earned for the proposed economic incentive involving high taxes on wetlands that would serve as a disincentive for development. Since the total number of points available in this question is eleven, a total of ten points is earned even though full credit is not earned in part (c).

Sample 3B (Score 6)

In part (a), tidal movement is identified as a cause of variation in salinity and the connection to the influx of salt water is correctly explained; this earns one point. The discussion of thermal pollution addresses a negative human impact that is more appropriately applied to part (c), and does not earn a point. In part (b), two points are earned for identifying and explaining two ecologically important roles of coastal wetlands, and one point is earned for one economically important role. The sale of products is not clearly explained and does not earn a point. The answer could have been improved if it had referenced haying, seaweed harvesting, and the sale of the resulting agricultural products, or the fishing industry and the sale of the catch, or aquaculture and the sale of fish or shellfish. In part (c), one point is earned for identifying and explaining one negative human impact: the development of coastal wetlands is related to filling in of wetlands and habitat loss. The discussion of pollution of the wetlands lacks specificity, so no additional points are earned. In part (d), the response earns one point for indicating a recommendation and explanation of a zoning proposal to prevent the development of coastal wetlands, clearly tied to the negative impact in part (c). The tax relief economic incentive begins as a reduction in property tax incentive; however, it says that the tax reduction would apply to insignificant development that would attract investors even more, so no point is earned for this contradiction.

Sample 3C (Score 5)

In part (a), one point is earned for relating rainfall (and the lack of rainfall) directly to changing levels of salinity. The connection between seasonal changes and temperature variation is unclear, lacking a connection between seasonal solar influx and water temperatures, so no point is earned. In part (b), one ecological role of wetlands, biodiversity is identified, but there is no discussion of its importance, so no points are earned. One point is earned for the discussion of tourism and boating. The discussion of the agricultural importance of wetlands is too vague, and does not earn a point: there should have been a discussion of specific agricultural products. In part (c), the discussion of herbicides and pesticides can be considered an explanation of the negative impacts of housing, and earns one point. The construction of roadways is a correct identification, but it lacks an explanation – destruction of wetlands is too vague. A better discussion might have included habitat destruction, and loss of native flora and fauna. In part (d), an environmental policy is described that would regulate the use of herbicides and pesticides, and the economic incentive of taxes on the purchase of herbicides and pesticides is a reasonable suggestion, for a total of two points.

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## Question 4

Sample 4A (Score 9)

One point is earned in part (a) for the reference to killing the birds for their feathers. No point is earned for the condor example, because aside from roosting occasionally in old growth trees, the condor is not a forest species and deforestation was not a significant factor in its original decline. Two points are earned in part (b), one for the function of preserves and another for the terms of the Endangered Species Act. Two points are earned in part (c) for the concept of the general effect of a small gene pool, and for the effect of a large body size. Four points are earned in part (d) for developing good arguments for and against protecting the African elephant. The premise that this animal is important in maintaining the biodiversity of its ecosystem was supported by the reference to its unique niche, and an example of an actual effect. The premise that not protecting the elephant would be good for the local economy was supported by the argument on the value of ivory, and potential impacts on developing nations.

Sample 4B (Score 7)

No points are earned in part (a) since the answer failed to link habitat loss with an actual effect on the decline of the species, and "slow reproductive rate" is not considered a cause for the original decline of the species. Two points are earned in part (b), one for banning hunting, and one for the sale of items derived from the birds. One point is earned in part (c) for the concept of slow reproductive rate, since it is correctly linked with population recovery. In spite of the lengthy development of the second idea, no point is earned for the concept of "having economic value to humans" because this is not an inherent characteristic of a species as such. Four points are earned in part (d) for identifying ecotourism as a factor, for supporting the argument, and for the well-developed argument about the country's more urgent needs.

Sample 4C (Score 6)

No points are earned in part (a) because the specific effects of urbanization on the bird populations are not mentioned, and the use of chemical pesticides is not considered a major cause for the original decline of the species. Two points are earned for part (b), one for the reference to the importance of the ban on DDT in the protection of the species, and another for the reference to the effects of the Endangered Species Act. Two points are earned in part (c), one for the relationship of small clutch size to slow recovery, and another point for the specialized diet reference. Two points are earned in part (d), one for the concept of the food web effect and one for the alternate land use idea, but neither of the arguments is developed well enough to merit the second possible point.