2025

AP® Environmental Science

Sample Student Responses and Scoring Commentary Set 2

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Free-Response Question 3

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Question 3: Analyze an Environmental Problem and Propose a Solution (Doing Calculations) — 10 points

A — **Point 01**

Identify a type of surface mining the company could use to access the coal.

Examples of acceptable responses may include the following:

- Strip mining
- Open pit
- Mountain top removal

B — **Point 02**

Describe an environmental problem associated with surface mining.

Examples of acceptable responses may include the following:

- Removal of vegetation/soil/rock causes loss/destruction of habitat.
- (Surface mining) causes loss of habitat, which results in loss of biodiversity.
- Removal of vegetation can increase rates of erosion.
- (Surface mining) can lead to contamination of groundwater/surface water/waterways from runoff of sediments/pollutants.
- Removal of vegetation/soil/bedrock/parent material can release dust particles/methane.
- High energy/fossil fuel consumption is needed to operate equipment and leads to air pollution.

C — **Point 03**

Describe an environmental problem the town could experience as a result of the electricity generation at the coal-burning power plant.

Examples of acceptable responses may include the following:

- Release of air pollutants/toxic metals/particulates/NO_X/SO_X could lower air quality/result in respiratory problems.
- Release of air pollutants/sulfur dioxides/nitrogen oxides could cause acid rain.
- Greenhouse gas emissions/carbon dioxide/methane/water vapor could lead to altered precipitation/climate/weather/temperature patterns.

D — **Point 04**

Propose a realistic solution the local government could enact that would reduce the negative environmental consequences of using coal to generate electricity.

Examples of acceptable responses may include the following:

- Require/incentivize the plant to install scrubbers/electrostatic precipitators.
- Incentivize the use of alternative energy sources/energy efficient appliances.
- Incentivize green building design/conservation landscaping/planting trees as carbon sinks.

E	**Calculate** how many pounds of coal would need to be burned to generate enough electricity to power a town with 11,000 houses for a year. **Show** your work.	**Point 05**
	One point for the correct setup to calculate how many pounds of coal would be needed. Examples of acceptable responses may include the following: • (11,000 houses x 10,640 kWh per house) / 0.88 kWh per lb of coal • (11,000 x 10,640) / 0.88	
	One point for the correct calculation of how many pounds of coal would be needed. Examples of acceptable responses may include the following: • 133,000,000 • 1.33 x 10^8	**Point 06**
F	**Calculate** the percent change in bird species per hectare since the power plant was installed. **Show** your work.	**Point 07**
	One point for the correct setup to calculate the percent change in bird species per hectare. Examples of acceptable responses may include the following: • (6.0 species / ha – 7.5 species / ha) / 7.5 species / ha x 100 • (6.0 – 7.5) / 7.5 x 100	
	One point for the correct calculation of the percent change in bird species per hectare. Examples of acceptable responses may include the following: • -20% • 20% decrease • -20	**Point 08**
G	Assuming that the growth rate remains constant, **calculate** the year in which the population will reach 52,500. **Show** your work.	**Point 09**
	One point for the correct setup to calculate the year the population will reach 52,500. Acceptable setup point: • (70 / 5.38) + 2022	
	One point for the correct calculation of the year the population will reach 52,500. Acceptable calculation point: • 2035	**Point 10**

----Response A----
Strip mining
----Response B----
Surface mining decreases biodiversity and destroys habitats. In order to get the ores, mining companies clear large plots of land and do not attempt to preserve the habitats above it. Additionally, as these habitats are destroyed, the plants and animals also die which decreases the biodiversity of an area as there are much less different species now than there was before the mining occurred.
----Response C----
The town could experience acid rain, which will acidify local bodies of water including lakes and ponds, killing the wildlife in them who cannot tolerate such low pH levels. The coal-burning plant releases Sulfur dioxide which combines with water to make sulfuric acid. When it precipitates, this acid rain falls into said bodies of water, acidifing them.
----Response D----
The local government could provide subsidies to the coal power plants if they utilize wet scrubbers in their smoke stacks to help decrease sulfur dioxide emmosion
----Response E----
(1 lb of coal/.88 kWh)(1.064x10^4 kWh/1 house)(11,000 houses/1year) = 133,000,000 lbs of coal/year
----Response F----
((6.0 species per hectare - 7.5 species per hectare)/7.5 species per hectare)(100) = -20%
----Response G----
Doubling time = 70/5.38 = 13.011 years
26,250(2) = 52,500
Population only needs to double once in order to reach 52,500 members. This means it takes 13.011 years to reach this population from 2022.
2022+13.011 = 2035.011
The populaition will reach 52,500 in the year 2035.

----Response A----
The company could use subsurface mining in order to acess the coal.
----Response B----
Surface mining removes the vegetation and habitats of the animals which live there and that could remove many different organisms, decreasig the biodiversity and leaving the ecosystem exposed and vulnerable.
----Response C----
Coal-burning power plants produce an excess amount of air pollutants such as CO_2 . These air pollutants could reach the town eventually and cause respiratory infections and diseases due to the lack of air quality.
----Response D----
They could require the coal-burning power plant to have scrubbers in order to combate the air pollution by stripping the out-going smoke of it's harmful pollutants.
----Response E----
1.064 X 10^4 kWh/year * 11,000 houses = 1.1704 X 10^8 kWh/year
----Response F----
6.0 species per hectare - 7.5 species per hectare = -1.5 species per hectare
-1.5 species per hectare/7.5 species per hectare = -0.2
-0.2 * 100 = -20% change
----Response G----
70%/5.38% = 13.01 years ? 13 years
2022 + 13 = 2035

----Response A----
Drilling.
----Response B----
It destroys the habitat that once lived above it.
----Response C----
The air-quality in the nearby town would decrease as a result of the carbon-emissions from the coal-burning plant.
----Response D----
Moving the coal burning plant to the other side of the town, causing the emissions to not blow towards the town.
----Response E----
(1.064 X 10^4/1 house) X (1 LB of coal/ 0.88 kWh) X (11,000 Houses/ 1 Year) = 1.33 X 10^8 OR 133000000
----Response F----
6/7.5 = 0.8
0.8 X 100 = 80.
There was an 80% change.
----Response G----
2024. Year 1: 40372.5
Year 2: 62092.905.

Question 3

Note: Student samples are quoted verbatim and may contain spelling and grammatical errors.

Overview

NEW for 2025: The question overviews can be found in the *Chief Reader Report on Student Responses* on AP Central.

Sample: 3A
Score: 10

One point was earned in part A for identifying "Strip mining" as a type of surface mining the company could use to access the coal. One point was earned in part B for describing "decreases biodiversity and destroys habitats" as an environmental problem associated with surface mining. One point was earned in part C for describing "The coal-burning plant releases Sulfur dioxide which combines with water to make … acid rain." One point was earned in part D for proposing "The local government could provide subsidies to the coal power plants if they utilize wet scrubbers." Two points were earned in part E: One point for the correct setup, and one point for the correct answer. Two points were earned in part F: One point for the correct setup, and one point for the correct answer. Two points were earned in part G: One point for the correct setup, and one point for the correct answer.

Sample: 3B
Score: 5

No point was earned in part A. One point was earned in part B for describing "Surface mining removes … habitats of the animals … decreasig the biodiversity." No point was earned in part C. One point was earned in part D for proposing "They could require the coal-burning power plant to have scrubbers in order to combate the air pollution." No points were earned in part E. Two points were earned in part F: One point for the correct setup, and one point for the correct answer. One point was earned in part G: No point was earned for the setup, and one point was earned for the correct answer.

Sample: 3C
Score: 2

No points were earned in part A. No points were earned in part B. No points were earned in part C. No points were earned in part D. Two points were earned in part E: One point for the correct setup, and one point for the correct answer. No points were earned in part F. No points were earned in part G.