

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

10 points

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

Point 01

Examples of acceptable responses may include the following:

- Strip mining
- Open pit
- Mountain top removal

B **Describe** an environmental problem associated with surface mining.

Point 02

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

Point 03

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

Point 04

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. One point for the correct setup to calculate how many pounds of coal would be needed. Examples of acceptable responses may include the following: $(11,000 \text{ houses} \times 10,640 \text{ kWh per house}) / 0.88 \text{ kWh per lb of coal}$ $(11,000 \times 10,640) / 0.88$	Point 05
	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 1.33×10^8	Point 06
F	Calculate the percent change in bird species per hectare since the power plant was installed. Show your work. One point for the correct setup to calculate the percent change in bird species per hectare. Examples of acceptable responses may include the following: $(6.0 \text{ species / ha} - 7.5 \text{ species / ha}) / 7.5 \text{ species / ha} \times 100$ $(6.0 - 7.5) / 7.5 \times 100$	Point 07
	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. One point for the correct setup to calculate the year the population will reach 52,500. Acceptable setup point: $(70 / 5.38) + 2022$	Point 09
	One point for the correct calculation of the year the population will reach 52,500. Acceptable calculation point: 2035	Point 10