

Past-paper walk-through

Noise Pollution ■ 7.8

eXercise

Questions in this set

- 2025 Set 2 Q3

Reading the mark scheme

- **B1** a mark that stands on its own – the point is either made or not.
- **M1** a *method* mark: the right approach, even if the number is wrong.
- **A1** an *answer* mark, and it usually needs its M mark first.
- **C1** a working mark on the way to the answer.
- **//** separates answers the examiner accepts equally.
- **ecf** = error carried forward: a later part is marked on your own earlier answer.
- **owtte** = “or words to that effect” – the wording need not match.

Question 3

2025 Set 2 ■ Q3

The local government of a newly built town has contracted with an electrical company to provide energy to the town. The company generates electricity primarily through the burning of coal and has built a new power plant for the town. A nearby deposit of coal was discovered close to the surface. To access the coal, the company decides to remove the overburden and vegetation over the deposit.

Respond to parts A, B, C, D, E, F, and G.

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

Question 3

2025 Set 2 ■ Q3

The local government of a newly built town has contracted with an electrical company to provide energy to the town. The company generates electricity primarily through the burning of coal and has built a new power plant for the town. A nearby deposit of coal was discovered close to the surface. To access the coal, the company decides to remove the overburden and vegetation over the deposit.

Respond to parts A, B, C, D, E, F, and G.

(b) Describe an environmental problem associated with surface mining.

Question 3

2025 Set 2 ■ Q3

The local government of a newly built town has contracted with an electrical company to provide energy to the town. The company generates electricity primarily through the burning of coal and has built a new power plant for the town. A nearby deposit of coal was discovered close to the surface. To access the coal, the company decides to remove the overburden and vegetation over the deposit.

Respond to parts A, B, C, D, E, F, and G.

(c) The town is located downwind of the new coal-burning power plant.

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

Question 3

2025 Set 2 ■ Q3

The local government of a newly built town has contracted with an electrical company to provide energy to the town. The company generates electricity primarily through the burning of coal and has built a new power plant for the town. A nearby deposit of coal was discovered close to the surface. To access the coal, the company decides to remove the overburden and vegetation over the deposit.

Respond to parts A, B, C, D, E, F, and G.

(d) The local government is concerned about the environmental consequences of using coal to generate electricity for the town.

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

Question 3

2025 Set 2 ■ Q3

The local government of a newly built town has contracted with an electrical company to provide energy to the town. The company generates electricity primarily through the burning of coal and has built a new power plant for the town. A nearby deposit of coal was discovered close to the surface. To access the coal, the company decides to remove the overburden and vegetation over the deposit.

Respond to parts A, B, C, D, E, F, and G.

(e) Burning one pound of coal produces an average of 0.88 kilowatt-hours (kWh) of electricity. An average household in the United States uses 1.064×10^4 kWh of electricity each year.

****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.

Question 3

2025 Set 2 ■ Q3

The local government of a newly built town has contracted with an electrical company to provide energy to the town. The company generates electricity primarily through the burning of coal and has built a new power plant for the town. A nearby deposit of coal was discovered close to the surface. To access the coal, the company decides to remove the overburden and vegetation over the deposit.

Respond to parts A, B, C, D, E, F, and G.

(f) Researchers are concerned about the impact of noise pollution on songbirds in a forest near the power plant. Since the power plant was installed, bird species richness has declined from 7.5 species per hectare to 6.0 species per hectare.

Calculate the percent change in bird species per hectare since the power plant was installed. **Show** your work.

Question 3

2025 Set 2 ■ Q3

The local government of a newly built town has contracted with an electrical company to provide energy to the town. The company generates electricity primarily through the burning of coal and has built a new power plant for the town. A nearby deposit of coal was discovered close to the surface. To access the coal, the company decides to remove the overburden and vegetation over the deposit.

Respond to parts A, B, C, D, E, F, and G.

(g) The town has been growing since it was built and had a growth rate of 5.38% in 2022, with a population of 26,250.

Assuming that the growth rate remains constant, **calculate** the year in which the population will reach 52,500. **Show** your work.

Solution 3

(a)

Mark scheme

- A type of surface mining the company could use to access the coal: strip mining, open pit mining, or mountaintop removal. 1 point for naming any one valid surface-mining type.

Solution 3

(b)

Mark scheme

- An environmental problem associated with surface mining: removal of vegetation/soil/rock causes loss/destruction of habitat (and resulting loss of biodiversity); removal of vegetation can increase erosion rates; surface mining can contaminate groundwater/surface water/waterways via runoff of sediments/pollutants; removal of vegetation/soil/bedrock/parent material can release dust particles/methane; or high energy/fossil fuel consumption to operate equipment leads to air pollution. 1 point for any one valid problem.

Solution 3

(c)

Mark scheme

- An environmental problem the downwind town could experience from the power plant's electricity generation: release of air pollutants/toxic metals/particulates/ NO_x / SO_x could lower air quality and cause respiratory problems; release of sulfur dioxides/nitrogen oxides could cause acid rain; or greenhouse gas emissions (carbon dioxide/methane/water vapor) could alter precipitation/climate/weather/temperature patterns. 1 point for any one valid problem.

Solution 3

(d)

Mark scheme

- A realistic solution the local government could enact: require/incentivize the plant to install scrubbers/electrostatic precipitators; incentivize the use of alternative energy sources/energy-efficient appliances; or incentivize green building design/conservation landscaping/planting trees as carbon sinks. 1 point for any one valid, realistic solution.

Solution 3

(e) Mark scheme

- Setup (1 point): pounds of coal needed = $(11,000 \text{ houses} \times 10,640 \text{ kWh per house}) / 0.88 \text{ kWh per lb of coal}$, i.e. $\frac{11,000 \times 10,640}{0.88}$, using the given household usage of $1.064 \times 10^4 \text{ kWh/year}$ and the given 0.88 kWh generated per pound of coal burned. Calculation (1 point): approximately 133,000,000 lb of coal (i.e. $1.33 \times 10^8 \text{ lb}$). Award 1 point for the correct setup (total kWh needed for the town divided by kWh generated per lb of coal) and 1 point for the correct final numeric value (accept equivalent or reasonably rounded answers).

Solution 3

(f)

Mark scheme

- Setup (1 point): percent change = $(6.0 \text{ species/ha} - 7.5 \text{ species/ha}) / 7.5 \text{ species/ha} \times 100$, i.e. $\frac{6.0 - 7.5}{7.5} \times 100$. Calculation (1 point): -20

Solution 3

(g)

Mark scheme

- Setup (1 point): since the target population of 52,500 is double the 2022 population of 26,250, use the Rule of 70 to estimate doubling time and add it to the starting year: $\left(\frac{70}{5.38}\right) + 2022$. Calculation (1 point): 2035 (doubling time of about 13 years added to 2022). Award 1 point for the correct setup (70 divided by the percent growth rate, plus the starting year) and 1 point for the correct final year (accept 2035 or a value from a reasonably equivalent growth calculation).