AP Environmental Science

Model Answers · 范文与满分答案

APES free-response is scored on specific, named content: a named pollutant, a named process, a computed number with its unit. Vague environmental language earns nothing however sensible it sounds. Each model below is written at that level of specificity. 评分要求具体名称与数据，笼统的环保表述不得分。

Describe, identify, explain

Identify one human activity that increases atmospheric methane, and explain how.

Rice cultivation in flooded paddies increases atmospheric methane. The standing water creates anaerobic conditions in the soil, and methanogenic archaea decompose organic matter in the absence of oxygen, releasing methane which diffuses into the atmosphere.

Two points: a NAMED activity and the mechanism. "Farming" is too vague to score; "rice paddies" is specific. The mechanism must name the condition (anaerobic) and the process (decomposition by methanogens). Answers that stop at "it releases methane" restate the question without explaining it.

Describe one ecological consequence of building a dam on a river, other than habitat loss from flooding.

A dam blocks the downstream transport of sediment. The river below the dam carries less sediment, so the delta at the river mouth receives less material than erosion removes and it shrinks. This reduces coastal wetland habitat and increases the vulnerability of the coastline to storm surge.

One clear consequence, developed through a chain: sediment trapped, delta starved, wetland lost. The question excluded the obvious answer, which is a deliberate test of breadth – a prepared student has three or four consequences available (sediment, migration barriers for fish, altered thermal regime, downstream flow regulation) and picks one the question has not already taken.

Calculations – show every step with units

A coal plant produces 500 MW at 35 per cent efficiency. Coal releases 30 MJ per kg. How many kg of coal are burned per second?

Energy input needed = 500 MW ÷ 0.35 = 1429 MJ per second. Coal required = 1429 MJ/s ÷ 30 MJ/kg = 47.6 kg per second.

Two scored steps and both must be visible with units. The efficiency is applied by DIVIDING the useful output, not multiplying – multiplying gives 175 MJ/s and a coal rate of 5.8 kg/s, which is the standard error. A units check catches it: MJ/s divided by MJ/kg gives kg/s, which is what was asked for.

A town of 40,000 people uses 300 litres of water per person per day. Its reservoir holds 2.0 × 10^9 litres. How many days of supply is that, assuming no inflow?

Daily use = 40,000 × 300 = 1.2 × 10^7 litres per day. Days of supply = 2.0 × 10^9 ÷ 1.2 × 10^7 = 167 days.

Both lines are scored. Setting the calculation out in scientific notation avoids the zero-counting error that costs most of the lost marks on this question type, and the answer should be sanity-checked: about five and a half months for a town reservoir is plausible, whereas 1.67 days or 16,700 days would not be.

Propose a solution and justify it

Propose one method to reduce nitrogen runoff from an agricultural field into a nearby river, and justify why it would work.

Plant a riparian buffer strip of deep-rooted grasses and trees between the field and the river. The vegetation slows surface runoff so that water infiltrates rather than flowing directly into the river, and the roots take up dissolved nitrate before it reaches the channel. This reduces the nitrogen load entering the river, which lowers the risk of algal blooms and the hypoxia that follows when the algae decompose.

Three scored elements: a specific proposal, the MECHANISM by which it works, and the environmental benefit that follows. Notice the answer names hypoxia and its cause rather than saying "it harms fish" – the rubric rewards the named process. A proposal such as "farmers should use less fertiliser" can score, but only with the same mechanism and benefit chain attached.

A city wants to reduce its transport-related carbon emissions. Propose one policy, describe how it reduces emissions, and identify one drawback.

The city could invest in an expanded electric bus network with dedicated bus lanes. Buses carry many passengers per vehicle, so the emissions per passenger-kilometre are much lower than for single-occupancy cars, and dedicated lanes make the journey faster than driving, which persuades commuters to switch. Total fuel consumed for the same number of journeys falls, and if the electricity comes from renewable sources the emissions fall further. A drawback is the high capital cost of vehicles and infrastructure, which may require higher local taxes or the diversion of funds from other services. The emissions reduction also depends on the electricity grid: in a region where power comes mainly from coal, the improvement is much smaller.

The drawback must be a genuine trade-off, not a restatement. "It might not work" scores nothing; "the benefit depends on the grid's fuel mix" is a real, specific limitation and is exactly the kind of conditional reasoning the rubric rewards in the final part of these questions.