Teacher Answer Key

Case Study

1. AI data centers use millions of gallons of water daily for cooling computer chips that generate significant heat. A facility consuming 3.5 million gallons per day would add a massive new demand to a water system that is already being depleted faster than it recharges. Unlike temporary industrial use, a large data center represents a long-term, continuous water draw that could accelerate aquifer depletion and threaten the community's water security for generations.

2. Communities should evaluate the long-term sustainability of their water supply against the projected consumption, the economic benefits (jobs, tax revenue) against the long-term costs, the company's contractual water usage limits and accountability measures, and whether there are alternative cooling technologies such as air cooling or water recycling systems that could reduce consumption. They should also consider whether the economic benefits are durable or whether automation might reduce the promised workforce over time.

Multiple Choice

1. A

2. D

3. B

Matching

1-D, 2-C, 3-A, 4-E, 5-B

Fill-in-the-Blank

1) 700,000, 2) 8, 3) 34

Short Answer (Sample Responses)

Q1: AI computation happens on physical servers in data centers that run on electricity and generate heat requiring water cooling. Every query activates hundreds of chips drawing electrical power from the grid, and that electricity was generated somewhere using some physical process. The environmental impact depends on the scale of usage and the energy source, but the physical infrastructure and resource consumption are real regardless of how digital the user experience feels.

Q2: If a data center's electricity comes from renewable or nuclear sources, its carbon emissions during operation are very low. If it uses fossil fuels, significant

carbon is emitted per query. Companies with net-zero commitments need their data centers to run on clean energy to honor those commitments, but rapid AI growth means electricity demand is outpacing the availability of clean power, causing some companies' emissions to increase even as they publicly commit to reductions.

Q3: Answers will vary. A strong answer might argue that individuals have some responsibility because their usage collectively drives demand that justifies data center buildout, so choosing not to use AI frivolously reduces that demand. A counter-argument might note that individual queries are infinitesimally small relative to systemic infrastructure decisions made by companies and governments, making individual behavior far less impactful than corporate and regulatory choices. Either position is valid if well-reasoned.