Beyond the Tailpipe

Weigh the effects of a change in transportation

SS24.CWI.10a "Evaluate the positive and negative impacts of scientific and technological changes on society and on the environment."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline two benefits of electric buses, circle two costs or harms, and number one benefit and one harm that show how a gain in one place can have an impact elsewhere.

What Changes When Buses Go Electric?

1 At a crowded bus stop, a diesel bus pulls away and leaves a cloud of exhaust. A battery-electric bus would produce no exhaust at the stop because its motor runs on stored electricity. Replacing diesel buses can lower roadside air pollution, which benefits riders, drivers, and neighbors who breathe that air. Electric buses are also quieter on the street. Yet buying them costs more up front than buying similar diesel buses, and routes may need charging stations. A city choosing new buses must weigh cleaner, quieter streets against higher initial costs and the work of changing its transit system.

2 The electricity that charges a bus has to come from somewhere. If a power plant burns coal or natural gas, charging can still cause greenhouse gas emissions, even though the bus has no tailpipe. Charging with electricity from wind or solar power can reduce those emissions. Making batteries also requires minerals such as lithium and nickel. Mining these minerals can disturb habitats and use large amounts of water in some places. The jobs and income from mining can help some communities, but pollution or heavy water use can harm others, especially where rules are weak.

3 Battery buses may cost less to fuel and maintain over time, but their total costs depend on electricity prices, mileage, and battery life. When a battery can no longer power a bus well, it should not simply be dumped. Recycling can recover some metals and reduce demand for new mining, but collecting and processing used batteries also takes energy and money. Some batteries can be reused for less demanding jobs before recycling. A city can compare these costs and effects with those of diesel buses, then plan cleaner charging and responsible battery collection. Technology changes where impacts happen, not just how large they are.

2 ANSWER WITH EVIDENCE

Use the passage

1. How could electric buses benefit people near bus routes while the minerals for their batteries harm people elsewhere?

2. Why does a bus with no tailpipe exhaust not necessarily have no environmental impact? Give two impacts from the passage.

3. Which source of charging electricity would make electric buses a better choice for reducing greenhouse gas emissions, and why?

4. Does recycling used bus batteries remove every cost of making and using them? Support your judgment with two details.

3 YOUR TURN

Your own words

A town is considering replacing diesel delivery vans with battery-powered vans. Write four or five sentences recommending a plan. Use at least two facts from the passage to predict an effect on people and an effect on the environment, identify a possible harm, explain how your plan would reduce it, and justify the trade-off.

ANSWER KEY

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HIGH SCHOOL · SS24.CWI.10a

PART 1 · READ AND MARK

Underline two benefits of electric buses, circle two costs or harms, and number one benefit and one harm that show how a gain in one place can have an impact elsewhere. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How could electric buses benefit people near bus routes while the minerals for their batteries harm people elsewhere?	**People near bus routes could breathe less roadside pollution. In mining communities, pollution or heavy water use could harm people.**
2	Why does a bus with no tailpipe exhaust not necessarily have no environmental impact? Give two impacts from the passage.	**Charging can cause greenhouse gas emissions if the electricity comes from fossil fuels. Mining battery minerals can disturb habitats or use large amounts of water.**
3	Which source of charging electricity would make electric buses a better choice for reducing greenhouse gas emissions, and why?	**Wind or solar power would reduce emissions from charging compared with electricity produced by burning coal or natural gas.**
4	Does recycling used bus batteries remove every cost of making and using them? Support your judgment with two details.	**No. Recycling can reduce demand for new mining, but collecting and processing batteries takes energy and money, and making batteries still requires mined minerals.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I would replace a few diesel delivery vans with electric vans first, then measure their costs and effects. Because electric buses have no tailpipe exhaust, the vans could also reduce pollution for people along delivery routes. Charging with wind or solar power could reduce greenhouse gas emissions, but making the vans' batteries might disturb habitats through mining. I would arrange battery collection for recycling to reduce demand for new mining. A small trial would help the town decide whether those gains justify the cost of chargers.

Accept other supported trade-offs, including quieter streets, higher initial costs, and mining's mixed effects on communities. For the open task, look for a reasoned prediction about vans based on passage evidence, not a claim that buses and vans have identical effects.