Name_____ Period _____ Date _____

Fleet Manager

STEM Sims

Lesson 2: Cough It Up

One of the major problems with internal combustion engines that are found in most vehicles is the amount of carbon dioxide exhaust the engine releases after the fuel is burned. Can you convert a vehicle's engine type to clean up its exhaust and reduce the carbon dioxide emissions?

Doing the Science

1. Start the Fleet Manager Simulation.
2. Select one of the vehicles in the fleet.
3. Select the "Use" button, then the "Drive" button. When the vehicle completes the route, select the "Status" button.
4. Record in Table 1 below the Vehicle name, Engine Type, Vehicle Color, and CO_2 Emissions released annually by the vehicle.

Table 1. Vehicles and Carbon Dioxide Emissions

Vehicle	Engine Type	Vehicle Color	CO_2 Emissions (tons/year)	Engine Conversion	CO_2 Emissions (tons/year)

5. Close the box by selecting the "X" in the upper right-hand corner, and then select the "Fleet" button.
6. Select a different vehicle and repeat steps 3-5. Test a total of three different vehicles. Make sure to record your data in Table 1.
7. Select one of the same vehicles you previously tested (use the vehicle's color if you can't remember the names of the vehicles) and select the "Convert" button at the bottom of the screen.
8. Select one of the engine conversions. Make sure to record the engine conversion type in Table 1. Select the "Make Conversion" button.
9. Repeat steps 3 – 5 to test drive your modified vehicle. Record your data in Table 1.
10. Repeat steps 7 – 9 for a total of three converted vehicles. Record your data in Table 1.

What Do You Understand?

1. Which vehicle that you tested released the most carbon dioxide into the atmosphere on an annual basis?

2. Which engine conversion was most effective at reducing the amount of carbon dioxide released by the vehicle? Provide a reason for the improved air quality rating of this vehicle's engine.

3. State any limitations or possible problems associated with the engine conversion you described in question #2.

4. How long would it take the company to recover the cost of the conversion in question #2 in terms of reduced operating costs? Show or describe your calculations.

5. Use the simulation to investigate if another engine conversion would result in a shorter term to recover conversion costs, but still result in reduced carbon dioxide emissions. Describe how you arrived at your response and show calculations to support your response.

6. List three things a company could do to reduce their gasoline fleet's operating costs without converting their vehicles' engines.

7. Drones have been proposed to deliver packages to reduce fleet costs. Name and describe two benefits of having drones serve as delivery vehicles.

8. Name and describe two downsides of having drones serve as delivery vehicles.