

Vehicle Exhaust Environmental Impacts Explained

<https://gemini.google.com/app/be91182772f83f8d>

Response: Based on environmental chemistry principles, the correct option is **(1) exhaust gas released from fossil fuel burning vehicles**.

Detailed Explanation

Exhaust gas from fossil fuel-burning vehicles contains a combination of gases, primary among them being **carbon dioxide (CO_2)**, **nitrogen oxides (NO_x , mainly NO and NO_2)**, and **volatile organic compounds (VOCs)** or unburnt hydrocarbons.

Here is how these components contribute to all three environmental issues:

1. Global Warming:

- Vehicles emit large amounts of CO_2 (a major greenhouse gas) along with trace amounts of N_2O , which trap heat in the atmosphere.

2. Acid Rain:

- High combustion temperatures inside vehicle engines cause atmospheric N_2 and O_2 to react, forming NO_x .
- These nitrogen oxides dissolve in atmospheric moisture to form nitric acid (HNO_3), contributing significantly to acid rain.

3. Photochemical Smog:

- Vehicle exhaust is the primary source of both NO_x and **unburnt hydrocarbons (VOCs)**.
- Under sunlight, NO_x and VOCs undergo photochemical reactions to produce secondary pollutants such as ozone (O_3) and peroxyacetyl nitrate (PAN), which are the main components of photochemical smog.

Why Other Options Are Incorrect

- **(2) Exhaust gas from coal power plants:** Produces SO_2 and CO_2 (leading to acid rain and global warming), but emits significantly fewer volatile hydrocarbons necessary to trigger classical vehicle-driven **photochemical smog**.
- **(3) Refrigerant gases:** CFCs/HFCs contribute mainly to ozone layer depletion and global warming, not acid rain or photochemical smog.

- **(4) Municipal solid waste emissions:** Primarily release methane (CH_4) and CO_2 (global warming), but do not directly cause photochemical smog or major acid rain.
- **(5) Biofuel burning vehicle emissions:** Biofuels are generally considered carbon-neutral regarding net global warming emissions over their lifecycle compared to fossil fuels.

Correct Answer: (1)
