**Alternative Fuels and *Environmental Pollution***

How *harmful* is a fuel for the *environment*? The *harmfulness* of a fuel depends on the amount of *emissions* it *releases.* But it is not only important to *take into account* the emissions released when the fuel is combusted in the car’s *engine*, it is also important to remember the emissions that are released from production and *storage* of the fuel. Because of this, it is best to talk about the fuel’s emissions in its ***life cycle*** which means emissions from its production, storage and *combustion*.

The following table shows emissions of alternative fuels during their life cycles *in comparison* to the emissions of *gasoline*.

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| **Alternative Fuel** | **Life cycle emissions**  **(production, storage and combustion of a fuel compared to gasoline)** | |
| **Biodiesel** | -50% of total emissions (B100) | The CO2 released when biodiesel is combusted is equal to the CO2 *captured* by the plants used to make biodiesel. |
| **Natural gas** | -11% of total emissions |  |
| **Hydrogen** | -33% of total emissions | No harmful emissions from combustion. All emissions from production and storage of hydrogen. |
| **Electricity** | -40% of total emissions (plug-in electric vehicles)  🡪Depends on *source* of electricity (*petroleum*, *solar power*, wind power*, nuclear power*, *coal* etc.) | No emissions from combustion. Emission only released during production of electricity.  Picture 1: Electricity sources in the USA. |
| **Ethanol** | -52% of total emissions | Depends on sources of energy used during ethanol production. |

**Questions**

1. Which are the “*cleanest*” alternative fuels and why?
2. What are the *advantages* of electricity and hydrogen as alternative fuels?

1. Why are electricity and hydrogen not “cleaner” than biodiesel and ethanol?

1. How could electricity and hydrogen be made “cleaner” alternative fuels?