

Name \_\_\_\_\_

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

1) What does the Federal BIN number mean?

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2) How are oxides of nitrogen (NO<sub>x</sub>) formed?

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3) What is the stoichiometric ratio and what does it mean?

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4) How is water formed during the combustion process?

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5) List the five exhaust gases and their maximum allowable readings for a fuel-injected vehicle equipped with a catalytic converter.

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## Answer Key

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1) The higher the tier number, the newer the regulation; the lower the bin number, the cleaner the vehicle. The Toyota Prius is a very clean Bin 2, while dirtier vehicles are given a higher bin number.

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2) Nitrogen is 78% of the air, so having some left over is normal. However, if the combustion temperatures and pressures are high enough, some of the nitrogen (N<sub>2</sub>) combines with the oxygen to form NO and NO<sub>2</sub>, which are harmful exhaust gases and referred to as oxides of nitrogen, NO<sub>x</sub>, where the "x" represents a number.

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3) Engines consume about 15 times more air than gasoline, this ratio of air to fuel is called the stoichiometric ratio. This ratio, which is 14.7:1 for gasoline, is the ratio where all the fuel is consumed in the combustion process and all the available oxygen is used.

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4) During combustion, the HC combines with the air to form water (H<sub>2</sub>O) and carbon dioxide (CO<sub>2</sub>), plus nitrogen (N<sub>2</sub>) and some other non-desirable gases.

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5) The five gases and their maximum allowable readings include:

HC = 30 to 50 PPM or less

CO = 0.3% to 0.5% or less

O<sub>2</sub> = 0% to 2%

CO<sub>2</sub> = 12% to 15%

NO<sub>x</sub> = less than 100 PPM at idle and less than 1000 PPM at WOT

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