

12 Nitrogen and its compounds – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)
oxides of nitrogen	氮氧化物	_____
engine	发动机	_____
catalytic converter	催化转化器	_____
exhaust gases	尾气	_____
acid rain	酸雨	_____

Recall

From Part 1 you know nitrogen is unreactive —but at very high temperatures it does react. Here we meet the **oxides of nitrogen** 氮氧化物 and the pollution they cause.

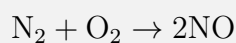
- Inside a hot engine, nitrogen and oxygen combine.
- The oxides (NO, NO₂) cause smog and acid rain.

New ideas

Read these first, then do the Practice.

■ 1 Where the oxides come from

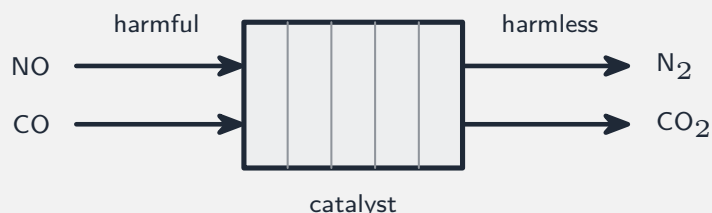
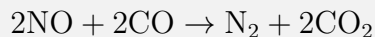
Oxides of nitrogen (NO_x) form when nitrogen and oxygen react at high temperature:



- **natural** —lightning gives enough energy.
- **man-made** —the high temperature inside a car **engine** 发动机.

■ 2 The catalytic converter

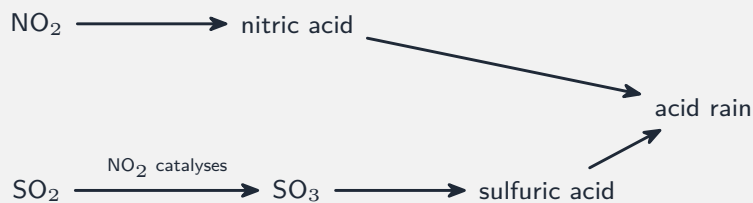
A **catalytic converter** 催化转化器 cleans the **exhaust gases** 尾气, letting the harmful gases react to form harmless ones:



■ 3 Acid rain

The oxides also cause **acid rain** 酸雨:

- NO₂ dissolves in rain to form **nitric acid**.
- NO₂ also speeds up (catalyses) the change of SO₂ into SO₃, which forms **sulfuric acid**.



Watch out: in a catalytic converter the *harmful* gases (NO, CO) react together to make *harmless* ones (N₂, CO₂). The catalyst only speeds this up—it is not used up.

Practice

Try these in order.

12.1 Write the equation for nitrogen and oxygen forming nitrogen monoxide. [1]

12.2 State one natural and one man-made source of oxides of nitrogen. [2]

12.3 Write the equation for the reaction in a catalytic converter that removes NO and

CO. [2]

12.4 Name the harmless products formed in a catalytic converter. [2]

12.5 Explain the **two** ways oxides of nitrogen contribute to acid rain. [2]

12.6 Challenge. Explain why oxides of nitrogen form inside a hot car engine but not in ordinary air. [2]
