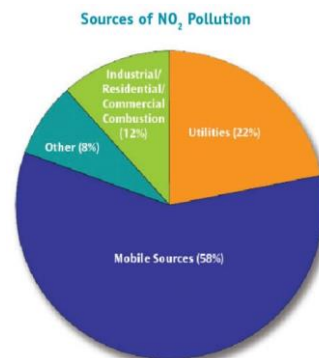


Extra Practice With Atmospheric Contamination With Stoichiometry Sneaked In

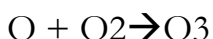
1. What's the difference between ozone at ground level and ozone in the stratosphere?

The ozone in the stratosphere serves a *protective* role (from UV) but it's a *contaminant* (pollutant) at ground level which affects plants, rubber and human lungs.



Source: U.S. EPA Website, <http://www.epa.gov/air/nitrogenoxides/pdfs/20100124presentation.pdf>

2. When O reacts with O₂ to produce O₃, how many grams of O₃ are produced for every gram(1.0) of O₂ that reacts?



$$1.0 \text{ g}(\text{mole}/32\text{g}) (1\text{mole O}_3)/(1 \text{ mole of O}_2) = 1/32 \text{ moles O}_3$$

$$1/32 \text{ moles O}_3 (48 \text{ g/mole}) = 1.5 \text{ g O}_3$$

3. Explain how NO₂ in the air leads to the formation of :

- a) Acid rain

It reacts with OH (hydroxyl, not hydroxide) in the air to produce HNO₃

- b) PM 2.5 pollution

It reacts with other hydrocarbons in the atmosphere.

- c) Ozone at ground level

In intense light, NO₂ can split up to form O, which then attacks O₂ to produce O₃

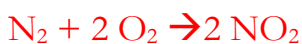
- d) Eutrophication

HNO₃ from question (a) leads to nitrates being deposited in lakes and estuaries.

4. a) When cars produce NO₂ from the air, is the reaction endothermic?

Yes the air absorbs heat from burning gasoline to react and form NO₂.

- b) How many moles of N₂ must react to produce 1.0 mole of NO₂? (Write a balanced reaction before proceeding and respect your grandmother and significant figures.)



$$1.0 \text{ mole of NO}_2 \left(\frac{1 \text{ mole of N}_2}{2 \text{ mole of NO}_2} \right) = 0.5 \text{ moles of N}_2.$$

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5. What two human activities cause PM_{2.5} to accumulate?

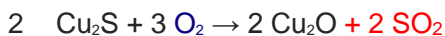
Driving gasoline-powered vehicles and heavy fertilization

6. What was done to reduce SO₂ pollution levels in Canada?

Smokestacks installed scrubbers(filters) to convert the SO₂ into a compound used for drywall.

7. A large amount of SO₂ is produced from the roasting of nickel ore:

Complete the equation and calculate how many kg of SO₂ are produced from the roasting of every 1.00 kg of Cu₂S .



$$1.0 \times 10^3 \text{ g Cu}_2\text{S} \frac{\text{mole}}{2(63.5)+32.1 \text{ g}} = 6.285 \dots \text{ moles Cu}_2\text{S}$$

$$6.285 \dots \text{ moles Cu}_2\text{S} \frac{2 \text{ mole SO}_2}{2 \text{ moles Cu}_2\text{S}} = 6.285 \dots \text{ moles SO}_2$$

$$6.285 \dots \text{ moles SO}_2 \frac{32.1+2(16.0)\text{g}}{\text{mole}} = 403 \text{ g SO}_2$$

8. How does acid form from SO₂?

It first oxidizes to form SO₃ and then



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9. Show how Cl from freons destroys ozone.



Or you could just say that they react with ozone in such a way that the Cl itself is recycled so that it's free to destroy more afterwards.



10. Where on Earth is the largest ozone hole?

In Antarctica

11. Redheaded, freckled people have the highest risk for developing which disease, especially if there is less ozone in the stratosphere?

Skin cancer