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| Microscale Chemistry |
| The chemistry of nitrogen dioxide |

**Introduction**

Nitrogen dioxide is a common atmospheric pollutant, produced by the burning of nitrogen containing fossil fuels, especially diesel.

It is extremely irritating to the lungs (especially for asthmatics) and should normally be handled only in a fume cupboard. In this experiment, however, the very small amounts produced are contained within the petri dish, thus limiting exposure.

**Health & Safety**

* Wear eye protection.
* Do not add more than the stated amount of sodium/potassium nitrite and do not remove the lid and smell the gas.
* Sulphur dioxide gas is toxic and corrosive – work in a well-ventilated area

Although we can detect the gas by our sense of smell, the ammonia levels will be below the Short Term Exposure Level.

Ensure that the sulphur dioxide water is (fairly) freshly prepared.

**You will need**

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| 1 x petri dish | 0.5 M sulphuric acid |
| Universal indicator solution | Potassium manganate(VII) solution |
| Potassium bromide 0.1 M | Potassium iodide 0.1 M |
| Iron(II) sulphate solution, 0.1 M | Barium chloride solution, 0.1 M |
| Sodium or potassium nitrate(II) (nitrite) solid | SO2 water – bubble SO2 through distilled water (in a fume cupboard) |
| 1 cm3 Pasteur pipettes | tweezers |
| Laminated reaction sheet – or non laminated inside a plastic wallet. | Small watch glass or ‘blister’ from tablet pack |

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|  | **Nitrogen dioxide chemistry** |
|  | **Wear eye protection. Work in a well-ventilated lab.*** If not already laminated, place this sheet in a plastic wallet/folder.
* Place a 9 cm diameter Petri dish on the thick (blue) line circle (left). Remove lid.
* Place the test solutions/papers in the Petri dish in the numbered positions, **1 – 7**, as described below.
* Also place 1-2 drops of solutions **1**-**7** in the matching outer-ring circles (i.e. outside the Petri dish) - you will then be able to compare with those inside the Petri dish to see what effect the nitrogen dioxide has.
	1. Universal indicator solution
	2. Potassium permanganate.
	3. Potassium bromide (4 drops).
	4. Potassium iodide, 0.1 M (4 drops)
	5. Iron(II) salt solution, 0.1 M (4 drops)
	6. Barium chloride solution, 0.1 M (4 drops)
	7. Barium chloride solution 0.1 M (4 drops) + SO2 water, (1 drop)
* Place an empty ‘reaction vessel’ (eg,) in the ‘RV’ circle.
* To generate nitrogen dioxide gas (TOXIC): use tweezers to place a few grains of sodium (or potassium) nitrate III (nitrite) in the gas generator).Add 0.5 cm3 (approximately 10 drops) of 0.5M sulphuric acid to the reaction vessel. **Immediately place the lid on the Petri dish**.
* Watch carefully and record your observations over the next 5-10 minutes (eg, *take photographs*).
* Explain as much of the chemistry going on in the Petri dish as you can.
* **Disposal**: put petri dish in a bowl of water. Wash solution to waste with cold running water.
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