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Chemicals (cold pack practical): I would like use the following chemicals for a cold pack prac: ammonium chloride, ammonium nitrate, magnesium sulfate and sodium thiosulfate.

Are these available? Are there particular safety issues?

**Voting:**



No votes yet

**Publication Date:** 26 September 2015

**Asked By:** Anonymous

Tags

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## chemicals

Submitted by [Science ASSIST ...](#) on Thu, 2015-10-08 00:57

Expert Answer

Chemical/salt solids which undergo endothermic reaction with water are suitable to use in a “cold pack making” investigation. The overall process becomes endothermic when heat is absorbed from surroundings to break up the lattice structures of these salts into individual ions when dissolved in water.

The four inorganic salts mentioned, namely: ammonium chloride, ammonium nitrate, magnesium sulfate and sodium thiosulfate do produce endothermic reactions with water and are listed in Science ASSIST’s [list of recommended chemicals for use in science in Australian schools](#).

### Availability:

Ammonium chloride, magnesium sulfate and sodium thiosulfate are available for purchase from any laboratory chemicals supplier.

### Ammonium nitrate

“Solid ammonium nitrate is a chemical of security concern and is subject to state and territory regulations. It may require a licence to purchase and store depending on the legislation in your jurisdiction. Solutions of ammonium nitrate are permitted in all jurisdictions. Schools in New South Wales, Victoria, Western Australia and Queensland do not require a licence to store, handle or use up to 3 kg of ammonium nitrate. Schools in Tasmania can apply for an exemption for a licence to store up to 3kg of ammonium nitrate. Schools in South Australia and Australian Capital Territory require a licence to store any amount of solid ammonium nitrate. An End User Declaration may also need to be completed before purchase of ammonium nitrate.”<sup>1</sup>

### Safety Issues

Before handling any chemical, the Safety Data Sheets (SDSs) must be consulted.

Science ASSIST recommends

- conducting a site-specific risk assessment before undertaking this activity. We have published an ASSIST information sheet [AIS: Risk management and risk assessment](#),<sup>2</sup> which offers an instructional guide on how to carry out and document a risk assessment using the [Science ASSIST risk assessment template](#).<sup>3</sup>
- that you store and dispose of these chemicals in accordance with the information in the Safety Data Sheet (SDS) from the manufacturer.
- Work with minimum possible quantities of chemicals to keep risks and exposure at low levels. Following is some brief hazard and safety information on the chemicals discussed.

Please refer to individual SDSs for detailed information on each chemical.

- **Ammonium chloride:** Acute toxicity (Category 4). Not classified as a dangerous good. Causes serious eye irritation. This product is hygroscopic. Keep container tightly closed. Incompatible with oxidising agents and as such must be stored away from them.<sup>4</sup>
- **Ammonium nitrate:** Oxidising solid (Category 3). Classified as a dangerous good class 5.1. Causes serious eye irritation. Harmful to aquatic environment. May intensify fires. Store with other oxidising agents away and separate from other groups of chemicals. This product is hygroscopic. Keep container tightly closed.<sup>5</sup>
- **Magnesium sulfate:** Non-hazardous substance according to GHS. Not classified as a dangerous good. Dust may cause minor skin irritation.<sup>6</sup>
- **Sodium thiosulfate:** Non-hazardous substance according to GHS. Not classified as a dangerous good. Can cause mild irritations (skin/eyes/respiratory). Should handle with caution.<sup>7</sup>

It is recommended that the following PPE is worn for all of the above chemicals: wear safety glasses, laboratory coat and nitrile gloves and ensure that work is always conducted in a well-ventilated area.

### Alternative to ammonium nitrate

Science ASSIST suggests substitution of ammonium nitrate with the less hazardous chemical Urea.<sup>8</sup> This product can be purchased from any laboratory chemical supplier.

For example, Vernier have developed An Investigation of Urea-Containing Cold Packs.<sup>9</sup>

### References

1 Science ASSIST. (2018). *Chemical Management Handbook for Australian Schools – Edition 3*, Retrieved from the Science ASSIST website: <https://assist.asta.edu.au/resource/4193/chemical-management-handbook-au...>

2 Science ASSIST. (2015). *AIS: Risk Management and risk assessment*, Retrieved from the Science ASSIST website: <http://assist.asta.edu.au/resource/3079/ais-risk-management-and-risk-ass...>

3 Science ASSIST. (2018). *Risk Assessment Template*, Retrieved from the Science ASSIST website: <http://assist.asta.edu.au/resource/2298/risk-assessment-template>

4 Sigma-Aldrich. (2021). *Ammonium chloride*, Safety Data Sheet. Search <https://www.sigmaaldrich.com/australia.html> to source the latest Safety Data Sheet via the product information page.

5 Sigma-Aldrich. (2022). *Ammonium nitrate*, Safety Data Sheet. Search <https://www.sigmaaldrich.com/australia.html> to source the latest Safety Data Sheet via the product information page.

6 Chem Supply website, (2019). *Magnesium sulfate*, Safety Data Sheet. Search <https://www.chemsupply.com.au/> to source the latest Safety Data Sheet via the product information page.

7 Chem Supply website, (2022) *Sodium thiosulfate*, Safety Data Sheet. Search <https://www.chemsupply.com.au/> to source the latest Safety Data Sheet via the product information page.

8 Chem Supply website, (2019) *Urea*, Safety Data Sheet. Search <https://www.chemsupply.com.au/> to source the latest Safety Data Sheet via the product information page.

9 Vernier Science Education. (nd) *An Investigation of Urea-Containing Cold Packs*, Retrieved (22 February 2023) from the Vernier Science Education website: [https://www.vernier.com/experiment/chem-i-3\\_an-investigation-of-urea-con...](https://www.vernier.com/experiment/chem-i-3_an-investigation-of-urea-con...)

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