



Learning notes

For teachers

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Reversible reactions and dynamic equilibria

Main Article: [De-carbonising Ammonia: alternatives to the Haber Bosch process?](#)

The production of ammonia, as explained in this article, is an important example of a reversible reaction that is used in creating fertilisers. But what is a 'dynamic' equilibrium and how can we explain and model what happens in one? Plus how else can we reduce the environmental impact of ammonia by using it more wisely? The following activities look into the answers to these questions.

Learning Task:

Watch the following video that tries to model a dynamic equilibrium. Think about and answer the following questions.

What does the word dynamic mean in this case? How does it show what happens in a reversible reaction?

Are there any problems with the model used? Are there any situations where it might not show what is happening in a reaction?

[Using Video to Illustrate Dynamic Equilibria](#)
suitable for home teaching

Take your learning further:

As well as making ammonia in the 'greenest' process we can, we also need to make sure we apply the best fertiliser in the most efficient way possible so it isn't wasted. Read the following slides that outline how we can use sensors to do this and then make a flow diagram that shows how the sensors work and how they are used to decide where to apply fertiliser in a large field.

[Farms, Sensors and Satellites](#)

Take your learning further still:

What sort of careers could you have if specialising in crop protection and how could you help solve global problems in your job? The following videos give an idea what is involved in the role of a research scientist in this area.

[Faces of chemistry: crop protection](#)

To find out more:

The following resources are available to extend the learning covered by this learning note and the article.

Manufacturing Ammonia - This resource, from the Royal Society of Chemistry 'Challenging Plants' resource pack, is a teacher presentation which provides background information on the industrial processes involved in the manufacture of ammonia. <https://www.stem.org.uk/rx346c>

Preparation of Ammonium Sulfate - This activity provides an opportunity to prepare a salt which can be used as a fertiliser as an alternative to the preparation of an inorganic salt such as copper (II) sulfate. www.stem.org.uk/rx347g

Making a Fertiliser - In this experiment, students prepare a sample of ammonium sulphate. The ammonium sulphate, an effective fertiliser, is crystallised and dried. Curriculum links include: ammonia, the Haber process, the nitrogen cycle, industrial chemistry, fertilisers. www.stem.org.uk/rx334k

The Properties of Ammonia - In this classic experiment, students heat calcium hydroxide and ammonium chloride in order to produce ammonia. The ammonia produced is tested for pH and solubility in water. Curriculum links include: acids and alkalis, pH, solubility of gasses, Haber process. www.stem.org.uk/rx332n