

# AS LEVEL CHEMISTRY B (SALTERS)

## Lesson Element

### Nitrogen chemistry tarsia puzzle

#### *Instructions and answers for teachers*

##### Introduction

This resource is a puzzle that learners can use to consolidate and revise various areas of chemistry in the context of nitrogen compounds. This resource is designed to be used during the teaching of *The chemical industry*, and requires knowledge of the tests for nitrate(V) and ammonium ions. The remaining understanding required relates to learning outcomes from the first year of the Chemistry B (Salters) course, although learners will find it easier to complete the task once the nitrogen chemistry content in *The chemical industry* has been fully taught.

This resource could be used as:

- an activation task early on in teaching *The chemical industry*, to activate learners' prior understanding of oxidation numbers, bonding, etc.
- a consolidation task at the end of *The chemical industry*
- a revision task during exam preparation.

##### **The Activity:**

Print/copy the puzzle template page of this resource onto the required number of sheets of card. Cut out the individual squares from each sheet and mix them up.

Give a set of cards to learners in small groups or individually, and ask them to pair up the question and answer sides on the squares.

When laid correctly, the squares will form a 3 × 4 rectangle as shown on the answer sheet (blank sides are a clue to the sides of the rectangle).

You could subsequently extend the activity by using some of the questions on the card as the basis for further questions. For example: 'Name a species in which nitrogen has the oxidation number -4'.

##### **Learning outcomes**

This resource relates to the following specification learning outcomes:

EL(i), EL(m), EL(o), EL(t), ES(e), ES(g), Cl(j)



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## Answer

$\text{NH}_4^+ + \text{OH}^-$ Formula for the ammonium ion	$\text{NH}_4^+$ Test for ammonium ions	$\text{NH}_3$ Highest oxidation number nitrogen can achieve
$\text{NO}_2$ Lowest oxidation number nitrogen can achieve	$-4$ Warm with Devarda's alloy and NaOH, test for ammonia with litmus	$+5$ Oxidation number of nitrogen in ammonia Formula for nitrate(I) ion
$\text{N}_2\text{O}$ Formula for nitrogen(IV) oxide	$+4$ Number of electrons in the outer shell of a nitrogen atom Test for nitrate(V) ion	$+2$ $-\text{ON}$ Highest number of covalent bonds a nitrogen atom can form (including dative)
$\text{NO}_2^-$ Formula for nitrogen(I) oxide	$\text{NO}_3^-$ Formula for nitrate(III) ion Oxidation number of nitrogen in $\text{N}_2\text{O}_4$	Oxidation number of nitrogen in nitrogen monoxide Formula for nitrate(V) ion



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## Puzzle template

<p><math>\text{NH}_4^+ + \text{OH}^-</math></p> <p>Formula for the ammonium ion</p>	<p><math>\text{NH}_4^+</math></p> <p>Test for ammonium ions</p> <p>Formula for ammonia</p>	<p><math>\text{NH}_3</math></p> <p>Highest oxidation number nitrogen can achieve</p>
<p><math>\text{NO}_2</math></p> <p>Lowest oxidation number nitrogen can achieve</p> <p>Products of the reaction between ammonia and water</p>	<p><math>-4</math></p> <p>Warm with Devarda's alloy and NaOH, test for ammonia with litmus</p> <p><math>-3</math></p> <p>Warm with NaOH, test for ammonia with litmus</p>	<p><math>+5</math></p> <p>Oxidation number of nitrogen in ammonia</p> <p>Formula for nitrate(I) ion</p>
<p><math>\text{N}_2\text{O}</math></p> <p>Formula for nitrogen(IV) oxide</p> <p>5</p>	<p><math>+4</math></p> <p>Test for nitrate(V) ion</p> <p>Number of electrons in the outer shell of a nitrogen atom</p> <p>4</p>	<p><math>-2</math></p> <p>Highest number of covalent bonds a nitrogen atom can form (including dative)</p> <p><math>+2</math></p>
<p><math>\text{NO}_2^-</math></p> <p>Formula for nitrogen(I) oxide</p>	<p><math>\text{NO}_3^-</math></p> <p>Oxidation number of nitrogen in <math>\text{N}_2\text{O}_4</math></p> <p>Formula for nitrate(III) ion</p>	<p>Oxidation number of nitrogen in nitrogen monoxide</p> <p>Formula for nitrate(V) ion</p>



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