Non-redox reactions

Lesson plan and teacher's notes · Form 2 Chemistry · 1 period of 40 minutes

School	(write school name)	**Teacher**	(write name)
Date	(date)	**Class**	Form 2
Subject	Chemistry	**Enrolment**	Boys ___ Girls ___ Total ___
Time	40 minutes	**Topic**	Non-redox reactions

Learners say what a non-redox reaction is, give examples (neutralisation and double displacement), justify that a reaction is non-redox using oxidation numbers and electron transfer, and present their findings to the class. Examples use hydrochloric acid with sodium hydroxide and silver nitrate with sodium chloride.

Specific outcomes

By the end of the lesson, learners should be able to:

1. Say what a non-redox reaction is
2. Give examples of non-redox reactions
3. Justify why a reaction is non-redox using oxidation numbers and electron transfer
4. Present findings to the class

Prior knowledge

- Oxidation and reduction
- Oxidation numbers of elements
- Acids, alkalis and salts

Teaching and learning materials

- chalk and board
- exercise books
- reactions written on the board or on cards

References

Ministry of Education (CDC) Form 2 Chemistry syllabus and module; 25Schools learners' note: Non-redox reactions.

Lesson development

Stage and time	Teacher activities	Learner activities
Introduction 5 min	Remind learners that some reactions involve electrons moving from one substance to another and are called redox reactions, and that many others do not. Write the title and key words.	Recall redox reactions and copy the title and key words.
Development: what a non-redox reaction is 10 min	Explain that in a non-redox reaction the oxidation numbers do not change and no electrons are transferred. Explain that if nothing is oxidised and nothing is reduced the reaction is non-redox.	Copy the definition and the two conditions.
Development: examples 8 min	Describe neutralisation reactions and double displacement reactions with hydrochloric acid and sodium hydroxide, and silver nitrate with sodium chloride.	Write the two reactions as word and symbol equations and name their types.
Development: justifying 10 min	Show the three points for a justification: write the reaction, state that oxidation numbers are the same before and after, and state that no electrons are transferred. Work the example of HCl and NaOH.	Write a justification for the silver nitrate reaction in pairs.
Conclusion 7 min	Ask groups to present one non-redox reaction to the class. Set the homework.	Present and copy the homework.

Teacher's content notes

Read these before the lesson. They are what you need to know, not what to copy onto the board.

What is a non-redox reaction

A non-redox reaction is a chemical reaction in which two things do not happen. First, the oxidation numbers of the elements do not change. Second, no electrons are transferred from one substance to another.

Using oxidation and reduction

To decide whether a reaction is redox or non-redox, use what you know about oxidation and reduction. If nothing is oxidised and nothing is reduced, the reaction is non-redox.

Neutralisation reactions

In a neutralisation reaction an acid reacts with an alkali to form a salt and water. An example is hydrochloric acid with sodium hydroxide to give sodium chloride and water.

Double displacement reactions

In a double displacement reaction two compounds swap partners. An example is silver nitrate reacting with sodium chloride to give silver chloride and sodium nitrate.

Justifying a non-redox reaction

Write down the reaction, state that the oxidation numbers of the elements are the same before and after, and state that no electrons are transferred. A good justification uses these two points together.

Questions to ask during the lesson

Question	Expected answer
A learner at a school near Feira says that all chemical reactions involve electrons moving from one substance to another. (a) Do you agree. (b) Name the reactions where this happens. (c) Say what the reactions without this movement are called.	(a) No. (b) Redox reactions. (c) Non-redox reactions.
A teacher near Feira writes HCl + NaOH gives NaCl + H2O on the board and asks what kind of reaction it is. (a) Name the type. (b) Name the acid and the alkali. (c) Name the salt formed.	(a) A neutralisation reaction. (b) Hydrochloric acid and sodium hydroxide. (c) Sodium chloride.
A group in a laboratory mixes silver nitrate with sodium chloride and says two compounds have swapped partners. (a) Name the type of reaction. (b) Name the two new compounds. (c) Say what is true of the oxidation numbers.	(a) A double displacement reaction. (b) Silver chloride and sodium nitrate. (c) They are the same before and after.

Worked examples for the board

Show that HCl + NaOH gives NaCl + H2O is non-redox

The reaction is a neutralisation reaction between an acid and an alkali. The oxidation numbers of the elements are the same before and after the reaction. No electrons are transferred from one substance to another. So it is a non-redox reaction.

Show that AgNO3 + NaCl gives AgCl + NaNO3 is non-redox

The reaction is a double displacement reaction because the two compounds swap partners. The oxidation numbers of the elements are the same before and after. No electrons are transferred. So it is a non-redox reaction.

Board plan

Write the title and key words. Left: the two conditions for a non-redox reaction. Centre: the two examples as equations. Right: the three-step justification.

Kind of reaction	Example	Products
Neutralisation	Hydrochloric acid with sodium hydroxide	Sodium chloride and water
Double displacement	Silver nitrate with sodium chloride	Silver chloride and sodium nitrate

Examples of non-redox reactions

Mistakes to expect

Learners often think	Put it right
All chemical reactions involve electrons moving between substances.	Some reactions involve electrons moving and are redox reactions, but many others involve no such movement and are non-redox.
A reaction between an acid and an alkali is a redox reaction.	It is a neutralisation reaction. The oxidation numbers do not change and no electrons are transferred, so it is non-redox.
Oxidation numbers change in a non-redox reaction.	In a non-redox reaction the oxidation numbers are the same before and after the reaction.
Writing only the equation is enough to justify a non-redox reaction.	A good justification states both that the oxidation numbers are the same before and after and that no electrons are transferred.

Differentiation

Learners who struggle

Give learners a card with the sentence frame: the oxidation numbers are the same before and after, and no electrons are transferred, so it is non-redox. Let them fill in the reaction and its type.

Learners who finish early

Ask learners who finish early to write their own justification for a double displacement reaction and present it to a partner.

Hearing or visual impairment

For learners with visual impairment, read the equations aloud and ask them to say the justification orally. For learners with hearing impairment, write each key word and each justification point on the board.

No projector, no printing

Write the two reactions and the justification frame on the board. Learners work from their exercise books with no equipment.

If time is short

Skip the group presentations and work only the two worked examples; set the justification of silver nitrate with sodium chloride as homework.

Evaluation

Question or task	A correct answer shows
A learner at a school near Feira mixes hydrochloric acid with sodium hydroxide solution and says it is a redox reaction. (a) Do you agree. (b) Name the type of reaction it is. (c) Justify your answer using oxidation numbers and electrons.	(a) No. (b) A neutralisation reaction. (c) The oxidation numbers do not change and no electrons are transferred, so it is non-redox.
A group is told to present one non-redox reaction to the class and chooses silver nitrate with sodium chloride. (a) Write the reaction in words. (b) Name its type. (c) Explain how they should justify that it is non-redox.	(a) Silver nitrate and sodium chloride give silver chloride and sodium nitrate. (b) A double displacement reaction. (c) State that the oxidation numbers are the same before and after and that no electrons are transferred.
A teacher near Feira asks a learner what is needed to show that a reaction is non-redox when nothing is oxidised and nothing is reduced. (a) State the two things that do not happen. (b) Say what is true of the oxidation numbers. (c) Say what a good justification must include.	(a) The oxidation numbers do not change and no electrons are transferred. (b) They are the same before and after. (c) Both points together.

Homework

A learner at a school near Feira is asked to show that the reaction of silver nitrate with sodium chloride to give silver chloride and sodium nitrate is non-redox. (a) Name the type of reaction. (b) State what is true of the oxidation numbers. (c) State what is true of electrons.

Extra practice with answers

Question	Answer
1. A learner at a school near Feira mixes hydrochloric acid with sodium hydroxide solution and says it is a redox reaction. (a) Do you agree. (b) Name the type of reaction it is. (c) Justify your answer using oxidation numbers and electrons.	(a) No. (b) A neutralisation reaction. (c) The oxidation numbers do not change and no electrons are transferred, so it is non-redox.
2. A group is told to present one non-redox reaction to the class and chooses silver nitrate with sodium chloride. (a) Write the reaction in words. (b) Name its type. (c) Explain how they should justify that it is non-redox.	(a) Silver nitrate and sodium chloride give silver chloride and sodium nitrate. (b) A double displacement reaction. (c) State that the oxidation numbers are the same before and after and that no electrons are transferred.

3. A learner near Feira says that in a reaction nothing is oxidised and nothing is reduced and asks what that means for the reaction. (a) Is the reaction redox or non-redox. (b) What is true of the oxidation numbers. (c) What is true of electron transfer.	(a) Non-redox. (b) They are the same before and after. (c) No electrons are transferred.
4. A teacher at a school near Feira asks a learner to give one example of a neutralisation reaction and one of a double displacement reaction. (a) Give the neutralisation example. (b) Give the double displacement example. (c) Say why both are non-redox.	(a) HCl + NaOH gives NaCl + H2O. (b) AgNO3 + NaCl gives AgCl + NaNO3. (c) The oxidation numbers do not change and no electrons are transferred.

Answers to the learners' check-yourself questions

1. What is a non-redox reaction?
   A reaction with no change in oxidation numbers and no transfer of electrons.
2. Give one example of a neutralisation reaction.
   HCl + NaOH gives NaCl + H2O.
3. Give one example of a double displacement reaction.
   AgNO3 + NaCl gives AgCl + NaNO3.
4. What happens to oxidation numbers in a non-redox reaction?
   They stay the same before and after the reaction.
5. Are electrons transferred in a non-redox reaction?
   No.
6. A learner at a school near Feira mixes hydrochloric acid with sodium hydroxide solution and says it is a redox reaction. (a) Do you agree? (b) Name the type of reaction it is. (c) Justify your answer using oxidation numbers and electrons.
   (a) No. (b) A neutralisation reaction. (c) The oxidation numbers do not change and no electrons are transferred, so it is non-redox.
7. A group is told to present one non-redox reaction to the class. They choose silver nitrate with sodium chloride. (a) Write the reaction in words. (b) Name its type. (c) Explain how they should justify that it is non-redox.
   (a) Silver nitrate and sodium chloride give silver chloride and sodium nitrate. (b) A double displacement reaction. (c) They should state that the oxidation numbers are the same before and after and that no electrons are transferred.

Teacher's reflection

What went well:

What I will change next time:

Learners who need follow-up: