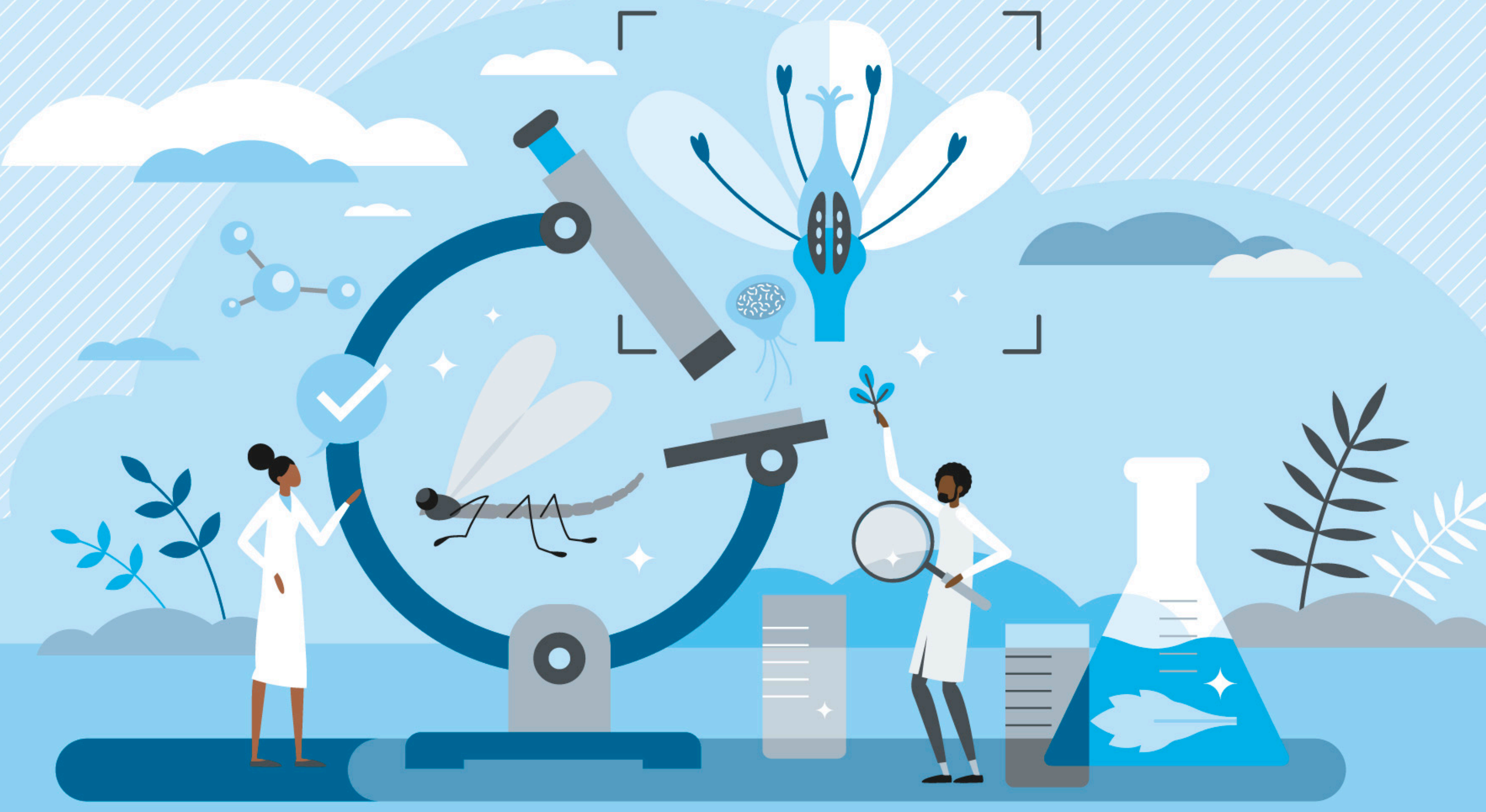
PARTICIPANT'S HANDOUT

2019 TRAINING WORKSHOP NO.2

NATURAL SCIENCES



GRADES 8-9

PILO

IMPROVING LEARNER PERFORMANCE

education

Department:
Education
PROVINCE OF KWAZULU-NATAL

Grades 8 & 9
Just-in-Time Training Workshop
2019: No. 2

Participants' Handout

Natural Sciences

Jika iMfundo
what I do matters

Endorsed by:

SADTU

NAPTOSA

NATU

NS Grade 8 and 9: JiT 2019 No 2

Participants' handout

The purpose of the workshop is twofold:

1. To consider the development of the concepts of elements; atomic structure; bonding; chemical change and balancing chemical equations. Representations of elements; atomic structure; bonding; chemical change and chemical equations will be discussed.
2. To review the experiments and investigations that are conducted during Grades Eight and Nine.

Session focus and activities	**Time**	**Resources** Only those in addition to handouts are noted for the activities; ideally each participant should have a copy of the CAPS document for Grades Eight and Nine
Introduction		
• Welcome • Introductions • Purpose of workshop and • programme overview • Pre-workshop activity	30 min	Participants' handout Resources handouts (includes a periodic table) Pre-workshop activty handout Register etc
SESSION 1: Elements and atomic structure Models of atoms and compounds CAPS pp 40; 41; 83;		
Activity 1: The Periodic Table and me CAPS p 63	30 min	
Activity 2: A model of an atom of an element CAPS pp. 40-41	10 min	Lentils or beads of different colours; presstick; 20 paper plates; cards with the names of the first 10 elements, placed in a box/packet
Actiivty 3: A different model of an atom CAPS	10 min	5 spheres of different colours and sizes per group
Activity 4: Another type of model	20 min	30 Styrofoam balls; toothpicks; beads; periodic table
Activity 5: Electrons are the key	20 min	Model from Activity 2
Actiivty 6: Ion formation	20 min	Pen or pencil, Periodic Table; pages 5 and 6 of the Resources Hand-out;
Activity 7: A further abstraction	20 min	Lentils or beads of different colours; prestik; paper plate; playdough or plasticine
Activity 8: More than one atom – without gaining or losing electrons	10 min	Periodic table; play dough or plasticine
Activity 9: Putting it all together	20 min	Periodic table; writing materials.
Sesion 2: Ways of conducting practical work in Chemistry		
Activity 10: Electrolysis of Copper (II) Chloride using the micro scale kit CAPS p. 41	20 min	1 x comboplate®; 1 x 9V battery; 2 x strips aluminium foil - 3 cm x 15 cm (or 2 x connecting wires with crocodile clips);

		1 x graphite pencil or 2 x graphite rods (approximately 2 mm x 5 cm); 2 x plastic coated paper clips (optional); *prestik*. Copper (II) chloride solution [1 M]; Indicator paper; Tap water.
Activity 11: The Preparation and Testing of Oxygen CAPS p.41	10 min	1 x glass container possibly with lid; 1 x plastic spoon; 1 x syringe; 1 x box of matches; 1 x toothpick splint. Manganese dioxide powder OR fresh liver; Fresh hydrogen peroxide solution [10 %];
Activity 12: Set up microscale apparatus for the preparation and testing of carbon dioxide. CAPS p.45	10 min	10 ml Calcium hydroxide; 1l water; 20 g magnesium carbonate; 10 ml dilute hydrochloric acid; droppers, syringes, drinking straws
Activity 13: Acids, alkalis and indicators CAPS p. 67	10 min	cabbage water; beetroot water; universal indicator; phenolphthalein indicator; 2 teabags; 100 ml 1M hydrochloric acid; 100 ml 1M sodium hydroxide; 20 droppers; 10 small test tubes; 20 plastic spoons;
Conclusion		
Post workshop activity Reflection on workshop Suggestions for Term 3	20 min	Post workshop activity handout
Total time	**5 hrs**	

INTRODUCTION

30 min

Welcome and introductions; distribution of materials

Orientation to the workshop – purposes

Pre-workshop activity

SESSION ONE: ELEMENTS AND ATOMIC STRUCTURE

Facilitator Input before Activity 1

Activity 1: The Periodic Table and Me CAPS p.63 (30 min)

Refer to the copy of the Periodic Table on page 1 of the Resources Pack and to the short research report on page 4 of the Resources Pack.

Brief discussion about how the periodic table is taught by you; by others; in schools that you know etc.

Facilitator Input after Activity 1

Facilitator Input before Activity 2

Activity 2: A model of an atom of an element CAPS pp. 41-42 (10 min)

You Need: periodic table**;** lentils of different colours; prestik; paper plate

(i) Refer to your periodic table

(ii) Select a card from the box. The card has the name of an element. This is your element until further notice.

(iii) Use the materials provided to construct a model of an atom of your element. Include protons, neutrons and electrons. Do not label your model with your name or the name of the element. Ensure that the model is secure and that the lentils or beads do not fall off

(iv) Exchange models with another participant.

(v) Use the periodic table to find out what element your neighbour chose.

THINK: How did you find out the name of your neighbour's element?

Facilitator Input after Activity 2

Facilitator Input before Activity 3

Activity 3: A different model of an atom CAPS pp. 41-42 and 63-64 (10 min)

You are provided with four spheres of different colours and sizes. They represent the elements Beryllium; Strontium; Calcium and Radium. They were labelled but the labels have gone missing.

What to do:

(i) Refer to the periodic table and use your own insight to find out which sphere represents an atom of each of these elements. Write your answers below:

Colour 1	Colour 2
Colour 3	Colour 4

(ii) Explain how you determined the identities of the atoms.

Facilitator input after activity 3

Facilitator input before Activity 4

Activity 4 : Yet another type of model – Ball and Stick CAPS pp.63-64 (20 min)

You need: Styrofoam balls of two different sizes, one large and one or more smaller; toothpicks; periodic table

What to do:

(i) Refer to your model from Activity 2

(ii) **Focus on the outermost shell of the atom only**

(iii) Construct a simple model of the atom you are working with. Use the toothpick to attach the spheres to each other.

(iv) Let the larger sphere *represent* the atom with electrons **except** the outer shell and the smaller one/s should *represent* the atom/s in the outer shell. For example, such a model of Lithium would look like:

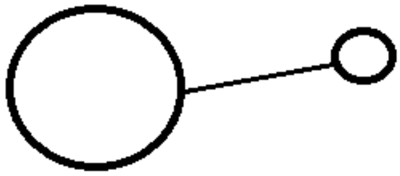


Figure 1: Representation of Lithium atom with outer electron shell

(v) Make a diagram of the atom you have constructed.

Facilitator input after Activity 4

Facilitator input before Activity 5

Activity 5: Electrons are the key! CAPS pp. 64 (20 min)

Background: Earlier on, you constructed models of atoms which represented protons, neutrons and electrons. Go back to that model. Look carefully at the electrons. The placing of electrons follows certain 'rules'.

[1]***For our purposes***, let's say that the shell of electrons closest to the nucleus can hold 2 electrons. Shells further away from the nucleus can hold 8 electrons.

You need: The questions below and the model that you made in Activity 2.

(i) Is your outermost electron shell full, half, full or almost full?

(ii) What do you think is the ***easiest*** thing that could happen to make an outermost shell full?

(iii) Discuss this with your neighbour for a short time.

(iv) Look again at the drawings of atoms of elements on Page 2 of the Resource Pack. Write beside each atom the words 'can gain'; 'can lose'; 'cannot gain or lose'; 'can gain or lose' and any other comments you want to make.

Construct sentences about some of the elements like this:
Use the words gain, lose, very, quite in your sentences.

Sodium can ....electrons ....easily

Chlorine can ....electrons ....easily

Lithium can ....electrons ....easily

Magnesium can ....electrons ....easily

Facilitator input after activity 5

[1] Remember that at this stage we are dealing with the first 20 elements only.

Facilitator input before Activity 6

Activity 6: Ion Formation CAPS p.65 (20 min)

You need; Pen or pencil, Periodic Table; pages 5 and 6 of the Resources Hand-out; a partner.

What to do:

(i) Refer to pages 5 and 6 of the Resources Hand-out which shows representations of atoms forming ions.

(ii) **Left hand column (Atoms)**

You will notice that all electrons have been filled in for sodium and chlorine.

Complete the column by filling in all the missing electrons for the remaining elements. If necessary, refer again to the Periodic Table

(iii) **Right hand column (Ions)**

You will notice that the diagram shows that sodium has ***lost*** an electron and that chlorine has ***gained*** an electron. The ***sodium ion*** and the ***chloride ion*** have been formed.

Using the drawings of the sodium and chloride ions, complete the right hand column of the table to show how the remaining elements have gained or lost electrons,

Remember that the gaining and losing of electrons is vital in the formation **of ionic compounds**.

Facilitator input after Activity 6

Facilitator input before Activity 7

Activity 7: A Further Abstraction CAPS pp.41-42 and 63-64 (20 min)

You need: periodic table; play dough or plasticine

What to do:

(i) **M**ake models of a lithium ion and a fluorine (fluoride) ion using the materials you have collected.

(ii) **Draw** these. You will see that we have moved from a model to a picture. Pictures are less time-consuming than models.

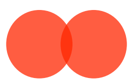
(iii) **Draw** the sodium and chlorine (chloride) ions together. What do you think will happen if positive sodium and negative chlorine meet?

(iv) **Draw** the reaction between magnesium and oxygen

Facilitator input after Activity 7

Facilitator input before Activity 8

Activity 8: More than one atom – without gaining or losing electrons (10 min)



CAPS p. 41

Work with a partner

You Need: periodic table**;** play dough or plasticine

What to do:

(i) Select the name of an element from the box.

(ii) Make two spheres of the same colour and shape to represent two atoms of the element

(iii) Push the two spheres together as shown above. You have made a model of a diatomic molecule. In your model, there are two atoms of the same kind.

(iv) In these cases, electrons are neither gained nor lost. Imagine the following situation where two (or two hundred or two thousand or two million) oxygen atoms meet. They need the outer electron shells filled. They can do this by gaining two electrons – but it is not logical to gain from each other!

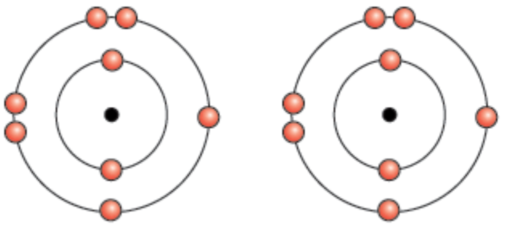


Figure 2: Two oxygen atoms

Instead of losing or gaining electrons, the atoms ***share*** electrons as shown below.

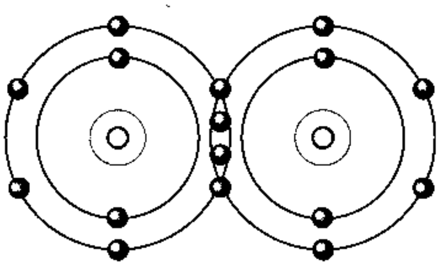


Figure 3: An oxygen molecule

(v) **Draw** the chlorine, fluorine, hydrogen and nitrogen molecules. To save time you should draw the outer electron shell only. These outermost electrons are the valence electrons. They are involved in compound formation

(vi) As a final simplification, you can think of atoms in the following way as well:
Represent hydrogen and metals with the 'arm' on the right side and non-metals with the 'arm 'on the left. In this way we can work out that all 'arms 'are partnered. Please remember that this is a ***gross*** simplification, but it helps people who are unfamiliar with chemistry to balance equations.

What do you think happens with Helium; Neon; Argon and others in that group?

They have full outer shells so . . .

Facilitator input after Activity 8

Activity 9: Putting it all together! CAPS pp. 63-65 (20 min)
By putting it all together, we mean using the ideas and models that we have just developed to help us balance equations. However, before you put it all together, check that you know the names and symbols of the first 20 elements of the periodic table and that you are familiar with the names of common compounds by conducting a quick check with the CAPS document pp. 63-69 and with each other.

Facilitator input before Activity 9

What to do:
Write balanced equations for the following reactions:
Sodium and chlorine react to form sodium chloride

Sodium and oxygen react to form sodium oxide

Magnesium and oxygen react to form magnesium oxide

Magnesium and chlorine react to form magnesium chloride

Lithium and fluorine react to form ....

Aluminium and oxygen react to form ....

Carbon and oxygen react to form ....

Nitrogen and oxygen react to form ....

Hydrogen and sulphur react to form ....

Facilitator input after Activity 9

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SESSION TWO: Ways of conducting practical activities

Activity 10: Electrolysis of Copper (II) Chloride using the micro scale kit (20 min)

What you need:

Apparatus: 1 x comboplate®; 1 x 9V battery; 2 x strips aluminium foil - 3 cm x 15 cm (or 2 x connecting wires with crocodile clips); 1 x graphite pencil or 2 x graphite rods (approximately 2 mm x 5 cm); 2 x plastic coated paper clips (optional); *prestik*.

Chemicals: Copper(II) chloride solution ($CuCl_2$ (aq)) [1 M]; Indicator paper; Tap water.

What to do:

Refer to Resource 3 on page 3 of the Resources Pack

1. Use a piece of prestik to stick the 9V battery to the comboplate®. This will prevent the battery moving around during the experiment so that the aluminium foil connectors are not pulled away from the electrodes.
2. Use the carbon rods to make two carbon electrodes.
3. Push one of the carbon electrodes into a large piece of prestik. Push the other electrode into the same piece of *prestik*. Make sure that the electrodes are far apart from one another so that they do not touch when placed into the copper chloride solution.
4. Use a clean dropper to fill about ¾ of one of the large wells of the comboplate® with the 1 M copper(II) chloride solution.
5. Place the carbon electrodes in the solution as shown in the diagram above. The electrodes do not need to be held in the upright position. They can rest at an angle against the wall of the large well.
6. Fold one of the strips of aluminium foil about three times to form a narrow but sturdy connector as shown in the diagram on page x. Fold the other aluminium foil strip in the same way.
7. Attach each one of the aluminium foil connectors to separate terminals of the battery. *Prestik* can be used to reinforce the connections to the battery. Alternatively, small crocodile clips can be used to make sure that the foil strips are properly connected to the battery terminals.
8. Connect the battery to the electrodes by attaching the aluminium foil strips from the terminals of the battery to separate carbon electrodes, as shown in the diagram. Small, plastic-coated paper clips can be used to attach the ends of each foil strip to the electrodes. This helps to prevent the foil from slipping off the electrodes during electrolysis.
9. After about one or two minutes, lift the comboplate® gently upwards towards your chin.

Do not inhale the fumes directly!

10. Moisten a small piece of indicator paper with tap water.
11. Hold one corner of the paper at the electrode where there is bubbling taking place.
12. Look closely at the other electrode in the solution and observe any changes taking place.
13. Allow the electrolysis to continue for another 5 to 10 minutes. Disconnect the foil from the electrode where no bubbling was observed.
14. Lift the electrode out of the copper (II) chloride solution and examine its appearance.

Discuss the advantages and disadvantages of using the micro scale kit.

Activity 11: The Preparation and Testing of Oxygen (10 min)

What you Need:

Apparatus: 1 x glass container possibly with lid; 1 x plastic spoon; 1 x syringe; 1 x box of matches; 1 x toothpick splint.

Chemicals: Manganese dioxide powder ($MnO_2(s)$) OR fresh liver; Fresh hydrogen peroxide solution ($H_2O_2(aq)$)[10 %];

What to do:

Work in pairs (Partner 1 and Partner 2)

1. Partner 1: Half-fill the glass container with hydrogen peroxide. Partner 2: Prepare a glowing splint
2. Add MnO_2 OR [2]***fresh liver*** to the container.
3. Wait for bubbles to occur.
4. Hold the glowing portion of the splint just above the open end of the container
5. Observe what happens
6. Extend this investigation with oxygen and other materials such as magnesium ribbon, carbon and sulphur.

Note

If you use the micro scale kit, you can use the diagram below to help you set up your apparatus

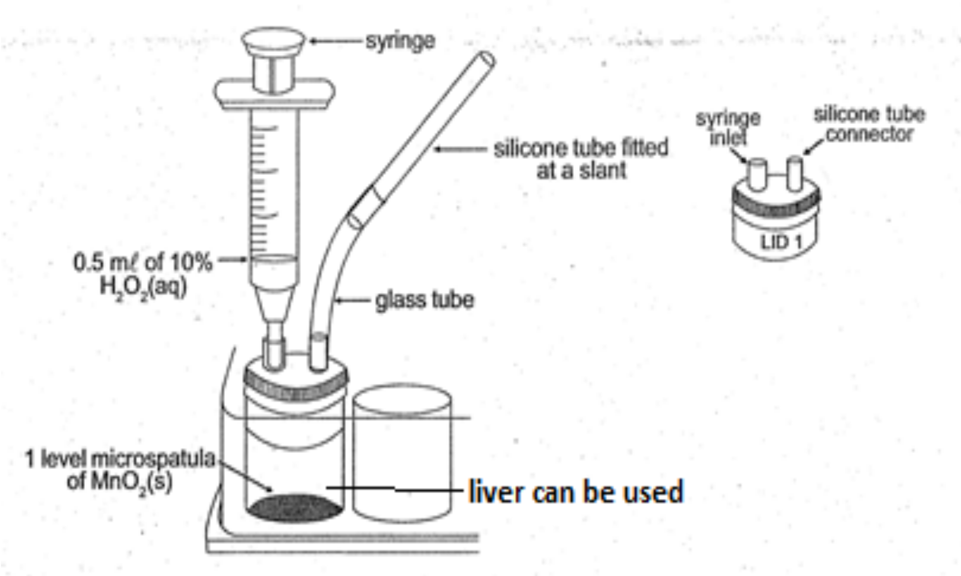

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Figure 4: Preparation of oxygen using the micro scale kit

Possible Questions

Q1. Write a balanced chemical equation to represent the reaction which decomposes hydrogen peroxide.

Q2. What is the role of the manganese dioxide or the liver in this experiment

Q3.Oxygen is often stored in large tanks for use in places like laboratories and hospitals. Why do you think these tanks have warnings for people not to smoke near them ?

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[2] Animal and plant material both contain an enzyme which calalyses the decomposition of hydrogen peroxide to water and oxygen. Liver is one of the best sources of this enzyme.

Activity 12: Use the micro scale kit to set up your own equipment for the preparation and testing of carbon dioxide. Conduct the investigation. (10 min)

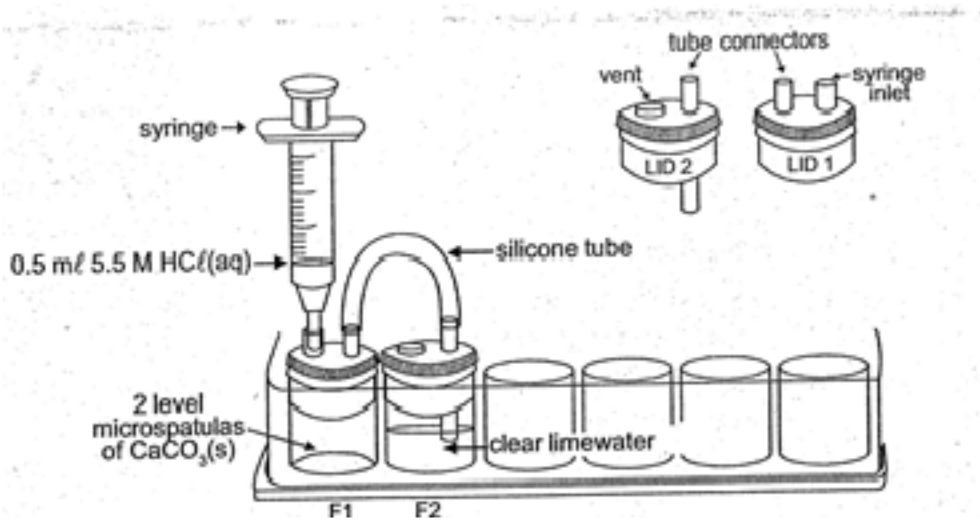

Figure 5: Preparation of carbon dioxide using the micro scale kit

If you do not have a micro scale kit or other conventional apparatus, you can use other equipment such as glass jars. If you hold the glass jars / bottles / drinking glasses as shown below, the carbon dioxide will sink downwards into the lime water solution in tube B.

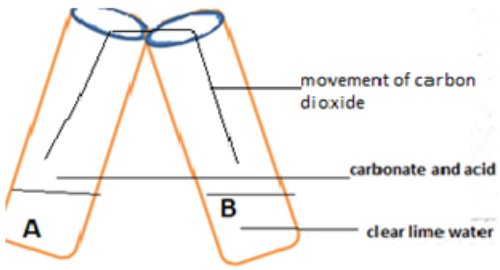

Figure 6: Preparation and testing of carbon dioxide

Facilitator input after Activity 12

Facilitator input before Activity 13

Activity 13: Acids, alkalis and indicators CAPS pp. 67 and 70 (10 min)
In the absence of apparatus, as previously stated, some investigations can still be conducted. Refer to page 7 of the Resource Pack for ideas.

CONCLUSION (20 min)
Key concepts
Post workshop activity
Reflection on workshop
Suggestions for workshop for Term 3