Practical ideas for 6e Physics and Chemistry

Engaging, cheap practical work for Malagasy classrooms

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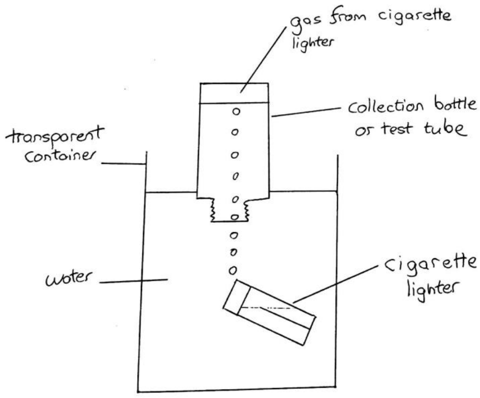
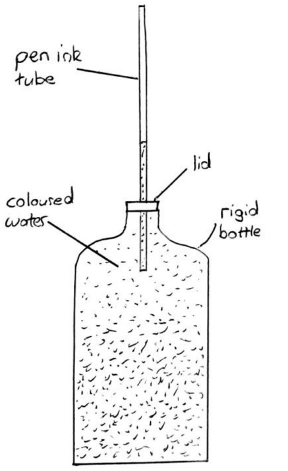
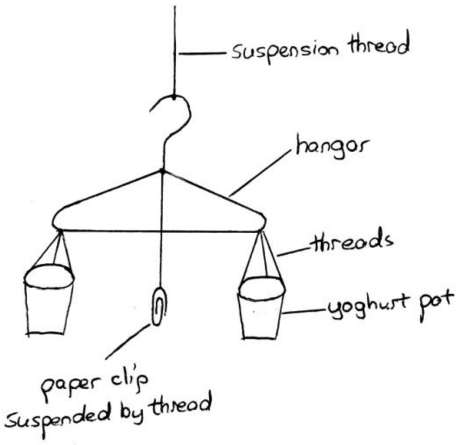
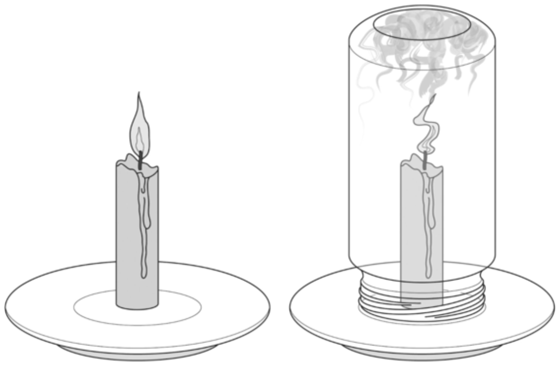
Translated into Malagasy by RAJAOFERA Mbolatiana Lilianah









Version 1.1

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1. Introduction

Practical work is important when teaching science because it:

- Increases interest in lessons.
- Helps students connect abstract ideas with concrete things. Lessons make more sense when students can see and touch what you are talking about.
- Improves examination results.
- Improves the practical skills of students which helps them in their lives.
- Inspires students to follow a career in science.

This book aims to make practical work accessible to **all** science teachers in Madagascar. Experiments have been carefully designed to ensure:

- No specialist science equipment is required.
- Required equipment can easily be found in larger towns and cities.
- Some experiments cost nothing, most cost under 1000Ar and a few cost more than 1000Ar. Most of the equipment can be kept and reused.

The experiments have been designed to fit into the 6e Physics and Chemistry curriculum.

Types of science practical work

Two ways you might do practical work with your class:

1) Demonstrations: show students something. Ensure any demonstration can be seen clearly by all the students.
2) Group work:
   a) Each group of students has a set of resources they work with. For example each group might have a measuring cylinder to measure volume.
   b) If there is one set of equipment, one group at a time uses the equipment. Other groups do other work during this time.

Practice makes perfect

Until you are a very experienced practical scientist, most of these experiments should be practised at home to avoid embarrassment in front of a class! If you cannot get an experiment to work, ask for help from other science teachers.

Safety

It is your responsibility to consider the safety aspects of practical work. Particular hazards are noted in each experiment; however these may not be comprehensive.

You should make students aware of any hazards before they carry out experiments. Bear in mind students are not normally as competent as adults so it is likely they will make mistakes.

We are not responsible for any injury or damage caused by carrying out the experiments suggested in the book.

About Centre de formation d'enseignants Robert MacGregor

We are a teacher training school that specialises in teaching Malagasy teachers:

- Modern teaching methods that do not require fancy resources.

- Practical science that is affordable.

We always receive excellent feedback on our resources and training. Get in touch if you would like us to train in your school. We can arrange training in most parts of Madagascar. See http://mada-enseignants.org for more information.

About the author

Robert has a 1st Class Honours Degree and a Postgraduate Diploma in Education from Edinburgh University, Scotland. He has worked in education since 2006, including working for top schools such as Jerudong International School, Brunei and Brighton College, England. In the 2015-2016 academic year, Robert taught science to students aged 9 to 18 on board the MV Africa Mercy (Mercy Ships) in Toamasina. During this time, he developed a very successful Malagasy teacher training program which is sensitive to the challenges and opportunities in Madagascar. Now he lives in Antananarivo and manages the training school and teaches science and mathematics at the British School. Robert enjoys mountain biking in the bush, cooking, his faith, and spending time with friends.

Acknowledgements

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Copyright

2. Experiments on 'Physical properties of materials'

2a: States of matter

i) Solids keep their shape

Point out examples of solids in the room. For example a bench or a wall. You could ask 'If I leave this bench here, will it change shape?'. Then ask students to put their thumbs up or thumbs down to show what they think. The correct answer is: no, it will not change shape. All solids do not change shape if forces do not act on them.

ii) Powdered solids don't keep their shape and don't have a flat free surface

Bring a transparent container of sugar to the lesson. Ask students to look closely at the sugar - they should see it is made up of tiny lumps of solid. However the shape of the sugar changes as the bottle tips. And the top of the sugar is not always flat.

iii) Liquids don't keep their shape and have flat horizontal free surface.

Bring in a bottle or bucket containing water. Show that the water changes shape as you tip the bottle, but that the surface of the water is flat, and horizontal.

You could also demonstrate a spirit level, which builders use to ensure things are flat.

2b: Handling a gas

Demonstration: Pouring CO2 to extinguish a candle

Equipment:

- Two 250ml containers: a plastic bottle with top cut off or a large drinking glass.
- A sodium bicarbonate sachet, available from grocery stores.
- 100ml Vinegar (Acetic acid).
- A short (3cm or less) Candle.
- A lighter or matches.
- Optional: Sheet of paper or card.

Note: This experiment may not work well in a draught. If the weather is windy, close the windows and doors before performing it.

Theory: Carbon dioxide pours like a liquid because it is denser than air.

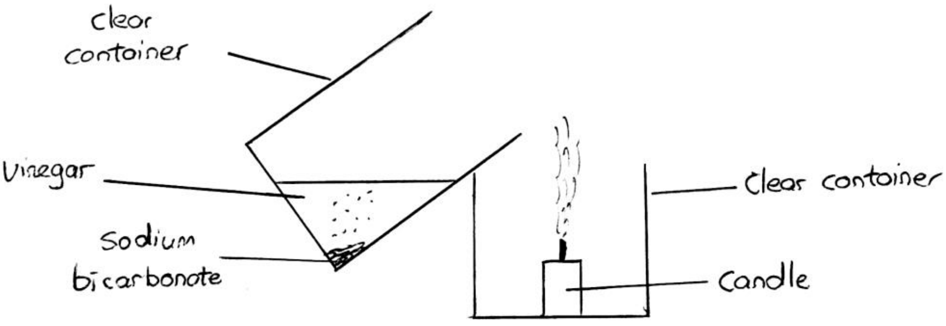
Carbon dioxide is made from the reaction of sodium bicarbonate and vinegar:

Sodium Bicarbonate + Vinegar → Carbon dioxide + water + sodium acetate

$NaHCO_3 (s) + CH_3COOH (l) \rightarrow CO_2 (g) + H_2O(l) + Na^+(aq) + CH_3COO^-(aq)$

The carbon dioxide is then poured over the candle. The candle will be extinguished because the carbon dioxide displaces the oxygen required for combustion.

Diagram:



Method:

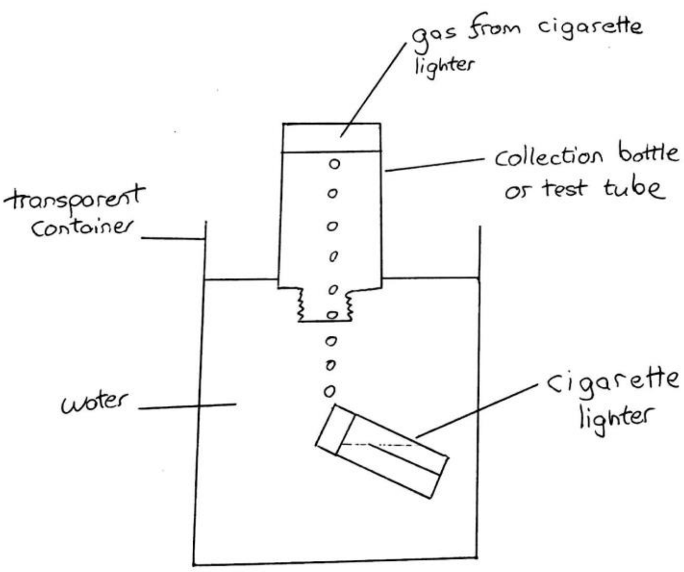
1) Place the candle in a clear container.
2) Light the candle.
3) Empty the sachet of sodium bicarbonate at the bottom of the other clear container.
4) Add vinegar to the sodium bicarbonate container until 1/4 full. The mixture fizzes producing carbon dioxide. You could place a piece of paper over the top of the glass to prevent any draught blowing the carbon dioxide out. Slide the paper off before the next step.
5) Pour the carbon dioxide over the candle. Do not pour any vinegar out. If you are successful the candle should go out, because oxygen is required for the candle to burn. This step is like pouring an invisible liquid over the candle.

Demonstration or student experiment: Collecting the gas from a cigarette lighter

Equipment:

- A 25ml or 50ml transparent bottle. A food colouring bottle is ideal.
- A transparent container, like the bottom half of a 1.5 litre water bottle.
- A Cigarette lighter-transparent version is best.

Diagram:



Method:

1) Fill the transparent container 3/4 full of water.
2) Fill the small bottle with water. Put your thumb or finger over the opening. Invert the bottle and put the opening under the water of the Eau Vive bottle. Remove your finger.
3) Activate the cigarette lighter under water. Collect the gas bubbles in the small bottle.

Notes:

Explain that this method can be used to collect gas from other experiments that produce gas.

Point out that the volume of the gas collected is much greater than the decrease in volume of the liquid from the cigarette lighter. In fact, a gas is about 1000x the volume of the corresponding liquid. This is because when a liquid is turned into a gas, the gas has a much larger volume.

2c: Mass and volume

i) Measuring the mass of a solid and a liquid

You may be able to borrow a balance. Or you could buy an electronic jewellery balance from a jeweller or semi-precious stone shop for about 40,000Ar (2017 prices).

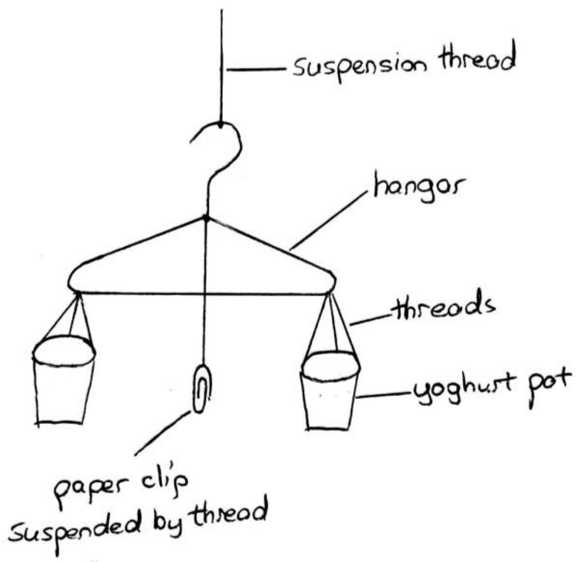
Alternatively make a balance.

A clothes hanger mass balance

Equipment:

- 1 Clothes hanger.
- Strong thread.
- 2 yoghurt pots.
- 1 Paper clip.
- Sellatape.
- 5 small marbles.
- 3 large marbles.

Diagram:



Method:

1) Hang the yoghurt cups on both sides of the bottom of the hangar.
2) Tie a plumb line (paper clip suspended by thread) onto the balance. Mark the point where the plumb line passes the bottom bar of the hangar when balanced.
3) Use sellatape or thread to secure the plumb line and yoghurt cups so the attachment position on the hangar cannot change.
4) Tie the suspension thread onto the top of the balance.
5) Weigh your marbles at a jeweller. All marbles have different weights so choose an average value for the small and large marbles.

Notes:

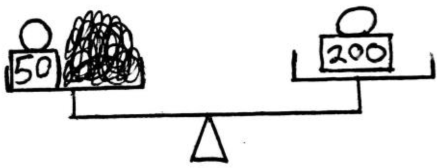
1) Using two different masses of marble helps pupils to understand why a market seller has more than one size of mass.
2) This homemade balance is not accurate and should not be used for trade.

Suggested activities with a balance:

1) Measure the mass of a solid object, e.g. eraser, mobile phone.
2) Measure the mass of some liquid. This requires two measurements:
   a) The mass of the empty container.
   b) The mass of the container and the liquid.

   The *mass of the liquid = mass of container and liquid - mass of empty container*.
3) Measure the mass of a very small object that your balance is not sensitive enough to measure. For example, measure the mass of a grain of rice or a paperclip. To do this:
   a) Measure the mass of a number of that item (between 10 and 100)
   b) Count the number of items.
   c) The *mass of one item = mass of many items ÷ number of items*.
4) Use the balance to weigh out a specific quantity of something, e.g. 50g of rice.
5) Solve weighing problems. For example: If you have scales and 1x200g and 1x50g mass, how can you weigh 150g of flour?

   Like many problems, this problem has multiple correct solutions:
   - Put the 200g mass on one side and the 50g mass on the other. Then add flour to the 50g side until the scales are balanced:



   - Use the 200g mass and scales to measure 200g of flour. Put the flour in a bag. Then use the 50g mass to remove 50g from the bag.

ii) Determination of the volume of a solid and liquid.

It is surprisingly easy to obtain equipment to measure volume:

- Syringes and medicine measuring cups are available in pharmacies.
- You can make a measuring cylinder out of an old water bottle.

1) Making a measuring cylinder

Equipment:

- A water bottle
- A 50 or 100ml syringe, or for more accuracy use an accurate measuring cylinder
- A pen (permanent marker if marking on plastic)
- Optional: Sellatape and white paper

Method:

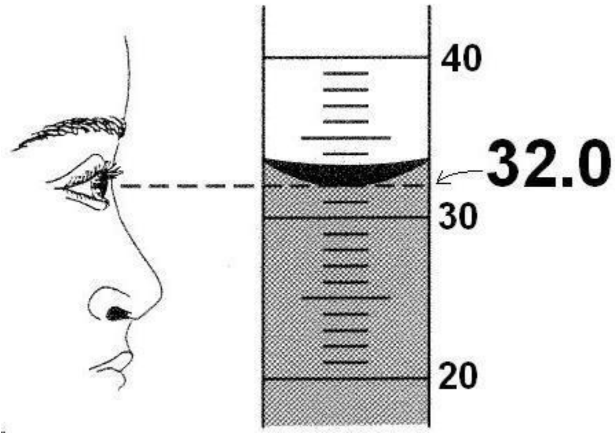
1) Cut the top off the water bottle.
2) Use the syringe to add 50ml of water to the bottle. Mark the position of the bottom of the meniscus with the permanent marker
3) Repeat step 2 until you have marks all the way to the top of the bottle.
4) Write numbers next to each 100ml mark.
5) Make small marks in between the larger marks to mark 10ml.Spread the marks evenly between the larger marks

Notes:

1) If you have a large measuring cylinder, you can make your cylinder more accurate. For example for the 450ml mark, put 450ml of water in the accurate measuring cylinder. Then pour that into the empty bottle cylinder and make the mark there.
2) You could make marks on paper attached to the cylinder. Then you can photocopy the scale for multiple bottles. Make sure the photocopy is exactly the same size as the original.
3) Homemade measuring cylinders are for educational purposes and are not accurate.
4) Make a number of these cylinders so students can use them in pairs or groups.

2) Volume measuring activities

When you measure the volume of something using a measuring cylinder, the reading is the line at the bottom of the meniscus. Make sure your eye is level with the reading:



Some volume measuring activities:

1) Measure the volume of a drinking glass.
2) Measure the volume of a small bottle.

3) Measure the volume of a bucket. There are a variety of correct ways of doing this with a measuring cylinder that is smaller than a bucket. Ask students to discuss different ways to do this. Be prepared for correct answers you haven't thought of.
4) Measure the volume of a solid by displacement. Put enough liquid to cover the object into the measuring cylinder and record the volume, v_1. Add the object and ensure it is submerged. You may need to use a pin to push it under the liquid if it floats. Measure the new volume, v_2. The volume of the object, $v = v_2 - v_1$.
5) Calculate the density of a solid by measuring the mass, then measuring the volume by displacement.

2d: Temperature

1) Measuring body temperature

You can purchase a mercury thermometer for measuring human body temperature from a pharmacy for under 5000Ar.

Mercury thermometers keep their reading after the heat source has been removed. To reset, hold tightly the end of the thermometer furthest from the bulb and give a repeated flick of your wrist. We recommend you ask the pharmacist to show you how to reset it when you purchase it.

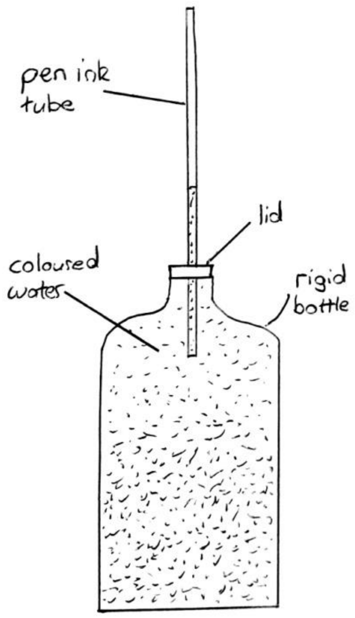
Caution! Mercury thermometers are fragile and mercury is toxic. Clean up any breakage carefully while avoiding skin contact with mercury. I suggest you store any loose mercury in a clear glass bottle sealed with tape for students to observe. Do not exceed the temperature range of the thermometer or it will break.

2) Making a model thermometer

Equipment:

- A inflexible (glass or hard plastic) bottle. A bottle used for injectable material is best as the top is self-sealing. Available from vets, doctors, pharmacists or hospitals.
- A empty ink tube from a ballpoint pen.
- Food colouring (optional)

Diagram:



Method:

1) Fill the bottle to the brim with water.
2) Optional: Add some food colouring
3) Make a small hole in the lid of the bottle for the ink tube to pass through.
4) Push the ink tube through the hole.
5) Put the lid on the bottle.

Note: A non self sealing bottle cap can be used but some glue or a rubber bung with a hole will be required to ensure an airtight seal between the tube and the bottle.

What to do with the model thermometer:

1) Heat the bottle in hands by holding it and ask students to observe what happens. If you have an airtight seal, the liquid should move up the tube as the bottle is heated.
2) Ask students to discuss why the water moves up the tube. The answer is that as the water is heated it expands. The expansion pushes the water up the tube.
3) Discuss the similarities and differences between the model thermometer and a real thermometer.

2e: Physical transformations

1) Give concrete examples of evaporation. For example: A blackboard drying after being wiped with a wet cloth, clothes drying or the ground drying in the sun.
2) Bring in some ice and watch it melt.
3) Put some ice in a yoghurt pot on a balance. Measure the mass before and after melting. Does the mass change? The mass may increases slightly due to condensation forming on the pot. To avoid this problem, dry the pot before recording the mass.
4) For the same mass, ice has a larger volume than water. To show this, freeze a rectangular bottle (e.g. a TAF Vinegar bottle). Once frozen, the sides of the bottle will bulge out. Show the frozen bottle to the class. Defrost the bottle in the lesson and ask students to observe what changed. The bottle should return to the normal shape. **Note:** Water is a special case; most solids have a lower volume than their liquids.
5) Put a closed glass bottle **full** of water in a freezer. Wrap it up in some bags or material because the bottle will explode since water expands when frozen. This is spectacular but you need a nearby freezer. **Safety!** Ensure the bottle is well wrapped up and be very careful with the broken glass. Make sure the freezer users know about the experiment. Occasionally, the water may become supercooled and not freeze. In this case, remove the bottle carefully, keeping it wrapped until it is warm.

3. Experiments about Electricity

The electricity section has many low cost experiments you and your class can carry out.

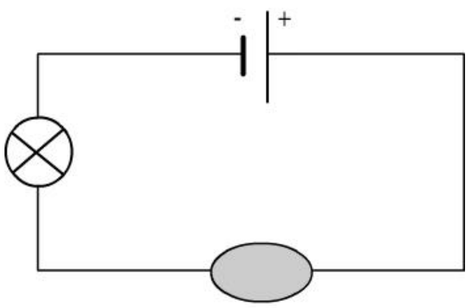
3a: Experiments with a cheap LED torch

Equipment:

- Cheap LED torch from market stall. The cheapest you can buy should be suitable (2017: 500-1000Ar). Buy 2 in case you break one.
- 2 Short wires with bare ends.
- Sellatape or electrical tape.

Experiments:

1) Take the torch apart and examine it. Experiments are best done with a torch that is open so students can see how it is constructed.
2) Pass around a battery. Ask students what they notice about it. Point out the two different terminals.
3) Take the bulb from the torch and connect it directly to the battery terminals. This shows the battery causes it to light. Try attaching the bulb to other things e.g. the desk or someone's head so students see it is the battery that causes the bulb to light
4) To show that the two terminals have a different nature, connect the LED one way and then the other way round. The LED will only light when connected one way round.
5) Demonstrate the switch on the torch. Explain that the switch is something that can make a gap in the circle of metal (circuit), so current can't flow. When there is a circle of metal including the bulb, the bulb lights.
6) Test materials to see if they are insulators or conductors:
   a) Attach a wire to each of the terminals on the switch so that when the wires are touched, the light comes on.
   b) Explain that electricity needs to flow in order to light a bulb. But what will electricity flow through?
   c) Attach the wires to a variety of things to see if they are conductors or insulators. Suggestions:



(Tested material)

- graphite (pencil lead)
- the plastic covering on a wire (which doesn't conduct so you don't get a shock)
- the metal inside a wire
- metals
- non metals
- A student's head or hand (you can make a joke with this and activate the switch with one student to turn the bulb on).

7) Test different parts of a lamp to see if they are insulators and conductors. You could smash a lamp with a filament to test it. **Warning:** Broken glass is sharp. Don't smash an energy saving lamp as they contain a small amount of toxic mercury vapour.

8) Examine the lamp to work out what voltage it is made for. Most lamps have the voltage written somewhere on them.
9) Identify breaks in a circuit using the conductivity tester (also known as a continuity tester) you made for experiment 6. You could make up a set of wires and bulbs. Ensure some of the wires have a break inside them and some of the bulbs are broken. Students will then use the continuity tester to work out which ones are broken and which are working normally.

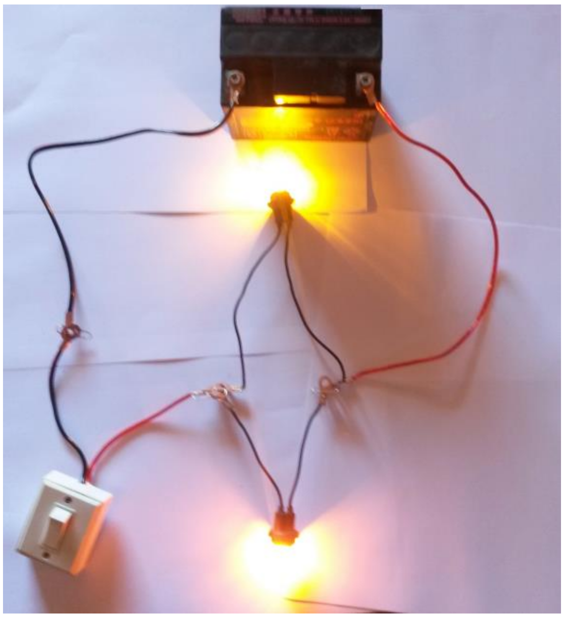
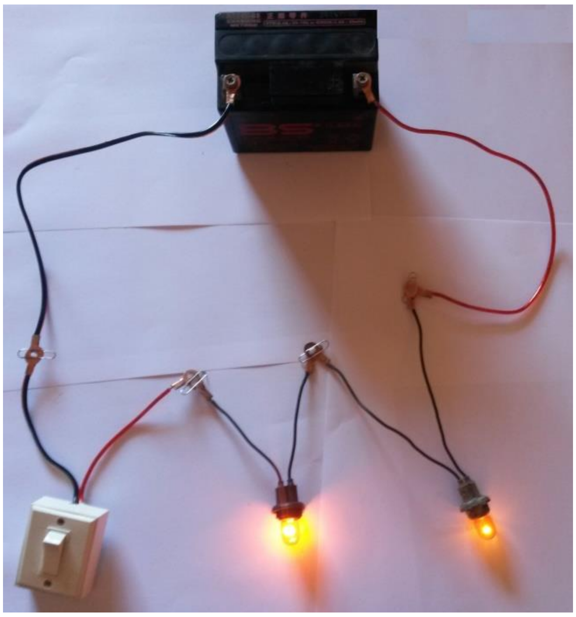
3b: Experiments with household and motorcycle electrical components

Equipment:

Household and motorcycle electrical components are cheap and easily available in most towns and cities. Second hand components are often available cheaper than new ones. Some examples are:

- Motorcycle indicator bulb holders.
- Motorcycle bulbs.
- 12 volt battery. Borrow a car or motorcycle battery.
- Household switches.
- Wire with twisted ends. You could put solder on the ends to make it more durable. Any electrical repairer can do this easily.
- Paperclips to clip wire ends together.
- Glass fuses
- Wire cutters
- Screwdriver to put wires in switch.

Pictures:

Experiments:

Most of the experiments you can do with a cheap LED torch can be done with this equipment. In addition:

1) Build series and parallel circuits:
   - Place switches in different positions to show how their position affects which bulbs are turned on and off.
   - Investigate how the brightness of bulbs compares when they are in series or parallel.
2) Demonstrate a fuse. Take one strand of copper from a multistranded copper wire. This simulates a fuse. Place this wire in the circuit with a bulb. Short out the bulb with another wire. You will see the strand of copper melt. Then you can show students some real fuses if you have them.

Safety:

Be careful not to short out the battery, except for the demonstration of a fuse. Shorts can cause wires to overheat and catch fire.

Students will often incorrectly build circuits that short out. They should not connect a battery until the teacher has checked their circuit.

4. Chemistry

Physical and Chemical changes

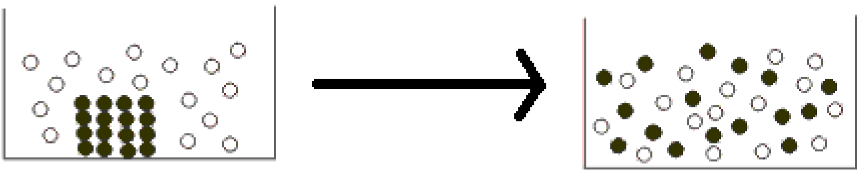
It can be challenging for students to differentiate between a physical and chemical change. Here we suggest practical ways you can teach this topic.

4a: Physical changes

A physical change is when no new substance is made, but there is a change in the appearance of a chemical. Examples of a physical change include change of state and dissolving.

Suggested experiments:

1) **Condensation:**
   a) Boil water in a pan with a lid. When you remove the lid, the top of the lid will be wet because the steam changes back into water.
   b) Put ice in a glass. In a humid climate, water will condense on the side of the glass. If the atmosphere is dry, hold the glass over hot water.
2) **Dissolving:**
   a) Add some salt to a glass of water. Stir the water until the salt is dissolved and cannot be seen. Ask the students: Is the salt still there? Some will say 'yes', others 'no'. Boil the water in a pan until it has all evaporated and you will be left with salt on the bottom.
   b) If you have a digital balance, accurate to 0.1g, you can investigate where the salt goes during dissolving:
      i. Weigh a glass containing water. Write the weight down.
      ii. Weigh out 1g of salt.
      iii. Ask students what they think the weight of the glass + salt will be **after** the salt has dissolved. For example, if the glass+water weights 54.6g, students will suggest that the glass+water+dissolved salt will weigh 54.6g, 55.6g, 55g etc...
      iv. Add the salt. You should observe that the total mass = mass of water + salt! The salt has not 'gone away', individual molecules of salt move between the water molecules.



Undissolved salt in water   dissolved salt in water

3) **Evaporation:** Put a couple of drops of ethanol or isopropyl alcohol on a student's hands. It will evaporate quickly and feel cold. This shows that evaporation cools things, which is the reason we sweat. As our sweat evaporates, it keeps us cool. Ethanol and isopropyl alcohol is available from pharmacies. Ethanol is usually more expensive than isopropyl alcohol. **Safety:** Ethanol and Isopropyl alcohol are flammable. Isopropyl alcohol is **poisonous**.

4b. Chemical reactions

Some of the following observations suggest a chemical reaction may have taken place:

- Change in colour.
- There is an energy change, which is not accompanied by a change of state. For example the substance heats up, cools down, and sound or light is produced.
- It is difficult to change the product back into the reactant.
- A precipitate is formed when 2 liquids are mixed.
- A gas is formed without any heating or change of pressure taking place.

Experiments that show a chemical change:

a) Rusting. Put an iron nail into a glass of salt water. The iron will turn into iron oxide very quickly.
b) Add a couple of drops of iodine solution (available in a good pharmacy) to something that contains starch (e.g. flour). The iodine will react with the starch and turn black. You should dilute 1 part iodine solution to 10 parts water before using it. Depending on the strength of your solution you may be able to dilute it even more than this. **Safety:** Iodine will stain material.
c) Cook an egg and observe the colour changes.
d) Add zinc to sulphuric acid. Bubbles of hydrogen will be produced and the temperature will increase.

Zinc can be obtained from very cheap, poor quality batteries (ones that **do <u>not</u>** say 'alkaline' on the side) which have a zinc coated casing. Zinc coated roofing sheets do not work well. Use some pliers to tear the battery open. Pull out the carbon electrode for electrolysis and use some of the metal casing for this experiment. As the casing only zinc coated you cannot reuse it after this experiment. These batteries are often available from street sellers for a very low price (400Ar for 3 in 2017).

Zinc-Carbon battery (**not** 'alkaline')

Sulphuric acid: Sulphuric acid is the battery acid used in lead acid car batteries. You can buy it cheaply from car battery repairers or from supermarkets. In Madagascar the concentration of the acid is not always as strong as stated on the bottle. Acid for batteries should be about

5Mol/l. More dilute acid is safer to handle. Try to use the most dilute acid you can that still shows the reaction and change in temperature.

Safety: Sulphuric acid is the **most hazardous chemical used in this book**. Sulphuric acid will **burn holes in clothing or material**. If it gets on skin or eyes **it must be immediately washed off with plenty of water**. Ensure you have water present for this purpose. When diluting acids, **always add the more concentrated acid to water** as addition of water can cause concentrated acid to boil violently. Use the most dilute acid you can for an experiment. If you spill acid, dilute with water and add bicarbonate of soda to the spill to neutralise. Dispose of small quantities of acid by diluting with lots of water and then pouring down a drain or toilet. Large quantities should be neutralised with sodium bicarbonate first.

e) Light a candle. Ask the students to discuss the following questions and share their ideas with the class. It is important you let students discuss with each other and make mistakes before helping them with the answer:

Q1) What is burning? How do you know?

Pupils often disagree about what is burning. Some will say the wax is 'used up' or 'melts'; ask if the drips of wax are the same volume as the candle was.

If everyone thinks that the wick is what burns, burn some non-plastic string and show that it burns much quicker.

Answer: The wax burns. The wick is used to transport the melted wax up to the flame where it burns.

Q2) What would happen if we cut off the air supply? Cover the candle with a clear glass cup or jar. The candle will go out after a few seconds.

Ask what does this tell us? Answer: Air is required for the candle to burn.

Q3) Is anything produced in the burning? Answer: Heat and light. If you place the bottom of a glass above the candle flame it will turn black, which demonstrates carbon is also produced in the burning.

Q4) Is this a physical transformation or chemical reaction? Why?

Answer: It is a chemical transformation. Light is given out. Heat is given out. The colour of the product (black carbon) is different to that of the original candle.

Questions about Physical and chemical changes

Some questions to ask students to check they can spot physical and chemical changes:

a) Is heating wax a chemical or physical change?
Answer: Physical change. Demonstrate this by melting wax on a metal spoon above a candle. When the heat is removed the wax will return to its former state.

b) Add tiny bit of potassium permanganate, about the size of one sugar crystal, to a cup of water. The water will turn purple. Ask students if this is a chemical or physical change.
Answer: Physical change. The potassium permanganate dissolves.

Obtain potassium permanganate from good pharmacies (about 200Ar/gram in 2017). You may need to crush it.

Safety: Potassium permanganate stains clothes and skin. If you stain skin, it is not harmful, but you will need to wait a long time for the stain to go away.

c) Sprinkle iron filings into a stove flame. File some iron into a flame. You should get some sparks. Ask students if this is a chemical or physical change.

Answer: This is a chemical change as light is produced.

d) Add vinegar to bicarbonate of soda. Ask if this is a chemical or physical change? Help students to observe that a) The reaction is endothermic - the product cools down; b) A gas is given off. Both these things suggest a chemical change.

3c. Combustion

Use of fuel efficient stoves

To help students understand how buying something more expensive can save money, compare two people who bought different stoves, and do the same amount of cooking:

Phillippe buys a traditional stove for 1800Ar. He spends 4000Ar/week on charcoal.

Helena buys an efficient stove for 3000Ar. She spends 2000Ar/week on charcoal.

Fuel efficient stove

Traditional stove

1) How much does Philippe spend in his first week?
Answer: 1800+4000 = 5800Ar

2) How much does Helena spend in her first week?
Answer: 3000+2000 = 5000Ar

3) How much does Philippe spend in the first four weeks?
Answer: 1800+4000x4 = 17,800Ar

4) How much does Helena spend in the first four weeks?
Answer: 3000+2000x4 = 11,000Ar

5) Which stove would you buy? Why?
Answer: The fuel efficient stove because the overall cost of running it is less.

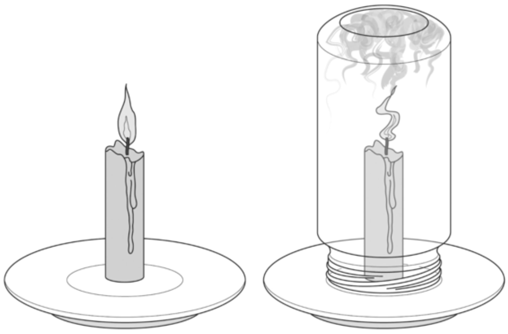
Mention that energy saving light bulbs are similar - they cost more but are cheaper to run. Also mention that efficient stoves and light bulbs will help protect our environment.

Experiment: How does the volume of air affect how much combustion can take place?

Equipment:

- A candle
- 3 glass jars of different volume (small, medium and large) that can cover the candle
- A lighter
- Optional: A stopwatch

Diagram:



Method:

1) Light the candle
2) Cover the candle with one of the jars. Observe how long it takes for the candle to go out. Optional: Time how long the candle takes to go out using a stopwatch.
3) Repeat with other sized jars.
4) If timing with a stopwatch, draw a bar chart of the results.
5) Draw a conclusion, for example: 'The larger the jar, the longer the candle burns for'.

Petrol fumes

It is essential you discuss the danger of petrol fumes, which are highly flammable. Many serious fires are caused by refuelling a vehicle near open flames. Do **<u>not</u>** attempt to perform experiments with petrol as serious burns or fires may result.

Health risks from combustion

Teach students that smoking causes cancer and lung diseases. It also wastes money that you could spend on a better life...don't start!

Pollution from vehicles and cooking fires also causes lung problems. When possible cook outdoors and avoid streets with lots of traffic.